# 大規模日本語連想データベースの構築・利用による
# 語彙知識のマッピング
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# 大規模日本語連想データベースの構築・利用による語彙知識のマッピング

# Mapping Lexical Knowledge through the Construction and Utilization of a Large-Scale Database of Japanese Word Associations

Keywords: (1) large-scale Japanese Word Association Database (JWAD); (2) lexical knowledge; (3) mapping; (4) questionnaire surveys and web-based survey; (5) lexical association network map; (6) semantic network; (7) graph clustering techniques; (8) bilingual lexical maps; (9) written errors

## 1. Introduction

This research project has been seeking to investigate lexical knowledge by mapping out the associative structures that exist for Japanese words. To that aim, the central focus of the research has been the ongoing construction of the large-scale Japanese Word Association Database (JWAD) (Joyce, 2005a, 2005b, 2005c, 2005d, 2005e, 2006, 2007; Joyce & Miyake, 2008). The project has also been exploring the utilization of the JWAD to creating lexical association network maps and to clustering semantic network representations of the JWAD, as approaches to tracing out the rich networks of associations that connect words together and to visualizing the hierarchical structures within semantic spaces (Joyce & Miyake, 2007, 2008; Miyake & Joyce, 2007a, 2007b, in press; Miyake, Joyce, Jung, & Akama, 2007). As examples of the wide range of applications for the JWAD and the lexical association network maps, the project has also conducted some studies in the areas of Japanese language instruction (Joyce, Takano, & Nishina, 2006; Takano, Joyce, & Nishina, 2006, 2007), Japanese lexicography (Joyce, 2005b, 2005d, 2006; Joyce & Srdanović, accepted), and the Japanese writing system (Joyce, 2007).

This section of the report provides a brief overview to (1) the construction of the large-scale Japanese Word Association Database (JWAD) (Joyce, 2005a, 2005b, 2005c, 2005d, 2005e, 2006, 2007; Joyce & Miyake, 2008), (2) the development of lexical association network maps and the application of graph clustering techniques to a semantic network representation of the JWAD (Joyce & Miyake, 2007, 2008; Miyake & Joyce, 2007a, 2007b, in press; Miyake, Joyce, Jung, & Akama, 2007), and (3) initial exploration of applications in the areas of Japanese language instruction (Joyce, Takano, & Nishina, 2006; Takano, Joyce, & Nishina, 2006, 2007), Japanese lexicography (Joyce, 2005b, 2005d, 2006), and the Japanese writing system (Joyce, 2007). Further details of these various aspects of the research project can be found in the papers and presentations compiled together and presented in the subsequent sections of the report.

## 2. Ongoing construction of the large-scale Japanese Word Association Database (JWAD)

The central focus of this research has been the ongoing construction of the large-scale Japanese Word Association Database (JWAD) (Joyce, 2005a, 2005b, 2005c, 2005d, 2005e, 2006, 2007, Joyce & Miyake, 2008). The JWAD aims to be large-scale in terms of both the number of words surveyed and the number of association responses collected. Joyce (2005a, 2005b, 2005c, 2005d) detail the initial construction of the JWAD, from the selection of 4,998 basic Japanese kanji and words as the initial survey corpus (see Appendix 1 for a list of the survey corpus) and the first collections of word associations through two large-scale traditional questionnaire surveys that were administered to 1,481 Japanese undergraduate students. Those two surveys obtained in total 148,100 word association responses.

In order to overcome the burdens of preparation and data inputting and to more efficiently collect the large-scale quantities of association responses for the database, the project also developed a web-based version of the word association survey. To that aim, the survey corpus was also coded with various kinds of information. The information types included pronunciation transcriptions in hiragana, orthographic-form codes (i.e., single kanji, multi-kanji, and mixed kanji-kana words), and component kanji codes (kuten codes), as well as semantic category codes, based on the Kokuritsu Kokugo Kenkyujo's (2004) recently revised semantic classification. As a further measure, ID codes for collected word responses are also being added as feedback data. During the academic years of 2006 and 2007, an additional 24,542 word association responses were collected via the web-based version of the association survey. Accordingly, this project has collected to date a total of 172, 642 word association responses.

From the data collected from the first two questionnaire surveys, the word association responses from approximately 50 respondents for a randomly selected sample of 2,099 items were processed and coded in order to make them publicly available as Version 1 of the Japanese Word Association Database (JWAD-V1) (released in June, 2007). Details of the coding are provided in Joyce (2007). Appendix 2 presents in an abbrievated format the word association data for the initial 100 items in Version 1 of the Japanese Word Association Database. The entries consist of the item identification number, the stimulus item itself, and statistics relating to the number of respondents (i.e., total number of responses), the total type counts (i.e., total number of different word association responses) and the size of the core items (i.e., word responses with a frequency of 2 or more). The entries also present the set of core associations which have frequencies of 2 or more (with response frequencies indicated in brackets), as well as the complete set of word association responses with frequencies of 1.

Version 2 of JWAD will be released once at least 50 word association responses have been obtained and coded for all 5,000 of the present survey items. In the future, the survey corpus will be expand by adding between 3,000 to 5,000 new items, which will be items that are frequent associates elicited for a core set of 1,000 survey items but are not already part of the survey corpus. The core set of items has already been selected, based on Japanese language proficiency test levels, and the work of identifying the new items is presently underway.

## 3. Lexical association network maps and graph clustering of JWAD semantic network representation

The project has also been exploring the utilization of the JWAD to creating lexical association network maps and to clustering semantic network representations of the JWAD, as approaches to tracing out the rich networks of associations that connect words together and to visualizing the hierarchical structures within semantic spaces (Joyce & Miyake, 2007, 2008; Miyake & Joyce, 2007a, 2007b, in press; Miyake, Joyce, Jung, & Akama, 2007).

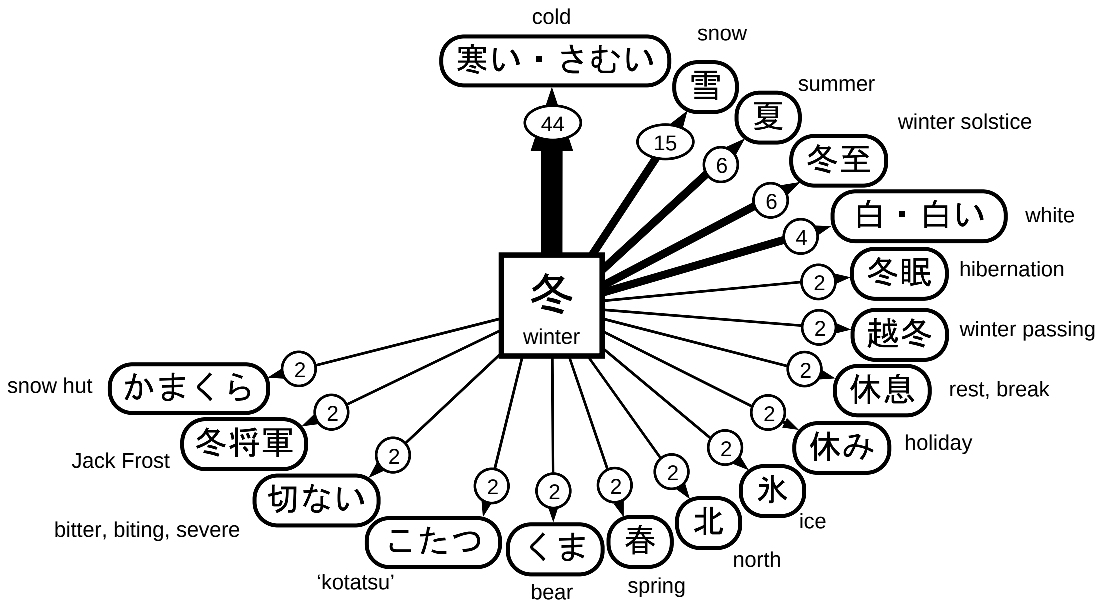


*Figure 1.* The association set for the noun 冬 'winter' consisting of 17 forward associations and a set of five core associates given by two or more respondents. The numbers on the connecting arrows indicate the percentage of respondents providing the response.

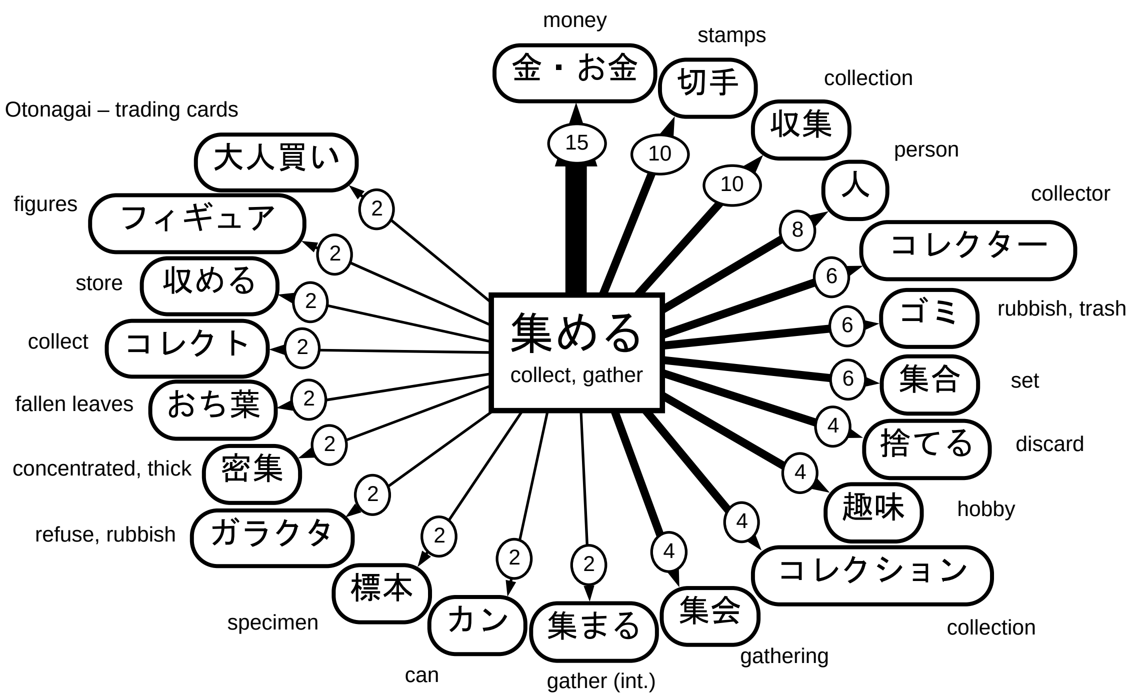


*Figure 2.* The association set for the verb 集める 'collect' consisting of 21 forward associations and a set of 11 core associates given by two or more respondents.

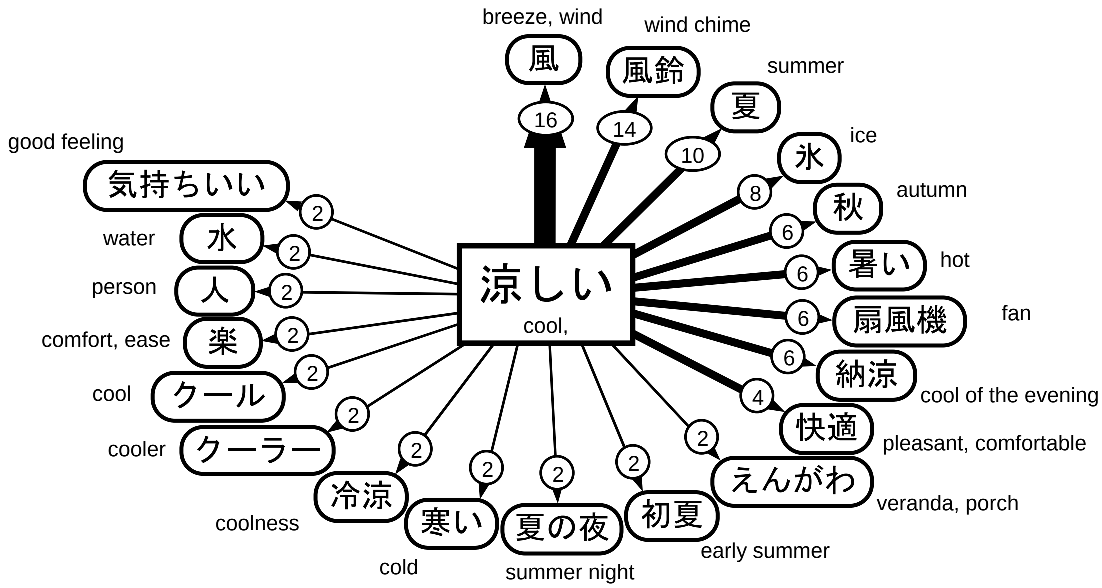


*Figure 3.* The association set for the adjective 涼しい 'cool' consisting of 21 forward associations and a set of 11 core associates given by two or more respondents.

As figures 1-3 illustrate, the basic component of the lexical association network map is the set of associates given in response to a given target word and their association strengths in terms of response frequencies. In addition to the forward associations, the lexical association network maps will later also include backward associations as well as the association relationships between the constituent words of an association set.

Figures 1 to 3, which constrast association sets for words from different word classes, provide interesting insights into the syntactic aspects of lexical knowledge. Figure 1 presents the associate set for the Japanese noun of 冬 'winter', where there is a very strong primary associate in the adjective of 寒い・さむい 'cold' which accounts for 44 percent of the all responses. The association set also includes many other nouns, such as 雪 'snow', 夏 'summer' and 冬至 'winter solstice', as well as other adjectives, such as 白・白い 'white' and 切ない 'bitter, biting, severe'. In contrast, Figure 2 presents the associate set for the Japanese verb of 集める 'gather, collect', which has a larger set of core associates, but, naturally, with weaker association strengths. The primary associate is お金・金 'money' which accounts for 15 percent of the responses, followed by two secondary responses of 切手 'stamps' and 収集 'collection' at 10 percent. Thus, compared to the very strong association between the adjective 寒い・さむい 'cold' and the noun 冬 'winter', more of the core responses for the verb 集める 'gather, collect' are nouns that could either occupy the direct object slot (i.e., お金・金 'money', 切手 'stamps', 人 'people', ゴミ 'rubbish, trash') or the subject slot (i.e., コレクター 'collector'). Figure 3 presents the associate set for the adjective of 涼しい 'cool', where the primary associate is 風 'wind, breeze'. Also, consistent with its adjectival word class, many of the associates for 涼しい are nouns that are typically modified by this adjective, such as 涼しい風 'cool breeze', 涼しい夏 'cool summer', and 涼しい秋 'cool autumn'. These examples clear show that the patterns of associations vary according to different word classes.

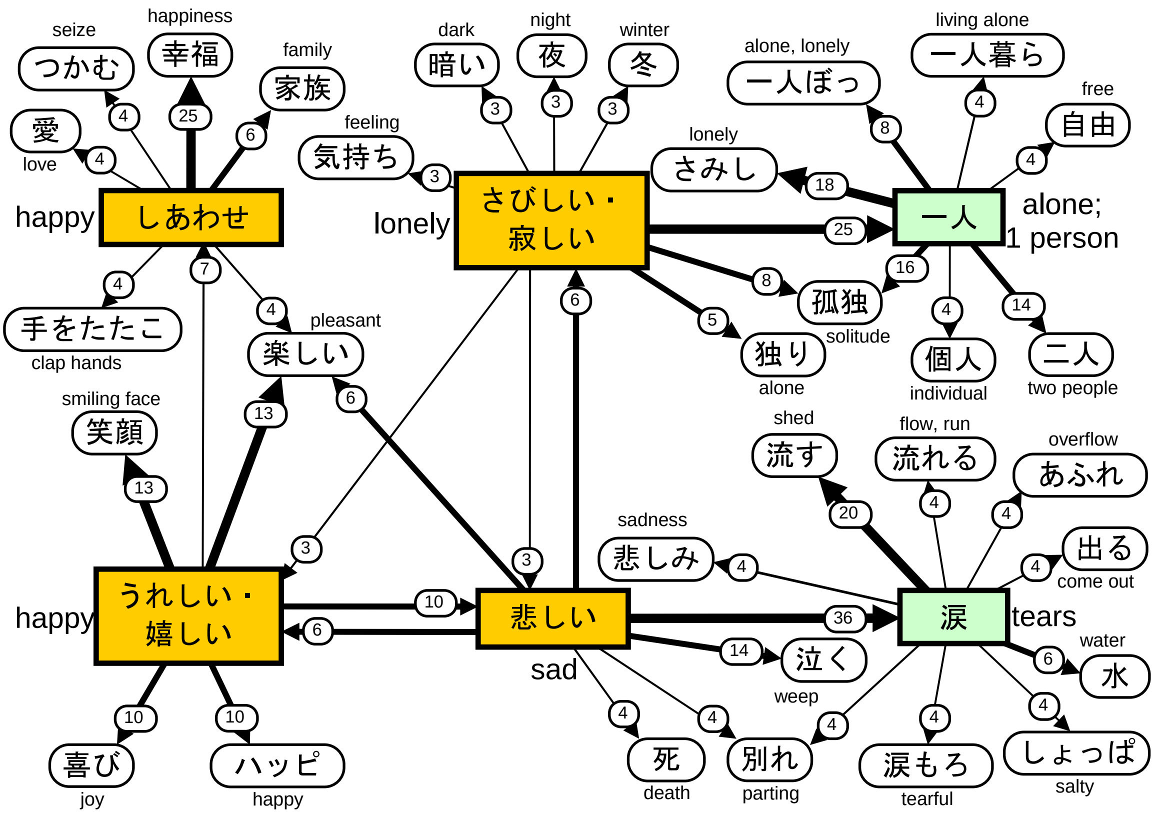


*Figure 4.* Example of lexical association network map building from and contrasting a small set of emotion words

Beyond the single-word level, lexical association network maps can also be combined to create various kinds of domain networks. Figure 4 is a lexical association network map based on a small set of emotion words, which illustrates some of the interesting contrasts that can be identified within sets of related words. While the positive synonymous words of しあわせ and うれしい・嬉しい 'happy' have rather strong associations to a small set of close synonyms, such as 幸福 'happiness', ハッピー 'happy', 喜び 'joy', and 楽しい 'pleasant', the negative emotion words of さびしい・寂しい 'lonely' and 悲しい 'sad' primarily elicit word association responses that can be regarded as having a causal or resultant relationship. For instance, the prime associate for さびしい・寂しい 'lonely' is 一人 'alone; 1 person', followed by the related words of 孤独 'solitude' and 独り 'alone', while 悲しい 'sad' has a particularly strong prime association of 涙 'tears' (given by 36% of the respondents), followed by 泣く 'weep' (given by 14% of the respondents).

As an extremely promising approach to tracing out the rich networks of associations that connect words together and to visualizing the hierarchical structures within semantic spaces, this research project has been employing the techniques of graph representation and their analysis that allow us to discern the patterns of connectivity within large-scale resources of linguistics knowledge and to perceive the inherent relationships between words and word groups (Joyce & Miyake, 2007, 2008; Miyake & Joyce, 2007a, 2007b, in press; Miyake, Joyce, Jung, & Akama, 2007).

This avenue of research has applied graph theory analyses to the initial JWAD association network representation. For comparison purposes, a network representation was also created for Okamoto and Ishizaki's (2001) Associative Concept Dictionary (ACD). Although the JWAD and ACD were contructed in rather different ways—most notable differences being that ACD is not strictly free word association responses, because response relationships were specified in the task, and that it only has associations for a corpus of 1,656 nouns—because the respective network representations only employed response words with a frequency of twonor more, the two networks are of very similar sizes (8,970 nodes for the JWAD network and 8,951 nodes for the ACD network). The characteristics of the two semantic network representations of Japanese word associations were analyzed by calculating the statistical features of degree distribution and clustering coefficient—an index of the interconnectivity strength between neighboring nodes in a graph. The results for degree distributions clearly indicate that the networks exhibit a pattern of sparse connectivity; in other words, that they possess the characteristics of a scale-free network. Moreover, the results for clustering coefficients suggest that both networks conform well to a power law, which indicates that both networks have intrinsic hierarchies.

In addition to applying these basic statistical analyses to the two semantic network representations constructed from large-scale databases of Japanese word associations, this research project has also applied some graph clustering algorithms which are effective methods of capturing the associative structures present within large and sparsely connected resources of linguistic data (Joyce & Miyake, 2007, 2008; Miyake & Joyce, 2007a, 2007b, in press; Miyake, Joyce, Jung, & Akama, 2007). Specifically, this line of research has compared the basic Markov clustering algorithm proposed by van Dongen (2000) with a recently proposed combination (Miyake & Joyce, 2007b) of the enhanced Recurrent Markov Clustering (RMCL) algorithm developed by Jung, Miyake, and Akama (2006) and Newman and Girvan's measure of modularity (2004). While the the basic Markov clustering algorithm is widely acknowledged to be an effective approach to graph clustering, it is also known to suffer from an inherent problem relating to cluster sizes, for the algorithm tends to yield either an exceptionally large core cluster or many isolated clusters consisting of single words. The RMCL was developed expressly to overcome the cluster size distribution problem by making it possible to adjust the proportion in cluster sizes. The combination of the RMCL graph clustering method and the modularity measurement provides even greater control over cluster sizes. As an extremely promising approach to graph clustering, this effective combination is being applied to the semantic network representations of Japanese word associations in order to automatically construct condensed network representations. One particularly attractive application for graph clustering techniques that are capable of controlling cluster sizes is in the construction of hierarchically-organized semantic spaces, which certainly represents an exciting approach to capturing the structures within large-scale association knowledge resources.

Conceptually, the graph clustering technique may be regarded as a way of automatically identifying the associations between related words within local domains, such as the manually created lexical association network map in Figure 4. While the creation of small domain association maps can provide interesting insights into association knowledge, the efforts required to manually identify and visualize even relatively small domains are not inconsequential. The clustering methods developed through this research, however, offer an effective way to automatically identify and visualize sets of related words as generated clusters. Table 1 presents the forward associations for some of the words in Figure 4 together with generated MCL clusters from the JWAD network. The comparion in Table 1 shows that many of the important word associations are clustered together within the same groups. In addition to identifying many of the important associates, the clustering results also include other words that are not part of the present association sets, but which are clearly related, at least at a more general level.

*Table 1.* Forward associations and generated MCL clusters for a set of emotional words

| Stimulus | Forward associations | MCL clustered words |
|---|---|---|
| しあわせ (happy) | 幸福 (happiness) (25), 家族 (family) (6), 手をたたこう (clap hands) (4), 愛 (love) (4), つかむ (seize) (4), 楽しい (pleasant) (4) | しあわせ (happy), 幸福 (happiness), 手をたたこう (clap hands) |
| うれしい・嬉しい (happy) | 笑顔 (smiling face) (13), 楽しい (pleasant) (13), 喜び (joy) (10), ハッピー (happy) (10), しあわせ (happy) (7) | うれしい・嬉しい (happy), 歓喜 (delight), 喜 (joy), 喜び (joy), 喜ぶ (be glad), 喜寿 (77th birthday), 怒 (anger), 喜怒哀楽 (human emotions), 悲しむ (be sad), 大喜利 (final act of *Rakugo*) |
| さびしい・寂しい (lonely) | 一人 (alone; 1 person) (25), 孤独 (solitude) (8), 独り (alone) (5), 冬 (winter) (3), 夜 (night) (3), 暗い (dark) (3), 気持ち (feeling) (3), 悲しい (sadness) (3) | さびしい (lonely), 一人 (alone; one person), 独り (alone) |
| 悲しい (sad) | 涙 (tears) (36), 泣く (cry) (14), さびしい (lonely) (6), うれしい (happy) (6), 死 (death) (4), 別れ (parting) (4) | 悲しい (be sad), 悲しみ (sadness), 寂しい (lonely), 涙 (tears), 流す (shed) |

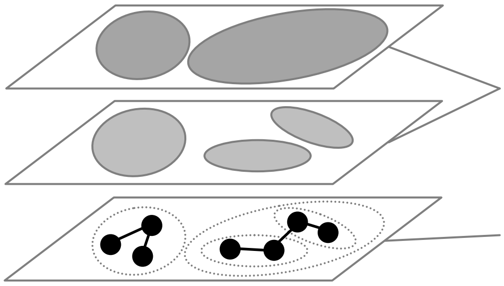


*Figure 5.* Schematic representation of how MCL and RMCL graph clustering methods can be used in the creation of a hierarchically-structured semantic space based on the JWAD network

One objective of the research on graph clustering methods has been to improve the control over the sizes of clusters generated by the algorthims. With finer control of cluster sizes, it will be possible to automatically construct a hierarchically-organized semantic space as a means to visualizing associative knowledge, as the schematic representation in Figure 5 attempts to illustrate.

The value of this aspect of the research project was recognized at the 21st Pacific Asia Conference on Language, Information and Computation where the paper by Miyake, Joyce, Jung, and Akama (2007) received the conference's 'Best Paper Award'.

**4. Applications of the JWAD and lexical association network maps**

As examples of the wide range of applications for the JWAD and the lexical association network maps, the project has also conducted some studies in the areas of Japanese language instruction (Joyce, Takano, & Nishina, 2006; Takano, Joyce, & Nishina, 2006, 2007), Japanese lexicography (Joyce, 2005b, 2005d, 2006; Joyce & Srdanović, accepted), and the Japanese writing system (Joyce, 2007).

As an initial exploration of the application of lexical association network maps to Japanese language instruction, Joyce, Takano, and Nishina (2006) conducted a study to investigate the use of bilingual lexical maps as an instruction strategy for specialist vocabulary (see also Takano, Joyce, & Nishina, 2006, 2007). Although memory research has long demonstrated that the categorization and semantic organization of stimulus materials dramatically influences retrieval performance (Bower, Clark, Winzenz, & Lesgold, 1969), some studies of foreign vocabulary learning have argued that thematic associations may be more effective than semantic relationships, because interference effects can occur when simultaneously studying sets of semantically-related L1-L2 word pairs (Tinkham, 1997). Morin and Goebel (2001) have demonstrated the effects of semantic clustering based on themes and associations in learning Spanish as a second language, while Bahr and Dansereau (2001) compared the effects of presenting English and German word pairs in either a bilingual knowledge map format or a list format and found significant better performance in the map condition. Extending on Bahr and Dansereau (2001), Joyce, Takano, and Nishina (2006) compared memory performance for

Japanese and English word pairs when presented in either bilingual lexical maps or list formats to beginner-level students of Japanese. The findings of significantly higher recall for the bilingual map conditions both immediately after study and one week later suggest that presentation format can greatly influence the encoding of the materials. Thus, the results indicate that studying specialist vocabulary presented within bilingual lexical maps can aid learning by emphasizing the semantic and thematic relationships within the target L2 vocabulary through the spatial organization of concepts and by activating existing L1 conceptual knowledge. The findings from this initial study to explore the application of lexical association network maps based on the JWAD to Japanese vocabulary instruction show that the JWAD and the lexical association network maps can be extremely useful resources for creating effective vocabulary learning strategies for Japanese language instruction.

In terms of applications of the JWAD and the lexical association network maps to the area of Japanese lexicography, Joyce and Srdanović (accepted) demonstrate the potential value of word association databases as languages resources for lexicographical and natural language processing contexts. Specifically, the study conducts some initial comparisons of the lexical relationships observed within Japanese collocation data, as extracted from a large corpus with the Japanese language version of the Sketch Engine tool (Srdanović, Erjavec, & Kilgarriff, 2008), with those found within Japanese word association sets within the JWAD. The comparison results indicate that while many lexical relationships are common to both linguistic resources, a number of lexical relationships were only observed in the association database. These findings suggest that both resources can be effectively used in combination in order to provide more comprehensive coverage of the wide range of lexical relationships, and thus affirm the value of the JWAD as rich linguistic resources. Joyce and Srdanović (accepted) also speculates on how the wider range of lexical relationships identifiable through the combination of collocation data and word association databases could be utilized in organizing lexical entries within electronic dictionaries in ways that are cognitively salient. While the challenges involved are certainly formidable ones, the principled incorporation of word association knowledge within electronic dictionaries could greatly facilitate the development of more flexible and user-friendly navigation and search strategies (Zock and Bilac, 2004).

One final research application of the JWAD that can be singled out for specific mention is research into the nature and complexities of the Japanese writing system. For example, Joyce (2007) demonstrated that the database of word associations collected through questionnaire surveys provided a particularly useful resource for investigating the nature of written errors. In contrast to the relatively low levels of written errors observed by Hatta, Kawakami, and Tamaoka (1998) in essay writing, the word association task required the respondents to indicate their target word even when not confident of how to correctly write the appropriate kanji. The results of examining 1,093 written errors suggests that even when native Japanese speakers make written errors they usually have some visual image for the outline of the target kanji or know some of the component elements.

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日本心理学会大会2006
2006年11月3-5日
WS101 言語認知研究再考－心理学の視点から見る－

## 日本語における語彙知識のマッピング
—大規模日本語連想語データベースの構築と利用—

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### プロジェクトの目的

日本語単語における連想構造をマッピングすることにより、語彙知識を検討する。

### 発表の流れ

- 背景
- データベースの構築
- 語彙連想マップ
- データベースと語彙マップの応用

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### 背景 [1] : 認知科学

- 語彙知識は、心理学、人工知能、自然言語処理などのように認知科学の多くの分野にとって重要な研究対象。
  - Firth (1957/1968) – a word's company
  - Church & Hanks (1990) – mutual information
  - Cantos & Sánchez (2001) – lexical constellations
  - Hirst (2004) – lexicon and ontology comparisons
- 連想語は、概念の間の関係における構造化されたパターンを反映(Cramer, 1968; Deese, 1965)。

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### 背景 [2] : 連想語データの使用

- Nelson & McEvoy (2005)
  -- 既知の単語の連想構造は、記憶成績に影響を及ぼす。
- Steyvers, Shiffrin, & Nelson (2004)
  -- 連想語データに基づいた意味空間(semantic space)
  -- 共起語データ(LSA)の意味空間と比べて、
  エピソード記憶課題での成績との相関が高い。
- Steyvers & Tenenbaum (2005)
  -- 3つの意味ネットワーク
  (a) 連想語データ; (b) WordNet; (c) Roget's thesaurus
  -- グラフ理論による比較の結果、全てに同じ特徴。

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### 背景 [3] : 既存の連想語データ

- 英語の場合
  -- Moss & Older (1996)
  約2,400語に対して40-50名の回答を収集
  -- Nelson, McEvoy, & Schreiber (1998)
  約5,000語に対して平均150名の回答を収集
- 日本語の場合
  -- 梅本 (1969)
  1,000名の回答が、コーパスはわずかの210語しかない
  -- 石崎 (2004)の「概念連想辞書」
  1,656名詞に対して10名の回答を収集
  連想関係が定まられたので、自由連想データでない

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### データベースの構築[1]: 質問紙調査

- 対象コーパス: 日本語の漢字と単語の5,000項目
- 調査1: 2,000項目に対して50名の回答
- 調査2: 3,000項目に対して10名の回答
- 回答者: 大学生1,486名 (平均年齢 = 19.03)

印刷されている文字を見て、**一番最初に思い浮かんだ**日本語の**単語**を1つ、下線部に書いてください。意味的に関係がある単語なら何でもけっこうです。
例： 本 読む

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### データベースの構築[2]: 連想語データの処理

- 日本語連想語データベースのバージョン1は、2,100項目に対する50名の連想語回答を年明けごろに公開予定。
- 現在、連想語データのコード化を行っている。

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| SA | （意味連想） | 耕す | → 畑 | 涼しい | → | 風 |
| PA | （音韻連想） | いる | → いるか | あんな | → | 案内 |
| OA | （文字連想） | 赤 | → 赤川 | 有様 | → | 殿様 |
| TR | （書き移り） | なく | → 泣く | 地味 | → | じみ |
| FW | （外国語） | 謝る | → sorry | | | |
| VC | （する動詞付） | 考慮 | → 考慮する | | | |
| PN | （固有名詞） | 意識 | → フロイト | | | |

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### データベースの構築[3]: 調査のウェブ版

- 大規模程度の連想回答をより効率的に収集するために、調査のウェブ版も発展した。

http://nerva.dp.hum.titech.ac.jp/terry/index.jsp

**調査にご参加ください。また、知り合い、研究室の方、特に周辺の学生にご紹介して頂ければ、幸い。**

- 全ての項目に対して50名の回答を越えたら、連想語データベースのバージョン2を公開予定。
- 近い将来に、調査対象項目を3000-5000語程度増加することも計画。

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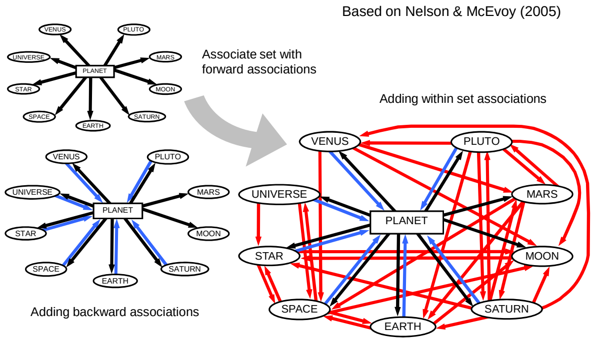
### 語彙連想マップ[1] : 基本概念

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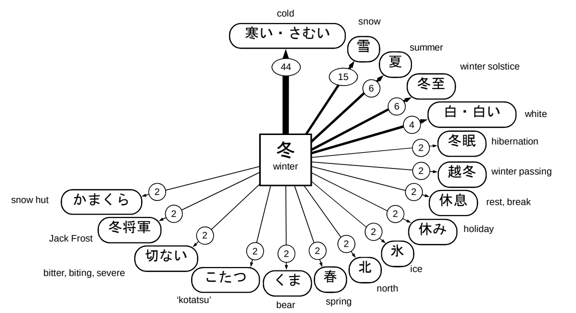
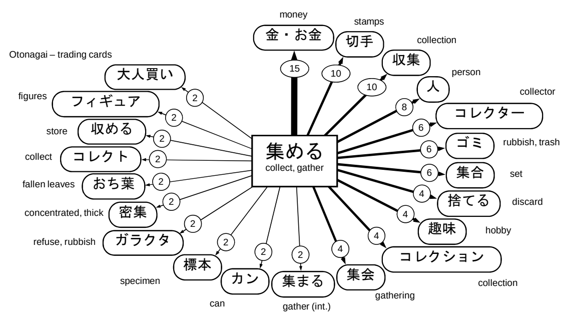
### 語彙連想マップ[2]: 「冬」の連想語の集合



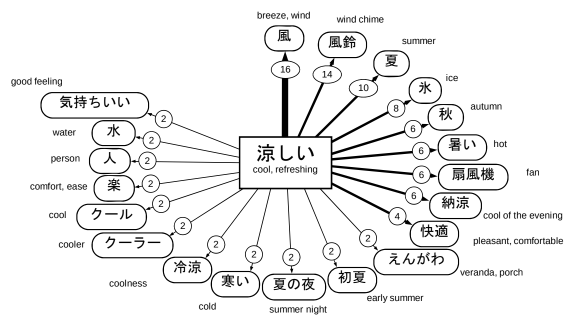

## Slide 11

### 語彙連想マップ[3]: 「集める」の連想語の集合




## Slide 12

### 語彙連想マップ[4]: 「涼しい」の連想語の集合



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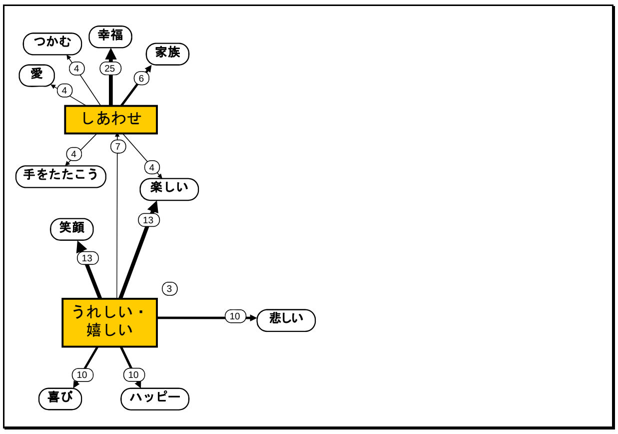


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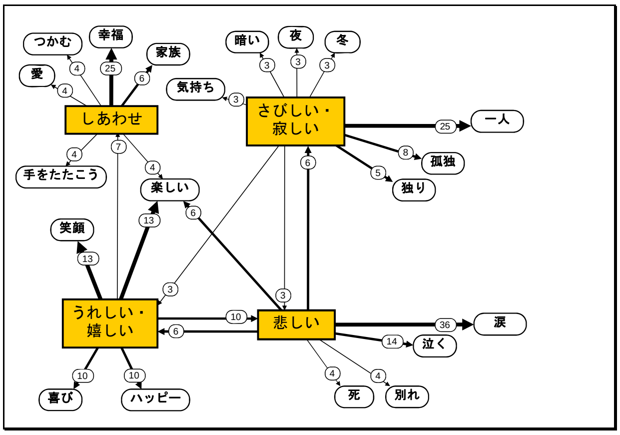


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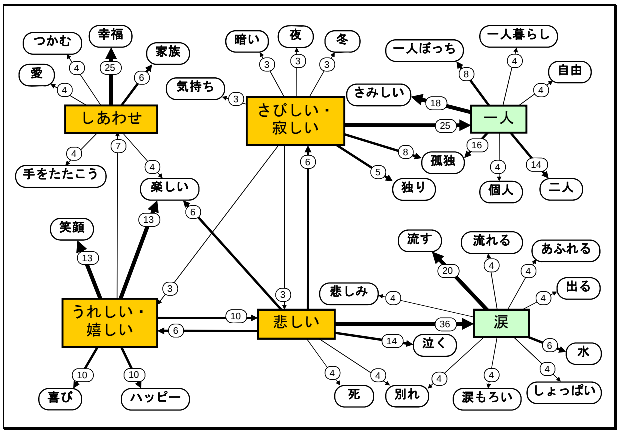


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## 語彙知識の重要な一部として連想構造

「おちつく」の連想語

類似語・反対語など

気持ち(4)、安心(3)、心(2)、気分(2)、リラックス(2)、
静か(2)、座る(2)、一息(2)、和らぐ(1)、冷静(1)、
ゆったり(1)、ドキドキ(1)、子供(1)

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## 語彙知識の重要な一部として連想構造

「おちつく」の連想語

類似語・反対語など

気持ち(4)、安心(3)、心(2)、気分(2)、リラックス(2)、
静か(2)、座る(2)、一息(2)、和らぐ(1)、冷静(1)、
ゆったり(1)、ドキドキ(1)、子供(1)

手段

お茶(2)、コーヒー(1)、煙草(1) 、結婚(1)

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## 語彙知識の重要な一部として連想構造

「おちつく」の連想語

類似語・反対語など

気持ち(4)、安心(3)、心(2)、気分(2)、リラックス(2)、
静か(2)、座る(2)、一息(2)、和らぐ(1)、冷静(1)、
ゆったり(1)、ドキドキ(1)、子供(1)

手段

お茶(2)、コーヒー(1)、煙草(1) 、結婚(1)

場所

家(6)、部屋(3)、部屋のすみっこ(1)、風呂(1)、
ソファー(1)、実家(1)、トイレ(1)、居場所(1)、住居(1)、
場所(1)、先(1)、御転婆(1)、my room (1)

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語彙知識の重要な一部として連想構造

「慌てる」の連想語

類似語・反対語など

急ぐ(9)、焦る(3)、あたふた(2)、慌てふためく(2)、驚く(1)、テンパる(1)、とり乱す(1)、困惑(1)、焦り(1)、動揺(1)、混乱(2)、パニック(1)、落ち着く(2)、冷静(1)、落ち着け(1)

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語彙知識の重要な一部として連想構造

「慌てる」の連想語

類似語・反対語など

急ぐ(9)、焦る(3)、あたふた(2)、慌てふためく(2)、驚く(1)、テンパる(1)、とり乱す(1)、困惑(1)、焦り(1)、動揺(1)、混乱(2)、パニック(1)、落ち着く(2)、冷静(1)、落ち着け(1)

原因関係

遅刻(2)、時間(1)、朝(1)、朝寝坊(1)、仕事(1)、恐慌(1)、テスト(1)、テスト前(1)、火事(1)、地震(1)、土けむり(1)

結果関係

わすれる(1)、ころぶ(1)、飛びだす(1)、落とす(1)、汗(1)、冷や汗(1)、挙動不審(1)、あぶなっかしい (1)、バタバタ(1)

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データベースと語彙マップの応用

- 日本語の心的語彙をモデル化
  - -- レンマ・ユニット・モデル (Joyce, 2002, 2004)における意味表象部分をより細かくモデル化
- 日本語の辞書編纂
  - -- 見出し語の下に連想語のデータを追加
  - -- ユーザ・フレンドリな検索方法
- 外国語としての日本語学習
  - -- 語彙連想マップは、日本語語彙獲得の有用な資料

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**Thank you for your attention**

# 専門語の学習方法としてのバイリンガル語彙マップ

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Key words: 語彙マップ　バイリンガル語彙獲得　専門語

ジョイス (2005a, 2005b, 2006)では、大規模日本語連想語データベースに基づく語彙連想マップが、第二外国語語彙習得に応用できることを示唆した。記憶の研究は、分類と意味組成が記憶成績に大きく影響を与えると数十年にわたって提言されてきた。しかし、Tinkham (1997)は、外国語の語彙学習について、意味的関係がある単語を同時に提示すれば、干渉的効果が生じるために、テーマで関連させている単語を提示するとより効果的であることを示した。Morin & Goebel (2001)は、第二言語としてのスペイン語学習におけるテーマと連想に基づいた意味のクラスタリングの効果を報告した。また、徳弘(2005)は日本語習得における「概念マップ」利用の効果について報告している。

Bahr & Dansereau (2001)は、英語とドイツ語の対語をリスト形式と二言語知識マップ形式を比べた結果、マップ条件において記憶成績が有意に高いことを示した。本研究の目的は、これらの先行研究を踏まえて、初級日本語学習者に対して専門語彙の日本語・英語の対語をリスト形式と語彙マップ形式を比較して、専門語彙教育におけるバイリンガル語彙マップの可能性を探求するものである。

## 方法

**実験参加者**　高等専門学校日本語予備教育生徒 47 名。実験参加者は、日本語の初級学者（学習開始後 1 ヶ月）であり、アジア･アフリカ諸国からの生徒である。出身国、日本語能力のバランスを考慮して、リスト形式群（コントロール群）とマップ形式群の二群に分けた。

**刺激材料**　英語・日本語各 14 語からなる対語を 3 セット用意した。各セットは「樹木」、「レポート」、「環境」に関連する一般的な学術専門語からなるように作成した。リスト形式では、それぞれの英語･日本語対を単に列に並べて提示した。マップ形式では、図 1 のように、意味の関連性に注目した空間に配置し語対で示した。

**手続き**　第 1 セッションでは、実験参加者はリスト形式あるいはマップ形式による 3 セットの対語を 30 分間学習するように指示される。その後に、(1)自由再生(FR: 15 分)、(2)ランダム配置の手がかり再生(CR-R: 7 分)、(3)学習時形式の手がかり再生(CR-F: 7 分)の 3 種類の記憶課題を行った。手がかり再生課題では、手がかりとして日本語の単語がひらがなで示されている。1 週間後の第 2 セッションでは、再び 3 種類の記憶課題(FR: 10 分; CR-R: 5 分; CR-F: 5 分)、さらに言語テスト(5 分)が課された。

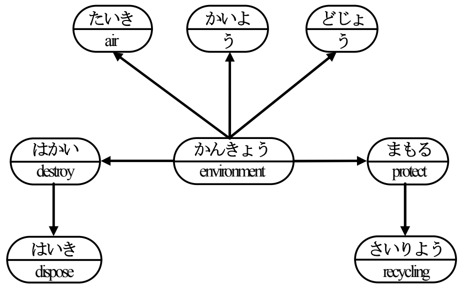


図 1.　バイリンガル語彙マップの一部

表 1.　記憶成績

| | 課題 | | | | | |
|---|---|---|---|---|---|---|
| | FR | | CR-R | | CR-F | |
| セッション 1 | | | | | | |
| リスト形式 | 28.1 | | 17.9 | | 19.6 | |
| 語彙マップ形式 | 37.8 | * | 21.6 | ns | 28.0 | ** |
| セッション 2 | | | | | | |
| リスト形式 | 12.0 | | 11.2 | | 14.4 | |
| 語彙マップ形式 | 24.8 | ** | 13.0 | ns | 22.8 | ** |

$*p < .05$. $**p < .01$.

## 結果および考察

表 1 はセッションと課題によって記憶成績を示している（注：FR では英語と日本語の記憶を併せたものである)。形式 x セッション x 課題の 3 要因分散分析の結果、形式($F(1, 45) = 198.01, p < .01$)、セッション($F(1, 45) = 148.89, p < .01$)、課題($F(2, 90) = 69.37, p < .01$)の主効果が有意で、3 要因の交互作用($F(2, 90) = 3.64, p < .05$)も有意であった。交互作用をさらに分析した結果、両方のセッションでの FR と CR-F の課題における記憶成績は、マップ形式群がリスト形式群より有意に高い。

本研究は、バイリンガル語彙マップが日本語における専門語習得に効果があるか否かを調査した。その結果、マップによる学習法は、語セット内の意味の関連性に注目し、第一言語における既存の概念知識を活用させることが、日本語における専門語の学習方法としては極めて効果的方法であることが明らかになった。

## 引用文献

Joyce, T., (2005), Constructing a large-scale database of Japanese word associations. In K. Tamaoka, (Ed.), Corpus Studies on Japanese Kanji, (Glottometrics, 10), pp. 82-98, Hituzi Syobo & RAM-Verlag.

本研究は、21 世紀 COE「大規模知識資源」の一環として行った。

(JOYCE Terry, TAKANO Tomoko, NISHINA Kikuko)

# Mapping Word Knowledge in Japanese:

# Coding Japanese Word Associations

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**Abstract**

This project is investigating lexical knowledge by mapping out the associative structures that exist for Japanese words. Specifically, the project is (1) constructing a large-scale database of Japanese word associations, (2) utilizing the association database to create lexical association network maps as a means of capturing association patterns, and (3) exploring applications of the database and the maps. This paper focuses on describing the coding of word association responses collected so far in preparation for the release of Version 1 of the Japanese Word Association Database. The paper also introduces a study conducted to explore the application of lexical maps to Japanese language instruction.
**Index Terms**: lexical knowledge, Japanese word association database, lexical association network maps, bilingual lexical maps

## 1. Introduction

Reflecting the fact that association is a basic mechanism of human cognition [1][2], there has been considerable interest within various areas of cognitive science, such as psychology, artificial intelligence and natural language processing, in identifying and understanding the structured relations that exist between concepts by mapping out how concepts are represented in the rich networks of associations that exist between words [3][4][5][6][7][8][9].

In a similar vein, this project is seeking to investigate the nature of lexical knowledge in Japanese by mapping out the complex networks of associations that exist for basic Japanese vocabulary as captured through large-scale free word association surveys [10][11][12][13][14]. This paper reports on the on-going construction of a large-scale database of Japanese word associations, based on responses collected from two conducted questionnaire surveys and from a web-based survey. More specifically, Section 2 focuses on describing the coding of collected word association responses for a random sample of 2,100 vocabulary items from the present database corpus of 5,000 items, which will made publicly available as Version 1 of the Japanese Word Association Database. Section 2 also touches on the development of a web-based version of the word association survey launched as an effective way of collecting the large-scale quantities of responses required for the database. Section 3 presents an example of the lexical association network maps and an example of how analyzing the types of association relationships elicited from related words can provide insights into their conceptual structures. Finally, Section 4 introduces a study conducted to explore the application of lexical maps to Japanese language instruction.

## 2. Constructing the database

This project is constructing a Japanese word association database that is large-scale in terms of both the number of words surveyed and the number of association responses collected.

### 1.1 Survey corpus of basic Japanese vocabulary

A survey corpus of 5,000 basic Japanese kanji and words was compiled [10][12], by identifying common items in three references sources of basic vocabulary for Japanese language education.

### 1.2 Questionnaire surveys

The majority of the word association responses collected to date have come from two large questionnaire surveys. The first survey collected up to 50 word association responses for a random sample of 2,000 items, while the second survey collected at least ten responses for the remaining 3,000 items in the survey corpus.

#### *2.1.1. Method*

*Participants:* Native Japanese university students (N = 1,481; 929 males and 552 females; average age 19.03, SD = 0.97) participated in the two surveys on a volunteer basis.

*Questionnaire sheets:* For both surveys, target items were divided into lists of 100 items. A survey questionnaire consisted of 10 pages with 10 items printed per page, as a centered column of words with underlined blank spaces for association responses (e.g., 本 __________). The instructions asked the participants to look at each printed item and to write down in the blank space the first semantically-related Japanese word that comes to mind.

#### *2.1.2. Results*

From two traditional paper questionnaire surveys, approximately 148,100 word association responses were collected for a corpus of 5,000 basic Japanese kanji and words.

### 1.3 Version 1 of Japanese Word Association Database

Through two questionnaire surveys, 2,100 items drawn at random from the survey corpus were presented to up to 50 respondents for word association responses (a list of these is available at http://www.valdes.titech.ac.jp/~terry/jwad.html). The word association responses to these items are being processed and coded in order to make them publicly available as Version 1 of the Japanese Word Association Database.

Table 1. Examples of database codes

| |
|---|
| Level 1 |
| Semantic association (SA) |
| 耕す (plow, cultivate) → 畑 (field) |
| 涼しい (cool) → 風 (breeze, wind) |
| Phonological association (PA) |
| いる /iru/ (exist; need) → いるか /iruka/ (dolphin) |
| しまう /shimau/ → しまうま /shimauma/ (zebra) |
| Orthographic association (OA) |
| 赤 (red) → 赤川 /akakawa/ /akagawa/ (proper noun) |
| 有様 (condition, state) → 殿様 ((feudal) lord) |
| Transcription response (TR) |
| なく /naku/ → 泣く /naku/ (cry, weep) |
| 地味 /jimi/ (plain) → じみ /jimi/ |
| Blank (B) |
| |
| Level 2 |
| Foreign word (FW) |
| 謝る (apologize) → sorry |
| Verb conversion (VC) |
| 考慮 (consideration) → 考慮する (consider) |
| Proper noun (PN) |
| 意識 (consciousness) →フロイト (Freud) |

The database codes, with examples, are presented in Table 1. There are two levels of codes. The level 1 codes classify responses at a general level in terms of their appropriateness. The main type is of semantic association, such as when the target word of 耕す meaning plow or cultivate elicits the semantically associated word of 畑 meaning field. While semantic association responses naturally represent the ideal type of data, responses are sometimes motivated by phonological and orthographic similarities. An example of a phonological association is the response of しまうま /shimauma/ which means zebra (morphologically, a combination of しま (stripe) and うま (horse)) for the word しまう /shimau/, a verb meaning to put away or finish. An orthographic association example is the response of 殿様 ((feudal) lord) for 有様 meaning condition or state, based on the shared second kanji. Although these two types of association are undoubtedly of interest in highlighting the richness of association as a mechanism of human cognition, they are not central to this project's objectives of investigating lexical knowledge in Japanese, and are being coded so they can be excluded from analyses when desired. Another level 1 code is transcription response, where the response word is essentially the target word represented in a different script, such as when the ambiguous word of なく in hiragana is written with the kanji 泣く specifying the meaning of weep or cry. The last code at this level is for blanks. Although blanks on the questionnaire sheets that were clearly due to a respondent skipping a page or failing to complete a questionnaire are treated as non-presented items, isolated blank responses are recorded as an index of words that do not easily elicit association responses. Level 2 codes include foreign word (e.g., 謝る (apologize) eliciting sorry), verb conversion, where a noun is changed to a verb by adding する (e.g., 考慮 (consideration) eliciting 考慮する (consider)), and proper nouns (e.g., 意識 (consciousness) eliciting フロイト (Freud)).

Once this coding work is completed, the word association response data will be made publicly available as Version 1 of the Japanese Word Association Database at the project website (http://www.valdes.titech.ac.jp/~terry/jwad.html).

## 1.4 Web-based survey

The data from the two questionnaire surveys makes a considerable contribution to the construction of the large-scale database, but the traditional paper format involves burdens in terms of preparation and data inputting. Accordingly, the project has developed a web-based version of the word association survey in order to collect large-scale quantities of association responses for the database (http://nerva.dp.hum.titech.ac.jp/terry/index.jsp).

When someone participates in the online survey, a unique individual survey list of 100 items is automatically generated from the survey corpus of 5,000 items. In generating a new list, the system executes a series of checks to eliminate intra-list associations based on information for the survey corpus, including presentation counts, pronunciations, orthographic form, component kanji codes, semantic category codes, and feedback ID codes. As the participant makes association responses to the items displayed on the computer screen one at a time, the system writes the participant ID number, the item ID number, the presented item, and the association response to an output file.

Since the launch of web-based survey at the end of July 2006, about 146 native Japanese speakers have participated providing approximately 13,260 word association responses. An initial block of 10,000 web-based responses has been checked for new feedback data, which has already been added to the survey corpus.

## 1.5 Future development of the database

The project plans to release Version 2 of the Japanese Word Association Database once at least 50 association responses have been collected and coded for all of the items in the present survey corpus of 5,000 basic Japanese kanji and words. The coding work is already underway for the responses collected from the second questionnaire survey for 3,000 items together with the first block of web-based responses.

The project also plans in the near future a major expansion of the survey corpus by adding between 3,000 to 5,000 new items. These items will be words that are frequent associates elicited for a core set of 1,000 survey items but are not already part of the survey corpus. These items will be extremely important in investigating the asymmetrical nature of word associations for the core set of 1,000 items. The core set of items has already been selected, based on Japanese language proficiency test levels, and the work of identifying the new items is presently underway.

# 3. Lexical association network maps

A central objective of the mapping lexical knowledge project is to utilize the Japanese word association database in developing lexical association network maps that capture and highlight the association patterns that exist between Japanese words [11][12][13]. After describing the basic concept of lexical association network maps and an example linking together a small set of related words, this section briefly discusses the future work of classifying association responses in order to elucidate the association structures of words and the complex nature of lexical knowledge.

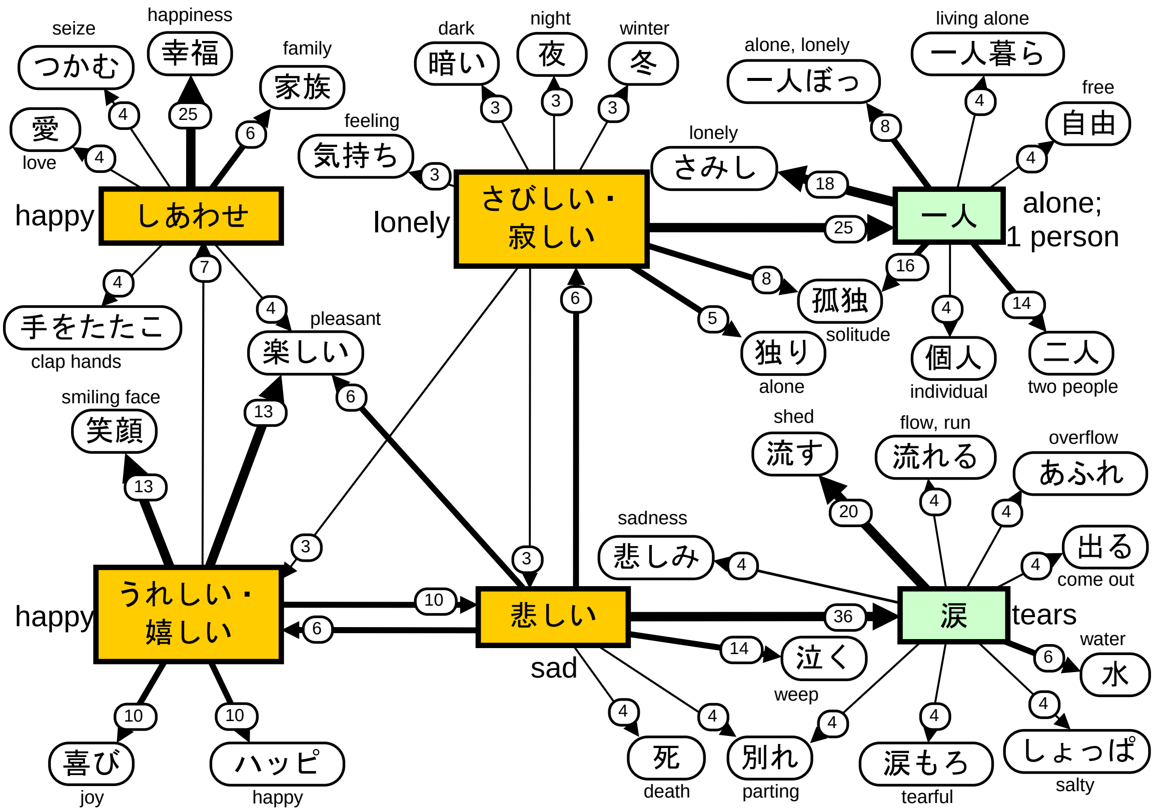


Figure 1. Example of lexical association network map building from and contrasting a small set of emotion words
*Note*: The numbers on the arrows indicate response frequency as percentages for a particular association set.

## 1.6 Basic concept of lexical association network maps

The basic component of the maps is the set of associates given in response to a given target word and association strengths in terms of response frequency. Although the basic associate set is defined by the forward association relationship between a target word and its associates, the maps also feature backward associations both in terms of numbers and strengths, as well as representing association density in terms of the associations between all the words within a particular association set. Comparisons of lexical association network maps for words from different word classes can provide interesting insights into the syntactic aspects of lexical knowledge [11][12][14].

## 1.7 Small domain example

Beyond the single-word level, lexical association network maps can also be combined to create various kinds of global semantic networks as another promising approach to investigating lexical knowledge. For example, in discussing their analyses of semantic networks based on word association norms, WordNet [15], and Roget's thesaurus, Steyvers and Tenenbaum speculate that the observed similarities between their networks reflect pervasive and deep features of semantic knowledge [5].

Figure 1 presents a lexical association network map based on a small set of emotion words. Interestingly, while the positive synonymous words of しあわせ and うれしい・嬉しい meaning happy have rather strong associations to a small set of close synonyms, such as 幸福 (happiness), ハッピー (happy), 喜び (joy), and 楽しい (pleasant), the negative emotion words of さびしい・寂しい (lonely) and 悲しい (sad) primarily elicit word association responses that can be regarded as having a causal or resultant relationship. For example, the prime associate for さびしい・寂しい (lonely) is 一人 (alone; 1 person), followed by the related words of 孤独 (solitude) and 独り (alone), as well as 暗い (dark), 夜 (night) and 冬 (winter), while 悲しい (sad) has a particularly strong prime association of 涙 (tears) (given by 36% of the respondents), followed by 泣く (weep) (given by 14% of the respondents). However, looking at the word associations from 一人, although the prime associate is さみしい (lonely), there are a number of other associations, while the prime associate for 涙 is 流す (to shed).

## 1.8 Classifying word association responses

Implicit awareness for the association structures that exist between words is a fundamental aspect of human lexical knowledge. When we hear or read a given word, conceptual schema are activated according to the word's association structures. Accordingly, a particularly important task for the mapping Japanese lexical knowledge project will be to classify the collected word association responses. Because the classification work offers an interesting opportunity to investigate the appropriateness and validity of classification systems and taxonomies from a cognitive perspective, it will undoubtedly have implications for approaches to both human-readable and machine-readable thesauri and for ontology research which has been extremely active in recent years [9].

Table 2. Comparison of the association structures for おちつく (calm down, relax) and 慌てる (be flustered; be in a hurry) based on tentative classifications of their word association responses

| |
|---|
| おちつく (calm down, relax) |
| Synonyms and antonyms, etc. (13 word types) |
| 気持ち (feeling)(4), 安心 (relief)(3), 心 (heart, spirit)(2), 気分 (feeling)(2), 静か (quiet)(2), リラックス (relax)(2), 座る (sit down)(2), 一息 (breath; pause)(2), 和らぐ (calm down; soften)(1), 冷静 (calm; composure)(1), ゆったり (calm; comfortable)(1), ドキドキ (throb; beat (fast))(1), 子供 (children)(1) |
| Location (13 word types) |
| 家 (home)(6), 部屋 (room)(3), 部屋のすみっこ (corner of a room)(1), 風呂 (the bath)(1), ソファー (sofa)(1), 実家 (parental home)(1), トイレ (toilet)(1), 居場所 (whereabouts)(1), 住居 (home)(1), 場所 (place)(1), 先 (destination)(1), 御転婆 (tomboy)(1), my room (1) |
| Means (instrumental) (4 word types) |
| お茶 (tea)(2), コーヒー (coffee)(1), 煙草 (cigarettes)(1), 結婚 (marriage)(1) |
| 慌てる (be flustered; be in a hurry) |
| Synonyms and antonyms, etc. (15 word types) |
| 急ぐ (hurry)(9), 焦る (in a hurry; be impatient)(3), あたふた (in a hurry; hastily)(2), 混乱 (confusion)(2), 落ち着く (calm down)(2), 慌てふためく (panic; be flustered)(2), 驚く (be surprised)(1), 焦り (hurry; impatient)(1), テンパる (about to blow one's fuse)(1), とり乱す (be distracted)(1), 困惑 (bewilderment)(1), パニック (panic)(1), 冷静 (calm; composure)(1), 落ち着け (calm down)(1), 動揺 (unrest; shaking)(1) |
| Cause relationship (11 word types) |
| 遅刻 (lateness)(2), 時間 (time)(1), 朝 (morning)(1), 朝寝坊 (oversleep)(1), テスト (test)(1), テスト前 (before test)(1), 仕事 (job)(1), 火事 (fire)(1), 地震 (earthquake)(1), 土けむり (dust cloud)(1), 恐慌 (panic; consternation)(1) |
| Resultant relationship (9 word types) |
| 汗 (sweat)(1), 冷や汗 (cold sweat)(1), ころぶ (tumble)(1), 落とす (fall down)(1), 飛びだす (fly out)(1), わすれる (forget)(1), 挙動不審 (suspicious behavior)(1), あぶなっかしい (dangerous; critical)(1), バタバタ (flapping)(1) |

*Note*: The numbers in parenthesis indicate number of responses

While the classification examples shown in Table 2 should be regarded as early tentative attempts requiring further refinement, with some classifications admittedly open to alternative interpretations, a comparison of the two association sets may still serve to illustrate how awareness of the association structures of words is an integral part of our lexical knowledge. Table 2 compares the association structures for the antonyms of おちつく (calm down, relax) and 慌てる (be flustered; be in a hurry). For both words, a considerable proportion of the word association responses may reasonably be classified as either synonym or antonym associations: in the case of おちつく, 13 types and 24 tokens (representing 43% and 49% of the responses respectively); in the case of 慌てる, 15 types and 29 tokens (43% and 58% of the responses respectively). However, although the two verbs elicit fairly similar levels of synonym and antonym responses, they contrast sharply in terms of their overall association patterns. The verb おちつく also elicits a considerable number of responses (13 types (43%) and 20 tokens (41%)) that may be classified as representing a location for the activity, such as 家 (home), 部屋 (room), and ソファー (sofa). The third group of responses for おちつく can be regarded as means or instrumental referents, such as お茶 (tea), コーヒー (coffee), and 煙草 (cigarettes) (4 types (13%) and 5 tokens (10%)). In contrast, the remaining association responses for the verb of 慌てる may be classified under one of two related groups reflecting either causal or resultant relationships. For instance, the causal relationship group (11 types (31%) and 12 tokens (24%)) includes responses like 遅刻 (lateness), テスト (test), and 仕事 (job), while the resultant relationship group (9 types (26%) and 9 tokens (9%)) includes responses like 冷や汗 (cold sweat), 飛びだす (fly out), and わすれる (forget). This simple comparison clearly shows that while the two verbs of おちつく and 慌てる are fairly close antonyms, they differ markedly in terms of their characteristic patterns of association, and consequently activate very different sets of cognitive schema.

## 4. Applications of the database and maps

The mapping Japanese lexical knowledge project is also committed to exploring a number of promising applications of the Japanese Word Association Database and the lexical association network maps.

### 1.9 Mental lexicon research

One area is the visual word recognition and mental lexicon research that the author has also been conducting [16][17][18][19]. Within that research, the word association database will be extremely useful in designing new psychological experiments to investigate the influence of morphological information in the lexical representation and retrieval of two-compound words, while the lexical association maps will enhance the Japanese lemma-unit model as a connectionist model of the Japanese mental lexicon [16][17].

### 1.10 Japanese lexicography

There are also direct applications of the database and the maps to Japanese lexicography. Firstly, the incorporation into Japanese learner dictionaries of word association data in the form of core associates, together with phrase patterns where appropriate, would enrich the variety of information provided and be especially useful for Japanese language learners.

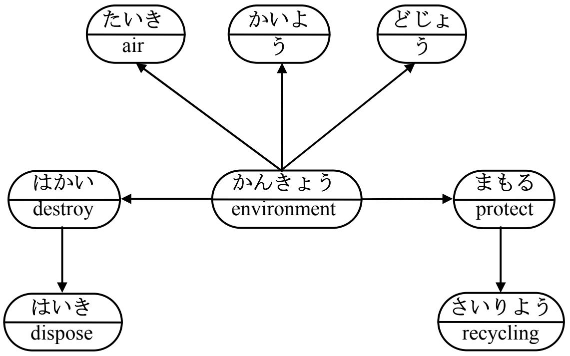


Figure 2. Section of the "environment" bilingual lexical map

Secondly, the database and the maps could be used to enhance electronic dictionaries in supporting user-friendly look-up functions [20]. The basic notion is that, if the lexical association network maps were incorporated within the dictionary, a user could search along association connections to locate a target word; something that would be especially helpful in the fairly common situation of the tip-of-the-tongue phenomenon where conventional form-based entry searching is useless.

## 1.11 Japanese language instruction: A bilingual lexical map study

The project has also being exploring the application of lexical association network maps to Japanese language instruction, and has conducted a study to investigate the use of bilingual lexical maps as an instruction strategy for specialist vocabulary [21], which is outlined in this section.

Memory research has long demonstrated that the categorization and semantic organization of stimulus materials dramatically influences retrieval performance [22]. However, in the case of foreign vocabulary learning, Tinkham has argued that thematic associations may be more effective than semantic relationships, because interference effects can occur when simultaneously studying sets of semantically-related L1-L2 word pairs [23]. Morin and Goebel have demonstrated the effects of semantic clustering based on themes and associations in learning Spanish as a second language [24], while Tokuhiro has reported effects of using 'conceptual maps' for Japanese [25]. Comparing the effects of presenting English and German word pairs in either a bilingual knowledge map format or a list format, Bahr and Dansereau have reported significantly better memory performance for the map condition [26].

### *4.1.1. Method*

*Participants:* 47 foreign students attending a Japanese language course in preparation to enter Japanese technical high schools. The participants were beginner-level learners of Japanese (approximately one month of study) from various Asian and African countries (accordingly there were no native English speaker participants in this study). Counterbalancing for nationality and for Japanese language proficiency, the participants were randomly assigned to two groups: a bilingual lexical map presentation group and a list presentation (control) group.

Table 3. Average recall scores as a function of task, session and presentation condition

| | Task | | | | | |
|---|---|---|---|---|---|---|
| | FR | | CR-R | | CR-F | |
| Session 1 | | | | | | |
| List format | 28.1 | | 17.9 | | 19.9 | |
| Map format | 37.8 | * | 21.6 | ns | 28.0 | * |
| Session 2 | | | | | | |
| List format | 12.0 | | 11.2 | | 14.4 | |
| Map format | 24.8 | ** | 13.0 | ns | 22.8 | ** |

*Note*: FR = free recall; CR-R = random cued recall; CR-F = study format cued recall.
The scores are higher in the free recall condition which required recall of both English and Japanese words.
* $p < .05$. ** $p < .01$.

*Material:* Three lists of general academic specialist vocabulary (trees, academic reports, and environment) were prepared, consisting of 14 English and Japanese word pairs. In the list presentation condition, the word pairs were simply arranged as a vertical column on an A4-page. In the map presentation condition, the word pairs were spatially arranged to emphasize semantic and thematic relationships, as the section of the 'environment' bilingual lexical map shown in Figure 2 illustrates.

*Procedure:* Session 1 consisted of a study stage and an immediate test stage. In the study stage, the participants had 30 minutes to learn the three sets of vocabulary. There were three memory tasks in the immediate test stage: (1) a free recall task (FR: 15 minutes); (2) a random arrangement cued recall task (CR-R: 7 minutes); and (3) a study-format cued recall task (CR-F: 7 minutes). In the cued recall tasks, the Japanese words were presented as cues. Session 2, conducted one week later, consisted of a test stage with the same three tasks (FR: 10 minutes, CR-R: 5 mins., CR-F: 5 mins) and a short language test.

### *4.1.2. Results and discussion*

Table 3 presents the average recall scores as a function of task, session and presentation condition. The results of a 3-factor ANOVA (2 presentation formats x 2 sessions x 3 tasks) indicated significant main effects for presentation format ($F(1, 45) = 198.01$, $p < .01$), for session ($F(1, 45) = 148.89$, $p < .01$), and for task ($F(2, 90) = 69.37$, $p < .01$), as well as a significant interaction ($F(2, 90) = 3.64$, $p < .05$). The results of planned comparisons revealed that recall scores were significantly higher for the map presentation condition than the list presentation condition for both the free recall and study-format cued recall tasks for both sessions.

These results indicate that studying specialist vocabulary presented within bilingual lexical maps can aid learning by emphasizing the semantic and thematic relationships within the target L2 vocabulary through the spatial organization of concepts and by activating existing L1 conceptual knowledge. These findings suggest that bilingual lexical maps based on the lexical association network maps for basic Japanese vocabulary being developed within this project can be very helpful in creating effective vocabulary learning strategies for Japanese language instruction.

## 5. Summary

This paper has reported on recent progress within the mapping Japanese lexical knowledge project. Specifically, the paper has described the coding of word association responses for 2,100 vocabulary items, which will made publicly available as Version 1 of the Japanese Word Association Database, as well as mentioning the on-going construction of the database through a web-based survey. After presenting an example of the lexical association network maps and noting the insights that can be gained from classifying word association responses, the paper has introduced a study conducted to explore the application of lexical maps to Japanese language instruction.

## 6. Acknowledgements

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# Constructing a Japanese Word Association Database

**Terry Joyce (Tama University)**

This paper reports on a project investigating lexical knowledge by mapping out the associative structures that exist for Japanese words. Specifically, the paper briefly outlines (1) the construction of the large-scale Japanese Word Association Database (JWAD), (2) the development of lexical association network maps, as a means of capturing association patterns, based on the JWAD, and (3) promising applications of the database and the maps. An example of a lexical association network map contrasting a small set of emotional words is presented to illustrate their potential in highlighting association structures and providing interesting insights into lexical knowledge.

## 1 Introduction

Association is a basic mechanism of human cognition. Inspired by that simple notion, a considerable amount of cognitive science research, particularly linguistic and psycholinguistic research, has sought to identify and understand the structured relations that exist between concepts by mapping out how concepts are represented in the rich networks of associations that exist between words (Cramer, 1968; Deese, 1965; Hirst, 2004; Moss & Older, 1996; Nelson & McEvoy, 2005; Okamoto & Ishizaki, 2001; Steyvers, Shiffrin, & Nelson, 2004; Steyvers & Tenenbaum, 2005; Umemoto, 1969).

This paper reports on a project seeking to elucidate fundamental aspects of lexical knowledge by mapping out the patterns of associative connections that exist for Japanese words. In particular, the paper describes (1) the construction of the large-scale Japanese Word Association Database (JWAD), (2) the use of the JWAD in developing lexical association network maps as a way of highlighting association patterns, and (3) some promising applications of the database and the maps.

## 2 Construction of JWAD

### 2.1 Existing word association databases

Although large word association databases exist for English (i.e., Moss & Older, (1996); Nelson, McEvoy, & Schreiber (1997)), databases of Japanese word associations have been comparatively scarce. Notable exceptions include the early, well-known survey conducted by Umemoto (1969), which gathered responses from 1,000 university students but only covered a very small set of 210 words, and, more recently, the association data for 1,656 nouns collected by Okamoto and Ishizaki (2001). However, a major drawback with the latter database, apart from only covering nouns, is the fact that response category was specified as part of the word association task, so it tells us little about free associations.

### 2.2 Version 1 of the JWAD

#### 2.2.1 Questionnaire surveys

After compiling a survey corpus of 5,000 basic Japanese kanji and words, construction of the JWAD started with two large-scale questionnaire surveys. The first survey sought to collect up to 50 responses for a random sample of 2,000 items, while the second survey collected at least ten responses for the remaining 3,000 items.

#### 2.2.2 Method

*Participants:* Native Japanese students attending the University of Tsukuba (N = 1,481; 929 males and 552 females; average age 19.03, SD = 0.97) participated in the two surveys on a volunteer basis.

*Questionnaire sheets:* For both surveys, target items were divided into lists of 100 items, and a page of the survey questionnaire consisted of 10 items as a centered column of words with underlined blank spaces for association responses (e.g., 本 __________). The instructions asked the participants to look at each printed item and to write down in the blank space the first semantically-related Japanese word that comes to mind.

*Results:* In total, approximately 148,100 word association responses were collected. Through the two surveys, a random sample of 2,099 items was presented to up to 50 respondents for word association responses.

#### 2.2.3 Coding of word association responses in JWAD-V1

The word association responses to the 2,099 items have been coded and processed together as version 1 of the JWAD (requests for JWAD-V1 may be directed to the author). Two levels of codes are applied to the database. The level 1 codes classify responses at a general level in terms of their appropriateness distinguishing between semantic associations (i.e., 耕す 'plow, cultivate' eliciting 畑 'field'), orthographic associations (i.e., 有様 'condition, state' eliciting 殿様 '(feudal) lord') and phonological associations (i.e., しまう /shimau/ 'to put away or finish' eliciting しまうま /shimauma/ 'zebra'). Another set of codes cover kinds of transcription responses, where the response word is essentially an orthographic variant of the item (i.e., 泣く 'weep, cry' for the homophone なく). Isolated blank responses are also recorded at this level as an index of words that do not easily elicit association responses. Level 2 codes attempt to provide additional information, such as marking foreign word responses (i.e., 謝る 'apologize' eliciting 'sorry'), verb conversion (i.e., 考慮 'consideration' eliciting 考慮する 'consider'), and proper nouns (i.e., 意識 'consciousness' eliciting フロイト 'Freud').

### 2.3 Web-based survey and future expansions to JWAD

In order to collect large-scale quantities of association responses, the project has also developed a web-based version of the word association survey (http://nerva.dp.hum.titech.ac.jp/terry/index.jsp). JWAD-V2 will be released once at least 50 association responses have been collected and coded for all 5,000 items in the present survey corpus. The survey corpus will shortly be expanded considerably, in order to further examine the asymmetrical nature of word associations.

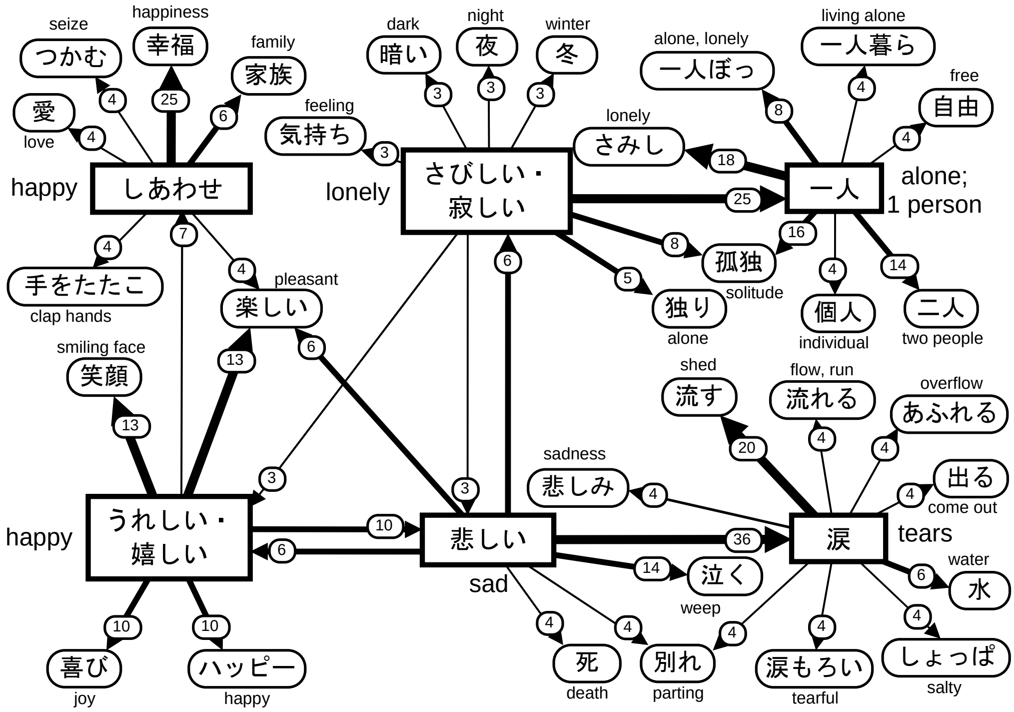


Figure 1. Example of lexical association network map building from and contrasting a set of emotion words.

*Note*: The numbers on the arrows indicate response frequency as percentages for a particular association set.

## 3. Lexical association network maps

A central objective of the project is to utilize the JWAD in developing lexical association network maps as an approach to the visualization of lexical knowledge. The basic concept of the maps is to represent the set of forward associations evoked by an item (i.e., set size and response frequencies as index of association strength), together with backward associations from those associates to the item, as well as association connections among all set constituents. However, as Figure 1 illustrates, single-word level maps can also be combined to create semantic networks for various domains.

Even such a small map can clearly illustrate how related words can have different patterns of association. For while the positive synonymous words of しあわせ and うれしい・嬉しい, meaning 'happy', have rather strong associations to a small set of close synonyms, such as 幸福 'happiness' and ハッピー 'happy', interestingly, the negative emotion words of さびしい・寂しい 'lonely' and 悲しい 'sad' primarily elicit word association responses that can be regarded as having a causal or resultant relationship. For example, 一人 'alone; 1 person', 孤独 'solitude' and 独り 'alone' are strong associates of さびしい・寂しい, while 悲しい has a particularly strong prime association of 涙 'tears' (36%) followed by 泣く 'weep' (14%).

In a complementary approach to discerning the patterns of connectivity within the JWAD, Joyce and Miyake (2007) have applied graph clustering techniques to a semantic network representation of the JWAD. Graph theory analysis of the JWAD network indicates that it has scale-free characteristics.

Conceptually somewhat similar to combining related association maps, graph clustering techniques can be a very useful tool for automatically identifying wider groups of related words. For instance, applying Markov clustering to the JWAD network yields the word groups of {喜, 喜び, 喜ぶ, 喜寿, 歓喜, 大喜利, 喜怒哀楽, 悲しむ, 怒} for うれしい・嬉しい and {一人・1 人, 独り, 一人ぼっち, 孤独, 独身, 独身貴族, 未婚, さみしい, 二人} for さびしい. Such results underscore the potential of graph clustering techniques to automatically construct hierarchically-organized semantic spaces as an approach to the visualization of large-scale linguistic knowledge resources.

## 4. Applications of the JWAD and lexical association maps

Finally, the project is also exploring a number of applications of the JWAD and the lexical association network maps. In the area of lexicography, for instance, the incorporation of word association data into Japanese learner dictionaries in the form of core associates, together with phrase patterns where appropriate, would enrich the variety of information provided and be especially useful for Japanese language learners. The inclusion of associations and maps could also be used to enhance electronic dictionaries in supporting user-friendly look-up functions (Zock & Bilic, 2004).

Another application area is in Japanese language instruction, and Joyce, Takano, and Nishina (2006) have conducted a study to investigate the use of bilingual lexical maps as an instruction strategy for specialist vocabulary. Their results indicate that emphasizing semantic and thematic relationships within target L2 vocabulary through the spatial organization of concepts in the form of a bilingual lexical map can be useful in aiding the study of specialist vocabulary.

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# 連想語調査の反応で観察された書き間違いの検討

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key words：書き間違い　文字表象　連想語調査

書き間違いのデータから、心的辞書内の文字表象の組織構造に関し、極めて興味深い洞察が得られる可能性がある。このことは、表音文字の平仮名、片仮名に加え、形態文字の漢字が混じり合っている複雑な日本語の文字体系の場合に、よりいっそう当てはまるものと思われる。しかしながら、健常な日本語話者がおかす書き間違いに関する研究は比較的少ない。その中でも、374 個にのぼる二字熟語の書き間違いを検討し、間違いの分類を試みた Hatta, Kawakama, & Hatasa (1997) および Hatta, Kawakami, & Tamaoka (1998)の研究が注目に値する。そこで集められたデータは、日本人学生が、必ずしも漢字を使わなくてもよいという状況下でおかした間違いの事例である。それゆえ、八田らの主張によれば、書き手が書いた漢字は少なくとも正しいと信じられて用いられたことになる。だとすれば、書き手があまり自信のない漢字を書こうとしている時、それがどのような情報に基づいて行なわれようとしているのかは、この研究では不明のままである。

本研究は、ネイティブ日本人を対象とした連想語調査(Joyce, 2005)で見出された、反応時の書き間違いデータを分析したものである。連想語調査では、回答者に印刷された刺激（基本的な日本語の漢字と言葉）を読んでもらい、最初に思い浮かんだ意味的に関連する語を書き留めてもらった。しかしながら、回答者は最初に思いついた単語をうまく思い出せない場合、それを別の言葉で置き換えて対応してしまうという懸念がある。そのため質問紙には、回答者が最初に思いついた単語の正しい字体に自信がなければ、別の単語を思い起こそうとするのでなく、「最初に思いついた単語の漢字を書ける範囲で書き、ふりがなをふってください」という指示を含ませておいた。連想語データの信頼性を高めるため、こうした指示を加えたわけだが、これは同時に、回答者が正しく書けるかどうか自信のない単語であっても、なんとか書く意欲を鼓舞する効果をもたらした。本研究では、二字熟語を書く際の間違いだけでなく、連想語反応で観察されたあらゆる書き間違いを考察の対象としている。

## 方法

回答者：約 1,480 名の日本人大学生に対して、連想語反応調査のための質問を行った。
対象項目：連想語データの入力に際し、1,093 個の書き間違いが見つかった。

## 結果

データは、ターゲット語の字体に関する分類と書き間違いに関する分類の 2 種類に分けられる。漢字の書き間違いの分類は、主として Hatta, Kamikawa, & Tamaoka (1998)による二字熟語の書き間違いの分類に依拠する。その分類は、基本的に 3 種類の置き換えに基づいている。すなわち、同じ読みもしくは同じ発音を持った漢字による置き換え(P)、構成や字体が類似した漢字による置き換え(O)、意味的に類似した漢字による置き換え(S)の 3 種類である。漢字書き間違いの分類には、さらにこれら 3 つのタイプが混成したものや、擬文字、語順の間違いなどが含まれる。八田らによる分類との重要な違いは、擬文字の扱いにある。八田らは、データ中、15%に及ぶ擬文字をひとまとまりのカテゴリーとして扱っているのに対し、本研究ではそれを字体、音韻、意味上の 3 つのカテゴリーに分類した。本研究には、二字熟語以外の単語の書き間違いも含まれるため、仮名の使用に関連した 4 種類の間違いもカバーできるよう、その分類スキーマを拡張した。今回新たに追加した書き間違いの最初のカテゴリーは、漢字と平仮名からなる単語に生じる送り仮名の間違い（例：「汚い」を「汚ない」と表記）。2 番目の新たなカテゴリーは、平仮名表記で、モーラに間違った文字を当てはめたもの（例：「少しずつ」を「少しづつ」と表記）。3 番目のカテゴリーは、仮名に必要な濁点がつけられていない、もしくは不必要な濁点がつけられているもの（例：ゴシック体をゴジック体と表記）。4 番目のカテゴリーは、仮名による音表記が標準的な表記にしたがっていない間違い（例：「サンドペーパー」を「サンドペパー」と表記）である。表 1 は、ターゲット語の字体に関する分類を示したものである。

**表 1. ターゲット語の字体に関する分類**

| ターゲット語字体 | 例（格好内はターゲット語） | 数 |
|---|---|---|
| 漢字 1 字 | 枝(技)、瓜(爪) | 51 |
| 漢字 1 字+仮名 | 謝まる(謝る)、借りる(貸りる) | 172 |
| 漢字 2 字 | 我満(我慢)、運盤(運搬) | 519 |
| 漢字 2 字+仮名 | 出合う(出会う) | 67 |
| 漢字 3 字 | 洗躍物(洗濯物) | 114 |
| 漢字 3 字+仮名 | 店閉まい(店仕舞い) | 15 |
| 平仮名 | どんぼ(とんぼ)、いぢめ(いじめ) | 28 |
| 片仮名 | ギブス(ギプス)、ドラ(ドア) | 33 |
| 他 | | 94 |
| | 合計 | 1,093 |

## 考察

漢字 1 字と仮名の組み合わせ語に関する間違いの頻度は、送り仮名使いにおける間違いの頻度を反映していると考えられる。さらに擬文字を分類することにより、回答者があまり自信のない漢字を書こうとする際、どのような情報を用いているかについて、興味深い洞察が得られるだろう。本研究によって、ネイティブ日本人は、漢字の書き方に自信を持てない場合でも、漢字の構成要素もしくは全体的形態について何らかの視覚的イメージをもっていることが示された。

Joyce, T. (2005). “Constructing a large-scale database of Japanese word associations”, In Tamaoka, K. (Ed.). *Corpus Studies on Japanese Kanji*. (Glottometrics 10). pp. 82-98. Hituzi Syobo: Tokyo, Japan and RAM-Verlag: Lüdenschied, Germany.

(Terry JOYCE)

# グラフクラスタリングによる連想語の意味ネットワークの分析

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key words : 日本語連想語データベース, RMCL グラフクラスタリング, 意味ネットワーク

単語をノードで表し、単語間の関連をエッジとするグラフ表示やその分析は、大規模言語知識資源の構成体系を明らかにし、単語や単語群の内在的関係を理解するための有効な手段である。本研究は、日本語連想語データベース（Joyce, 2005）を用いて意味ネットワークを作成し、グラフ理論やネットワーク分析を適用して、日本語連想語意味ネットワークの構造を調査することを目的とする。次数分布やクラスタリング係数の計算結果に加え、階層構造的な意味空間の視覚化に有効なグラフクラスタリング RMCL（Jung, Miyake, & Akama, 2006）を適用し、その結果を示した。

## 日本語連想語意味ネットワーク

Joyce (2005)が報告した、自由連想による日本語連想大規模データベース（JWAD）の構築は、現在第一版が公開されている(http://www.valdes.titech.ac.jp/~terry/jwad.html)。JWAD 第一版は、日本語基本語彙 5000 単語から成る調査リストから無作為に 2,100 を選出した連想語に対して返答された、約 50 の反応語リストで構成されている。本研究では、JWAD の中から 2 回以上答えられた連想反応語に限定して、7,966 単語から成る意味ネットワークを作成した。そしてグラフクラスタリングには、連想頻度数をエッジの重みとし、語の連想関係を考慮しない無向グラフを RMCL の計算に使用する。

まず、次数分布とクラスタリング係数によって、ネットワークの構造を調べた。次数分布 P(k)は、べき乗則分布（指数係数 2.3）に従っており、Balabasi と Albert (1999)によると次数分布がべき乗則、すなわち $P(k) \sim k^{-r}$ の関係が成り立っていることから、スケールフリー性が確認できた。また、1 単語に対して結びつく単語の平均語数は 3.7 語と極めて少ない。さらに、Watts と Strogatz (1998)が導入したノード間の繋がりの度合いを表すクラスタリング係数を求めると、平均クラスタリング係数は 0.046 であった。これらの結果から、スパースな構造であることが分かる。

## RMCL グラフクラスタリング

次に、Jung ら(2006)が考案した再帰的アルゴリズム Recurrent MCL を意味ネットワークに適用する。この手法は、マルコフクラスタリング（MCL）から発展したもので、MCL のクラスタリング過程と収束ハードクラスター間を再隣接化して、再度 MCL を計算する。その結果、単語・概念間における適正な階層的意味ネットワークの構築を可能にする。また、MCL はランダムウォークに基づいたシンプルなアルゴリズムであり、パラメータ操作の容易さと収束の速さから、大規模データのパターン抽出に適している。

作成した日本語連想語意味ネットワークに対して、MCL を計算した結果、収束クラスター数は 1,441 であり、平均クラスター要素数は、5.6 (SD 3.1)であった。次に、第 2 ループの結果から収束 MCL クラスターを再隣接し、再度 MCL を計算した結果、759 RMCL クラスターに細分された。ここで、RMCL 平均クラスター要素数は 1.9 (SD 1.5) とばらつきが小さく、さらに、全 RMCL クラスター要素数が 10 以下であることから、小さいクラスター群であることが分かる。

**表 1 : RMCL 結果の一例**

| 代表ノード | クラスタリング係数 | 次数 | クラスター要素（MCL 代表ノード） |
|---|---|---|---|
| 近所 | 0.244 | 10 | 番号, 家, 建物, 番, 盆, 帰る, 携帯, 電話, 留守, 近所 |
| 魚 | 0.029 | 21 | 買, おくさん, 店, 弱い, 魚, 焼ける, 烏賊, 世話, 熱い, 買い物 |
| 車 | 0.026 | 56 | 車, 免許, 検, 舟, 車輪, 相談, 道路, 自転車, さわる |
| 親 | 0.036 | 11 | 人, 敵, 夢, 丁寧, 親, すみません, わがまま, 対する, 目立つ |
| 友達 | 0.069 | 35 | ねえさん, 友達, 妹, いもうと, 愛, しあわせ, 抱く, いとこ, かわいい |

表 1 に RMCL クラスター要素数の上位 5 個における、代表ノード、そのクラスタリング係数と次数とクラスター要素をそれぞれ示す。代表ノードは、外部のクラスターにおける次数の高い単語を選択した。そして、クラスター要素は、MCL クラスターの代表ノードを表しており、階層的に MCL クラスタリング結果を調べられる。ここで「近所」以外の単語は、低クラスタリング係数値と高次数から、多様な単語と関係するハブ的な役割を持っていることが分かる。

## 結論

本研究では、JWAD データを基にして作成した日本語連想語意味ネットワークを分析し、ネットワークのスケールフリー性とスパース性を確認した。RMCL の結果は、意味ネットワークにおけるハブ的な役割を持った単語が抽出された。さらに、次数などの基本的な分析だけでは不十分である、低次数の単語と結びついた密な単語群の関係性を示した。これらの分析結果は、語彙連想マップの開発にあたって有益な比較材料となりうる。

## 引用文献

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Jung, J., Miyake, M, & Akama, H., (2006), Recurrent Markov cluster (RMCL) algorithm for the refinement of the semantic network, LREC2006, pp. 1428-1432.
本研究は、21 世紀 COE「大規模知識資源」の一環として行った。

(JOYCE Terry, MIYAKE Maki)

Slide 1

1

# Analysis of the semantic network structure of Japanese word associations


Maki MIYAKE Osaka University
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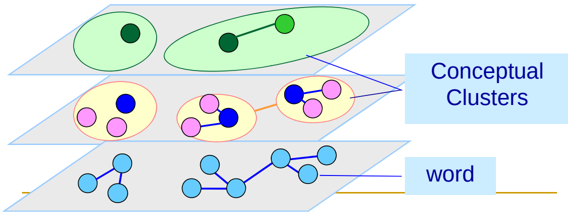
Slide 2

2

## Objectives

Analyze statistical features of the JWAD semantic network

Exploring the potential of graph clustering techniques to automatically construct hierarchically-organized semantic spaces




Slide 3

## Construction 1: Conducted surveys

- Survey corpus: 5,000 basic kanji and words
- Survey 1: Collected up to 50 responses for 2,000 items
- Survey 2: Collected up to 10 responses for 3,000 items
- Participants: 1,481 Japanese undergraduates (age = 19.03) completed 100-item free word association questionnaires

印刷されている文字を見て、**一番最初に思い浮かんだ**日本語の**単語**を1つ、下線部に書いてください。意味的に関係がある単語なら何でもけっこうです。
例： 本 読 む

Slide 4

4

## Construction 2: Coding responses

Level 1 codes

Semantic associations (SA): 99,768 responses (95.20%)
（意味連想） 耕す → 畑 涼しい → 風

Phonological associations (PA): 648 responses (0.62%)
（音韻連想） いる → いるか しまう → しまうま

Orthographic associations (OA): 528 responses (0.50%)
（文字連想） 赤 → 赤川 有様 → 殿様

Transcription responses (TR): 2,287 responses (2.18%)
（書き移り） なく → 泣く 地味 → じみ

Blanks: 862 (0.82%)

Slide 5

5

## Construction 3: Online survey

- In order to collect large-scale quantities of association responses, online survey format developed

http://nerva.dp.hum.titech.ac.jp/terry/index.jsp

**To native Japanese speakers**

**Please participate in the survey + introduce it to others**

**Thank you.**

- JWAD Version 2 will be released once all present items have at least 50 responses

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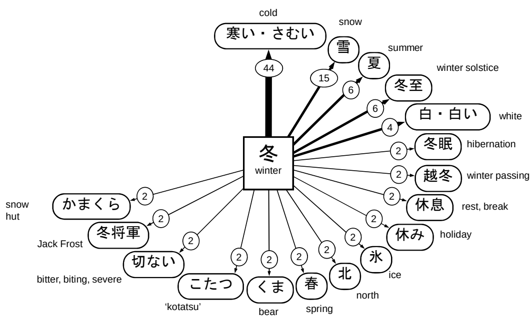
## Lexical association network maps



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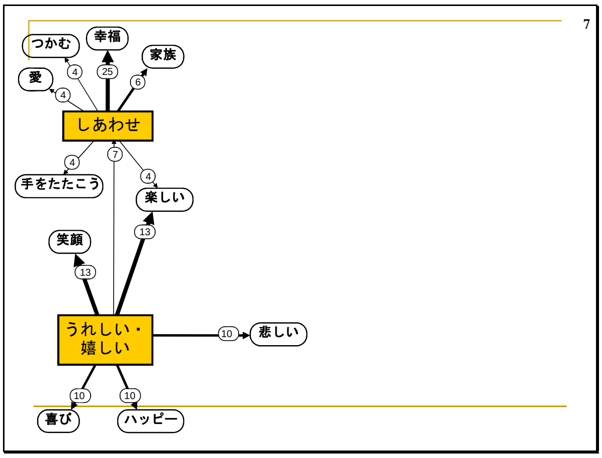


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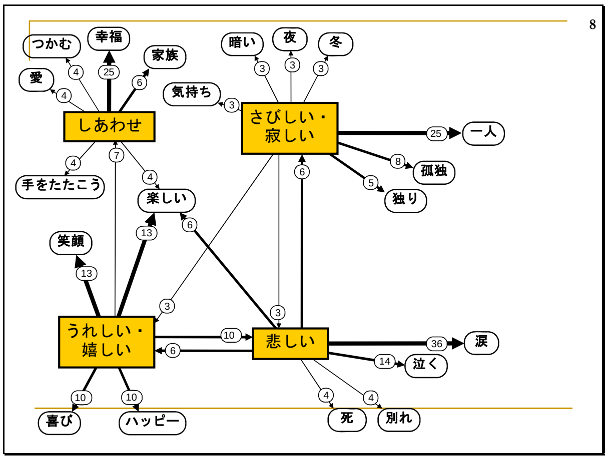


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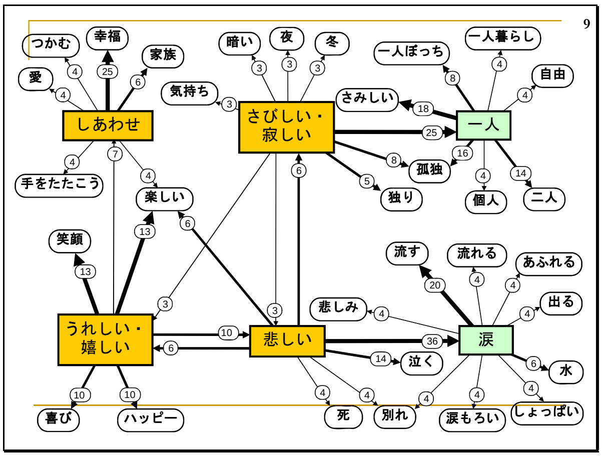


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## Analyzing the JWAD semantic network

- Characteristics of the JWAD semantic network
  - Degree distribution
  - Clustering coefficient
- Graph clustering
  - Markov Clustering (MCL)
  - Recurrent MCL

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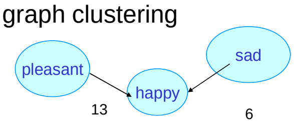
## Building the JWAD semantic network

- Original data: Version 1
  - http://www.valdes.titech.ac.jp/~terry/jwad.html
- Data to create a network
  - Frequency of 2 or more
  - 7,966 words
- Adjacency matrix for graph clustering
  - Undirected graph
  - Edge-weighted

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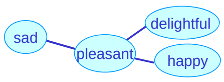
## Network features: Degree distribution




Power law distribution (Barabasi, 1999)

$$P(k) \approx k^{-r}$$

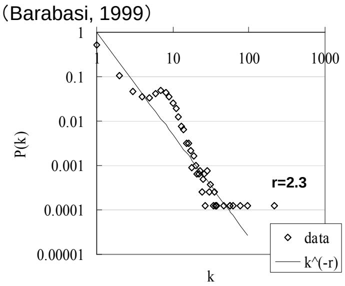
**Scale-free**

**Average of degree**

**<k> = 3.67**

**(0.05%)**

**Sparseness**



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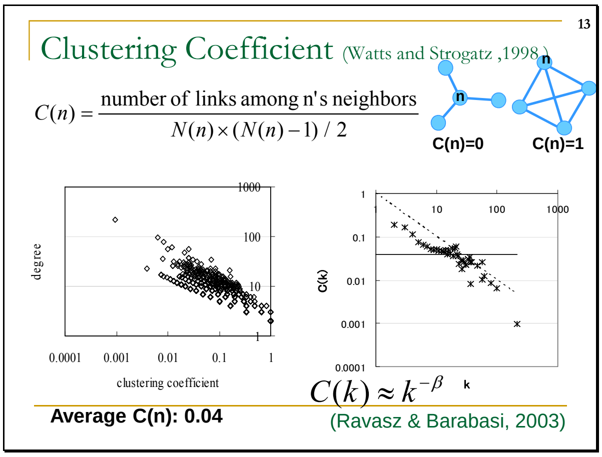


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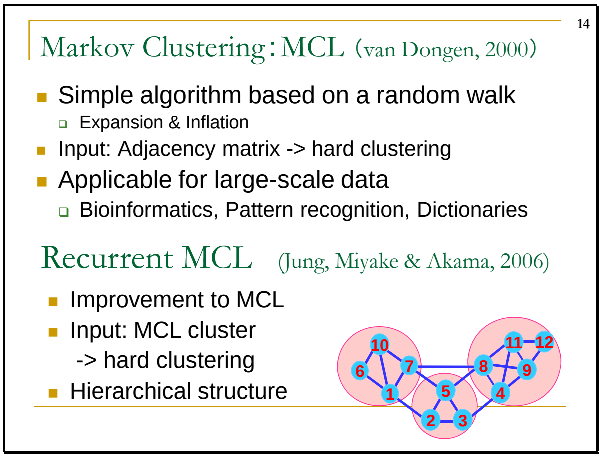


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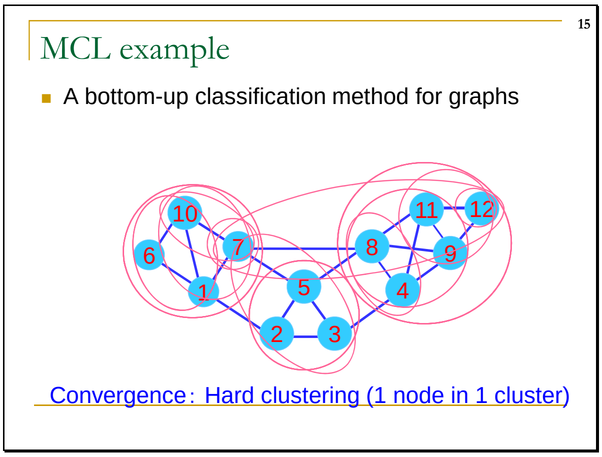


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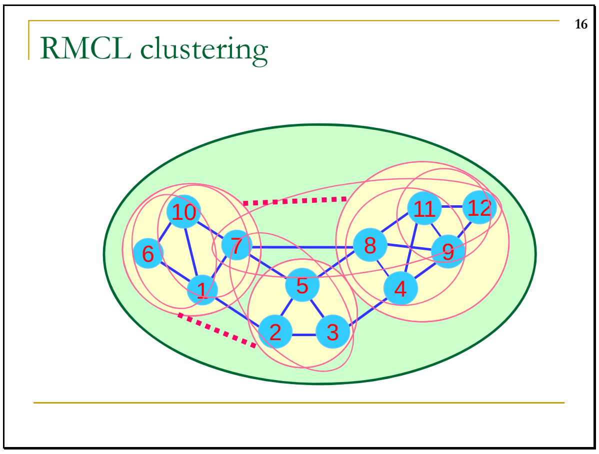


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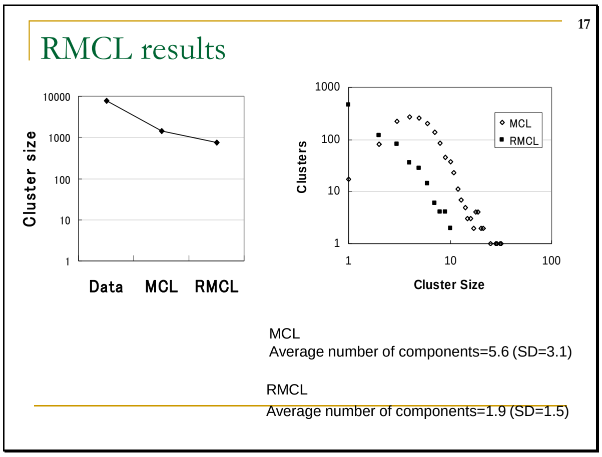


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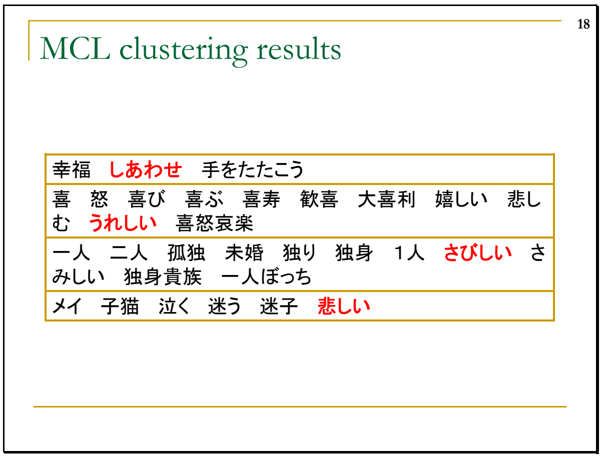

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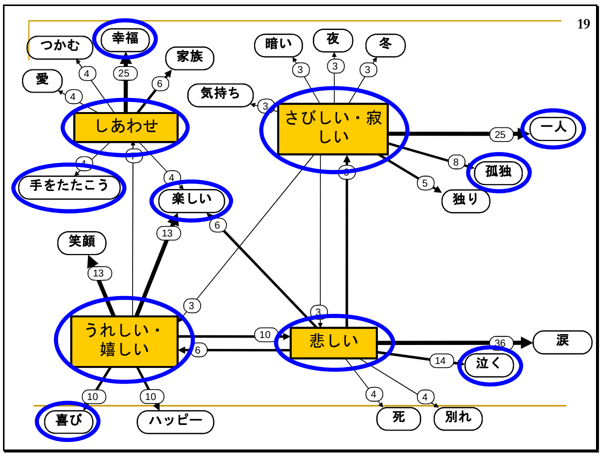


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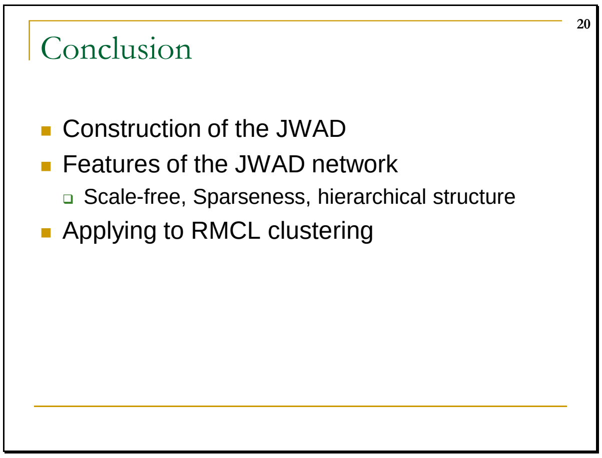

# Mapping out a Semantic Network of Japanese Word Associations through a Combination of Recurrent Markov Clustering and Modularity

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**Abstract**

The principle objectives of this paper are to calculate some basic statistical network properties in examining the characteristics of a semantic network representation of Japanese word associations, and to apply graph clustering techniques using a partitioning index in mapping out word associations. After briefly outlining the construction of the Japanese word association database (JWAD) in Section 2, graph theory and network analysis approaches are discussed in Section 3. Specifically, Section 3 explains about a recently proposed graph clustering algorithm (RMCL). Section 4 describes the application of the RMCL method in combination with the modularity index to the word association network. Results indicate that the developed network has both scale-free and sparseness characteristics. The clustering results highlight the usefulness of the RMCL method, and the merits of using the average modularity value as an indication of the clustering process.

## 1. Introduction

In this paper, we propose an original approach to optimally applying Markov Clustering to avoid some of its minor disadvantages. Specifically, the Recurrent Markov Clustering (RMCL) algorithm (Jung, Miyake, & Akama, 2006) allows us to generate an appropriate semantic network from word association data in the sense that it creates adjacency relationships among 'concept' clusters which are then treated as nodes. In striving to deepening our understanding of lexical knowledge, many areas of cognitive science, including psychology and computational linguistics, are seeking to unravel the rich networks of associations that connect words together. And, key methodologies for that enterprise are the techniques of graph representation and their analysis that allow us to discern the patterns of connectivity within large-scale resources of linguistic knowledge and to perceive the inherent relationships between words and word groups.

While research applying forms of multidimensional space modeling, such as Latent Semantic Analysis (LSA) and multidimensional scaling, to the analysis of texts have been fairly fruitful, the methodologies of graph theory and network analysis are particularly suitable for elucidating the important characteristics of semantic networks.

This paper applies graph theory and network analysis methods to the analysis of a semantic network representation of Japanese word associations. After briefly outlining the construction of a large-scale database of Japanese word association (JWAD) (Joyce, 2005; 2007), we apply the recently proposed RMCL method, where a parameter that strongly influences granularity is selected using Newman's (2004) modularity measure in detecting reasonable sizes for components. As this provides greater control over cluster sizes, it is an extremely promising approach to the automatic construction of condensed network representations, which, in turn, can facilitate the creation of hierarchically-organized semantic spaces as a way of visualizing large-scale linguistic knowledge resources.

## 2. Semantic Network Representation of Japanese Word Associations

This section outlines the ongoing development of a semantic network representation of Japanese word associations. After briefly noting some existing word association norms as frames of reference for the Japanese Word Association Database (JWAD) project (Joyce, 2005, 2006), the JWAD and its semantic network representation are introduced.

### 2.1. Existing word association norms

Although comprehensive word association norm data has been available for some time for English (see Moss and Older (1996) for British English and Nelson, McEvoy, and Schreiber (1998) for American English), a large-scale database is currently being constructed for Japanese (Joyce, 2005; 2007).

Compared to an early survey by Umemoto (1969) that gathered free associations from 1,000 university students for a very small set of 210 words, the JWAD survey list of 5,000 basic Japanese kanji and words may be regarded as large-scale. The JWAD is also far more extensive than the word association data collected by Okamoto and Ishizaki (2001), which includes 10 responses for 1,656 nouns. In addition to being restricted only to nouns, another major drawback with their data is that it is not free word association data, because categories for responses were specified in advance.

### 2.2. Questionnaire surveys

The majority of the word association responses for JWAD have come from two surveys, in which questionnaires were administered to 1,481 native Japanese university students (929 males and 552 females; average age = 19.03, SD = 0.97). In both free word association surveys, a questionnaire consisted of 100 items, and participants were asked to look at each printed item and write down the first semantically-related Japanese word that came to mind. The first survey was conducted in order to collect up to 50 responses for a random sample of approximately 2,000 items, while the second survey was conducted to collect at least ten responses for the remaining items.

More recently, in order to collect the large-scale quantities of association responses necessary for the ongoing construction of the JWAD, a web-based version of the free word association survey has been launched (http://nerva.dp.hum.titech.ac.jp/terry/index.jsp).

### 2.3. The Japanese Word Association Database

In two questionnaire surveys, a random sample of 2,099 items was presented to up to 50 respondents for word association responses. This response data has been coded and processed, and is being made publicly available as Version 1 of the Japanese Word Association Database (http://www.valdes.titech.ac.jp/~terry/jwad.html).

In addition to continuing to collect association responses for all of the present 5,000 survey items, a major expansion of the survey corpus, to increase it by between 3,000-5,000 items, is also being planned for the near future.

### 2.4. Building the semantic network graph

Given the difference in response levels between the first and second surveys, the present semantic network graph of Japanese word associations is based only on the response data for the 2,099 item sample, which was presented to up 50 respondents (i.e., JWAD version 1). In creating the network, only association response words with a frequency of two or more were used. This selection resulted in a set of 7,966 words to be represented and clustered in the network. While the JWAD could arguably be more naturally represented as a directed graph by distinguishing between the cue and response words, the present representation is an undirected but weighted network to examine the network's structural properties and for convenience in clustering graphs.

## 3. Analysis of Network Structures

As already noted, graph representations and the methods of graph theory and network analysis are particularly promising techniques with which to examine the intricate patterns of connectivity within large-scale linguistic knowledge resources. For instance, Steyvers and Tenenbaum (2005) have conducted an especially noteworthy study that examined the structural features of three semantic networks, based on Nelson et al's (1998) word association database, WordNet (Fellbaum, 1998), and Roget's (1991) thesaurus, respectively. By calculating a range of statistical features, including the average shortest paths, diameters, clustering coefficients, and degree distributions, they observed interesting similarities between the three networks in terms of their scale-free patterns of connectivity and small-world structures.

Similarly, we calculate the statistical features of degree distribution and clustering coefficient—an index of interconnectivity strength between neighboring nodes in a graph—in analyzing the characteristics of the semantic network representation of the JWAD.

### 3.1. Degree distribution

From their computations of degree distributions, Balabasi and Albert (1999) suggest that for scale-free network structures, the degree distribution P(k) will correspond to a power law, which can be expressed as:

$$P(k) \approx k^{-r}$$

indicating that the number of connections, that is, degree k, follows by an exponential distribution with a constant exponent value for r that is typically between 2 and 4.

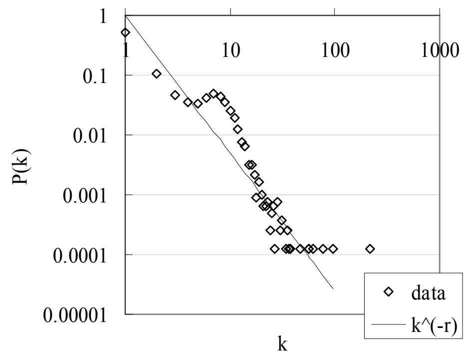


Figure 1. Degree distribution

Figure 2 presents the degree distribution of word occurrences in the network, and shows that P(k) conforms to a power-law where the best fit power function has an exponent, r, of 2.3. The average degree value of 3.67 (0.05%) for the complete semantic network of 7,966 nodes clearly indicates that the network exhibits a pattern of sparse connectivity; in other words, that it possesses the characteristics of a scale-free network.

### 3.2. Clustering coefficient

In their study into the probabilities that an acquaintance of an acquaintance is also an acquaintance of yours, Watts and Strogatz (1998) advocate the notion of clustering coefficient as an appropriate index for the degree of connections between nodes. In this study, we define the clustering coefficient of n nodes as:

$$C(n) = \frac{\text{number of links among n's neighbors}}{N(n) \times (N(n)-1)/2}$$

where N(n) represents the number of adjacent nodes. Accordingly, a clustering coefficient is a value between 0-1. When a sub-cluster has a value of 0, the graph will be star-like in appearance, while a complete graph would have a clustering coefficient of 1.

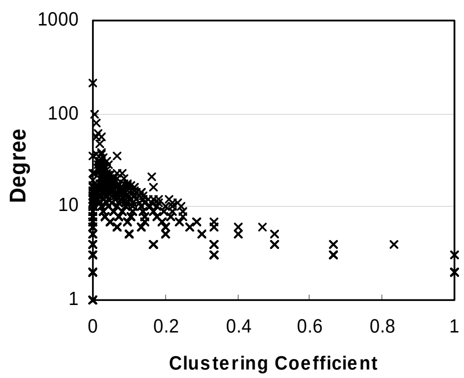


Figure 2. Clustering coefficients vs. degree

Figure 2 is a plot of the clustering coefficients as a function of degree. The average clustering coefficient is 0.04, indicating that the complete network basically consists of many star graphs connected together. The clustering coefficient for 6,045 nodes (76% of the total) is 0. This low level of connectivity is undoubtedly due to the fact that the present JWAD survey corpus was compiled to be representative of basic Japanese vocabulary, and thus the JWAD includes word items from a wide range of semantic categories. There are 170 nodes that have a clustering coefficient value of 1 and an average degree value of 1.7, which indicates that each node connects to only a few other nodes and that these together form small complete graphs.

# 4. The Applied Methods

Recently, a number of studies have applied graph theory approaches in investigating linguistic knowledge resources (Church and Hanks, 1990; Dorow, Widdows, Ling, Eckmann, Danilo, & Moses, 2005; Steyvers & Tanenbaum 2005; Watts & Strogatz, 1998; van Dongen, 2000). For instance, Dorow, et al (2005) utilize two graph clustering techniques as methods of detecting lexical ambiguity and of acquiring semantic classes instead of word frequency based computations. The two techniques are curvature (essentially the clustering coefficient proposed by Watts & Strogatz (1998)) and the Markov Clustering (MCL) algorithm proposed by van Dongen (2000).

In addition to applying these two techniques to the analysis of the JWAD semantic network, we also employ the recently developed Recurrent Markov Clustering (RMCL) algorithm (Jung, Miyake, and Akama, 2006), which improves on the MCL algorithm as a bottom-up classification method by making it possible to adjust the proportions of cluster sizes.

## 4.1. Markov Clustering

Markov Clustering (MCL) is an effective method for detecting the patterns and clusters within large and sparsely connected data structures. The first step of MCL consists of sustaining a random walk on a graph by 'expansion'. The random-walking agent follows an expanding flow represented by the *k*-th power of a transition matrix, which is a sort of stochastic matrix obtained by scaling each column of an associated matrix to have a sum of 1 (the associated matrix is defined as an adjacency matrix plus an identity matrix to take into account self loops on a graph). The second step, called 'inflation', involves switching the transition matrix at each step in the random walk so that the agent becomes trapped in dense sub-graphs by using the Gamma Operator with a parameter of r which is determined by taking the Hadamard power of a stochastic matrix and subsequently rescaling its columns to have a sum of 1 again. MCL simulates the flow on a stochastic transition matrix in converging towards an equilibrium state, and through the MCL process, a graph is partitioned into hard clusters. The inflation parameter r influences the clustering granularity. In other words, the larger the value of r is set to be, the smaller the resultant clusters will be. While this parameter is generally set as r = 2, Gfeller, Chappelier, and Rios. (2005) selected a value of 1.6 as a reasonable value for a synonym dictionary.

However, while MCL is clearly an effective clustering technique, particularly for large-scale corpora (Dorow, et al., 2005; Steyvers & Tenenbaum, 2005), the imbalance that emerges in the distribution of cluster sizes is undeniably problematic.

## 4.2. Recurrent Markov Clustering

Jung, et al. (2006a, 2006b) have recently proposed an improvement to MCL called Recurrent Markov Clustering (RMCL), which provides for greater control over the sizes of clusters by adjusting graph granularity and the generality of concepts. The recurrent process incorporates feedback about states of overlapping clusters prior to the final MCL output stage. This reverse tracing procedure is a key feature of RMCL making it possible to generate a virtual adjacency matrix for non-overlapping clusters based on the convergent state resulting from the MCL process. The resultant condensed matrix provides a simpler graph, which can highlight the conceptual structures that underlie similar words.

## 4.3. Modularity

The index referred to as modularity (Newman & Girvan, 2004) is particularly useful in assessing the quality of divisions within a network. Modularity Q indicates differences in edge distributions between a graph of meaningful partitions and a random graph under the same vertices conditions (numbers and sum of their degrees). The modularity index is defined as:

$$Q = \sum_i (e_{ii} - a_i^2)$$

where $i$ is the number of cluster $c_i$, $e_{ii}$ is the proportion of internal links in the whole graph and $a_i$ is the expected proportion of $c_i$'s edges calculated as the total number of degrees in $c_i$ divided by the total of all the degrees in the whole graph. In practice, high Q values are rare, and usually the values settle within a range of between about 0.3 and 0.7. In this study, modularity is employed to optimize the appropriate inflation parameter and the clustering stage of the RMCL process.

# 5. RMCL of the JWAD Network

In this section, we outline the application of the RMCL algorithm to investigating the undirected-weighted graph of the JWAD, and present clustering results from both MCL and RMCL.

## 5.1. MCL with different parameters of r

Figure 3 plots MCL cluster sizes as a function of the inflation parameter r ranging from 1.5 to 5. Taking r = 1.5 as the smallest value, the results yield the relatively low number of 932 MCL clusters having a quite high standard deviation (SD) of 6.88, while there is a series of small MCL clusters (SD = 1.87) when r = 5.

In terms of the resulting partitions, while it is typical to look for local peaks in the Q value, as Figure 4, plotting modularity as a function of r, indicates there are no peaks in the Q value. In this case, we adopt the average of 0.48 as a reasonable value, and accordingly r = 2 is taken as the inflation parameter.

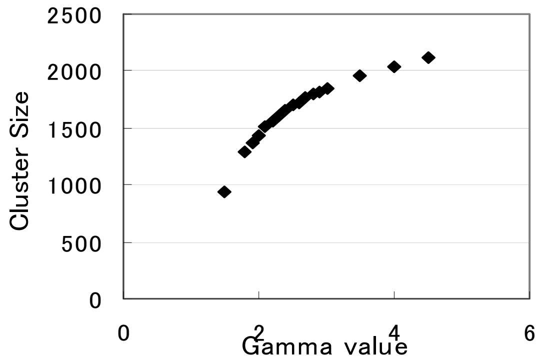


Figure 3. Cluster size as a function of r

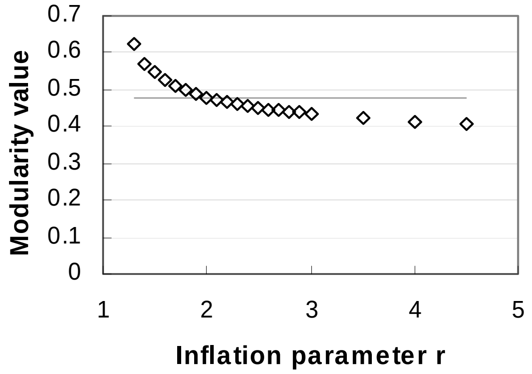


Figure 4. Modularity as a function of r

Figure 6 presents the transition in cluster sizes as a function of the MCL process, which finally generated a nearly-idempotent stochastic matrix at the 13th clustering stage with 1,411 hard clusters. Among the 1,411 representative nodes for MCL clusters, 1176 nodes (83%) were found to be items that were presented as stimulus words in the free word association task surveys.

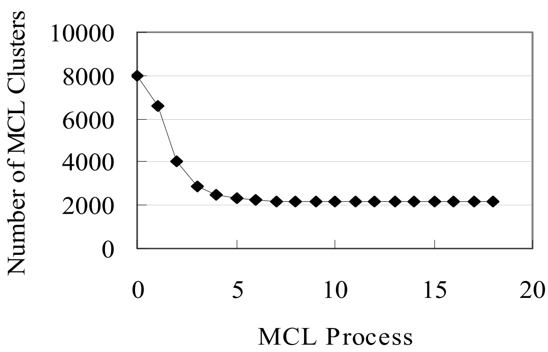


Figure 5 Cluster size transitions during MCL process

### 5.2. RMCL clustering results

Before executing RMCL, it is necessary to create a virtual adjacency matrix by combining overlapping clusters at particular stages in the MCL process with the final converged hard clusters.

Plotting modularity as a function of the clustering stage, Figure 6 indicates that the Q value peaks at stage 6. Although the RMCL results at clustering stage 6 appear to have good partitions, the 1,345 RMCL clusters at cluster stage 6 form a single cluster and there is essentially little difference from the 1,441 clusters yielded in the MCL results. In the same way as with the inflation parameter, we select the average of 0.71 as a threshold value, so cluster stage 2 is taken for the virtual adjacency matrix.

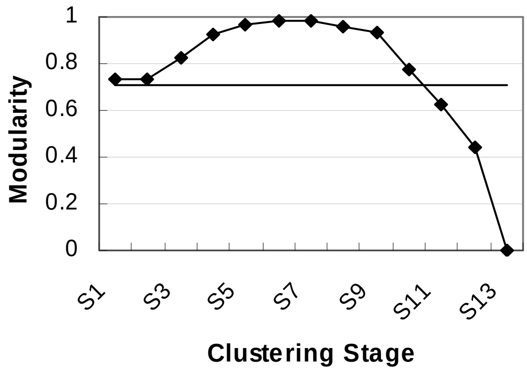


Figure 6. Modularity as a function of clustering stage

In this case, RMCL resulted in just 855 hard clusters. Among the 855 representative nodes for RMCL clusters, 624 nodes (73%) were found to be words that had been presented as stimulus words.

There are 410 MCL clusters (48%) that have only 1 component, with clustering coefficient values that are very close to 0 and low degree values.

| Representative Node (degree) | Curvature | MCL components |
|---|---|---|
| 普通 'usual' (8) | 0.04 | 変 'strange' 平凡 'common'<br>普遍 'universal' |
| 異常 'abnormal' (8) | 0.07 | 正常 'normal' 気象 'weather'<br>異常者 'abnormal person'<br>異常事態 'abnormal situation' |

Table 1. RMCL clustering result for 普通 'usual'

For each MCL and RMCL cluster, the node that has the highest degree of connections to other MCL/RMCL clusters is regarded as being the representative node for that cluster. Taking the RMCL cluster of 普通 ‘usual’ as an example, as Table 1 shows, it consists of the two MCL clusters of 普通 ‘usual’ and 異常 ‘abnormal’, which can be regarded as being of opposite meanings. Both are stimulus words in the free association surveys, and their clustering coefficients (curvature) are higher than the average of all words. Considering the MCL components, one can see that the clustering process can highlight synonymous and antonymous relationships between words, such as the associations of 変 'strange' with 普通 ‘usual’, 異常 'abnormal' and 正常 'normal'. While 普通 ‘usual’ is also associated with words of similar meaning such as 平凡 'common', 異常 'abnormal' functions as an adjective part in modifying entities. These findings demonstrate how the RMCL can help provide insights in the associative characteristics of different kinds of cue words.

## 6. Conclusion

This paper has reported on the application of graph clustering methodologies to the analysis of a semantic network. More specifically, the paper has discussed an ongoing research project to map out a semantic network representation of Japanese word associations. After outlining the continuing construction of the large-scale Japanese Word Association Database, the paper analyzed the characteristics of an initial semantic network representation of the JWAD. Calculated degree distributions for the network indicate that it has the scale-free organization of large-scale networks.

This paper has also proposed the combination of a modularity measurement and the RMCL graph clustering method to provide greater control over cluster sizes. The clustering results indicate that the RMCL method yielded a series of non-overlapping clusters that are smaller than clustering based on edge weighting and curvature clustering. By designating a representative node for each cluster, it is possible to automatically construct a condensed network representation in elucidating the structures within hierarchically-organized semantic spaces, which is an especially appealing approach to visualizing large-scale linguistic knowledge resources.

Finally, while we recognize that many of the nodes have curvature values of 0 in this initial JWAD network graph, based on the first version of the JWAD, as the JWAD expands, we plan to continually apply these graph theory approaches in mapping out the growth of the JWAD semantic network.

## 7. Acknowledgements

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# Hierarchical Structure in Semantic Networks of Japanese Word Associations

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**Abstract.** This paper reports on the application of network analysis approaches to investigate the characteristics of graph representations of Japanese word associations. Two semantic networks are constructed from two separate Japanese word association databases. The basic statistical features of the networks indicate that they have scale-free and small-world properties and that they exhibit hierarchical organization. A bottom-up classification method for graphs, called Recurrent Markov Clustering (RMCL), is also applied to the word association networks with the objective of generating hierarchical structures within the semantic networks. RMCL is shown to be an efficient tool for analyzing large-scale structures within documents and corpora. As a utilization of the network clustering results, we briefly introduce two web-based applications implemented with webMathmatica: the first is a search system that highlights various possible relations between words according to association type, while the second is to present the hierarchical architecture of a semantic network. The systems realize dynamic representations of network structures based on the relationships between words and concepts.

**Keywords:** Network analysis, Graph clustering, Japanese word associations.

## 8. 1. Introduction

As an approach to deepening our understanding of lexical knowledge, many areas of cognitive science, including psychology and computational linguistics, are seeking to unravel the rich networks of associations that connect words together. Key methodologies for that enterprise are the techniques of graph representation and their analysis that allow us to discern the patterns of connectivity within large-scale resources of linguistic knowledge and to perceive the inherent relationships between words and word groups.

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Although studies applying versions of the multidimensional space model, such as Latent Semantic Analysis (LSA) and multidimensional scaling, to the analysis of texts have been fairly fruitful, the methodologies of graph theory and network analysis are particularly suitable for elucidating the important characteristics of semantic networks.

Recently, a number of studies have applied graph theory approaches in investigating linguistic knowledge resources (Church and Hanks, 1990; Dorow, Widdows, Ling, Eckmann, Danilo, & Moses, 2005; Steyvers & Tanenbaum 2005; van Dongen, 2000; Watts & Strogatz, 1998). For instance, Dorow, et al (2005) utilize two graph clustering techniques as methods of detecting lexical ambiguity and of acquiring semantic classes instead of word frequency based computations.

This paper applies graph theory and network analysis methods to the analysis of semantic network representations of Japanese word associations. After briefly outlining the two separate Japanese word association databases used—the Associative Concept Dictionary (Okamoto & Ishizaki, 2001) and the Japanese Word Association Database (Joyce, 2005, 2006, 2007)—the paper calculates some basic statistical features, such as degree distributions, clustering coefficients and the average clustering coefficient distribution for nodes with degrees. We also apply the recently developed Recurrent Markov Clustering (RMCL) algorithm (Jung, Miyake, & Akama, 2006) which enhances the bottom-up classification method of the basic MCL algorithm by making it possible to adjust the proportion in cluster sizes. Given this greater control over cluster sizes, the RMCL clearly provides a very appealing approach to the automatic construction of condensed network representations, which, in turn, can facilitate the creation of hierarchically-organized semantic spaces as a way of visualizing large-scale linguistic knowledge resources.

## 9. Building Semantic Network Graphs of Japanese Word Associations

This section outlines the semantic network representations of the Japanese word association databases. Specifically, the section briefly describes two separate databases of Japanese word associations—the Associative Concept Dictionary (ACD) and the Japanese Word Association Database (JWAD)—and the semantic network representations created from them.

### 1.12 Existing word association norms

As frames of reference concerning the scales of the two Japanese word association databases, it worth noting that large-scale, comprehensive word association normative data has existed for some time for English. For example, Moss and Older (1996) collected between 40-50 responses for some 2,400 words of British English, while Nelson, McEvoy, and Schreiber (1998) compiled perhaps the largest database of American English covering some 5,000 words with approximately 150 responses per item. Notwithstanding the early survey by Umemoto (1969), which gathered free associations from 1,000 university students for a very small set of 210 words, clearly there has been a serious lack of comparative databases of Japanese word associations. Both the ACD and the JWAD seek to redress this situation, especially the ongoing JWAD project which is committed to constructing a large-scale database for its current survey corpus of 5,000 basic Japanese kanji and words.

### 1.13 Associative Concept Dictionary

Okamoto and Ishizaki (2001) created the Associative Concept Dictionary (ACD), which is organized as a hierarchal structure of higher/lower level concepts. The data consists of 33,018 word association responses provided by 10 respondents according to specified response categories for 1,656 nouns. By excluding response words with a frequency of 1 and a clustering coefficient of 0, 9,373 words were selected for use in creating a semantic network representation.

### 1.14 Japanese Word Association Database

The Japanese Word Association Database is being constructed as part of a project to investigate lexical knowledge in Japanese by mapping out Japanese word associations (Joyce, 2005; 2006; 2007). While the particular task—specifying in advance the associative relationship for responses—employed in creating the ACD can arguably be justified in terms of constructing a dictionary of associated concepts, the data provides little insight into the rich and diverse nature of word associations. Accordingly, the JWAD employs the free word association task in collecting association responses. Also in contrast to the ACD, which only examined nouns, the JWAD is surveying words of all word classes. Version 1 of the JWAD consists of a random sample of 2,099 items from the survey corpus of 5,000 basic Japanese kanji and words that were presented to up to 50 respondents. For the JWAD network, only words with a frequency of 2 or more were selected, which resulted in set of 7,966 words to be clustered.

## 10. Analyses of the Network Structures

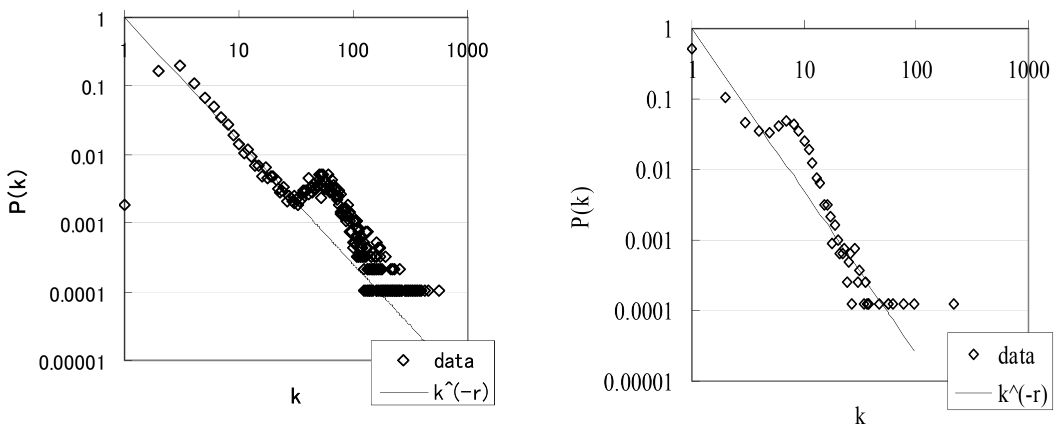
As already suggested, graph representations and the techniques of graph theory and network analysis are particularly promising techniques with which to examine the intricate patterns of connectivity within large-scale linguistic knowledge resources. For instance, Steyvers and Tenenbaum (2005) conducted a noteworthy study that examined the structural features of three semantic networks. By calculating a range of statistical features, including the average shortest paths, diameters, clustering coefficients, and degree distributions, they observed interesting similarities between the three networks in terms of their scale-free patterns of connectivity and small-world structures.

Following their basic approach, we analyze the characteristics of the two semantic network representations of Japanese word associations by calculating the statistical features of degree distribution and clustering coefficient—an index of the interconnectivity strength between neighboring nodes in a graph.

### 1.15 Degree distribution

From their computations of degree distributions, Balabasi and Albert (1999) suggest that the degree distribution, P(k), for scale-free network structures will correspond to a power law, which can be expressed as $P(k) \approx k^{-r}$.

Figure 1 presents degree distributions for word occurrences in the two semantic networks, which indicate that P(k) conforms to a power-law in both cases (with exponent values, r, of 1.8 for the ACD (panel a) and 2.3 for the JWAD (panel b). In the case of the ACD, the average degree value is 19.96 (0.2%) for the complete semantic network of 9,373 nodes, while the average degree value is 3.67 (0.05% for 7,966 nodes) in the JWAD's case. The results clearly indicate that the networks exhibit a pattern of sparse connectivity; in other words, that they possess the characteristics of a scale-free network.




(b). JWAD

(a). ACD

**Figure 7.** Degree distributions for the two semantic networks

### 1.16 Clustering coefficient

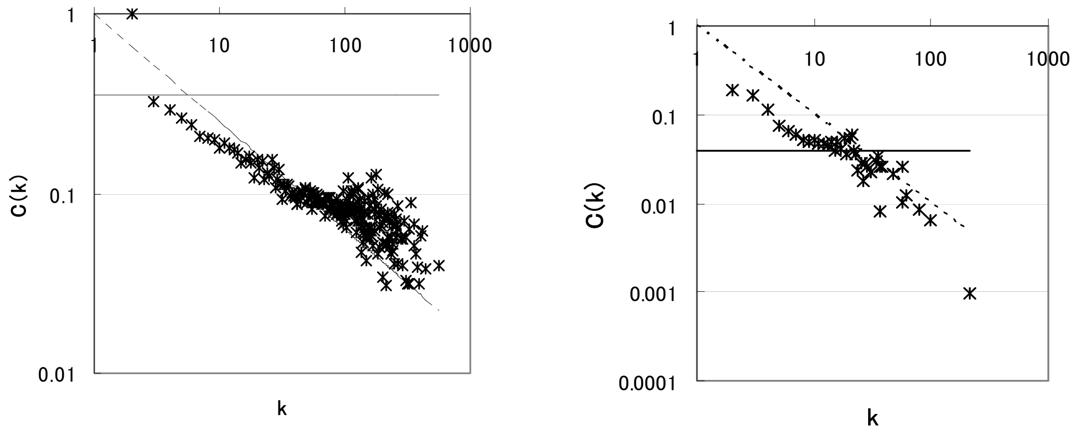
In their social network study investigating the probabilities that an acquaintance of an acquaintance is also an acquaintance of yours, Watts and Strogatz (1998) advocate the notion of clustering coefficient as an appropriate index of the degree of connections between nodes. In this study, we define the clustering coefficient of n nodes as:

$$C(n) = \frac{\text{number of links among n's neighbors}}{N(n) \times (N(n) - 1) / 2}$$

where N(n) represents the number of adjacent nodes. Accordingly, a clustering coefficient is a value between 0-1.

Moreoever, Ravasz and Barabasi (2003) introduce the notion of clustering coefficient dependence on node degree as an index of the hierarchical structures found in real networks—such as the WWW, the Actor Network based on the www.IMDB.com database—which are based on the hierarchical model of $C(k) \approx k^{-1}$ (Dorogovski, Goltsev, & Mendes, 2001). Specifically, the hierarchical nature of a network can be characterized by using the average clustering coefficient, C(k), of nodes with k degrees, which will follow a scaling law such as $C(k) \approx k^{-\beta}$, where $\beta$ is defined as a hierarchical exponent.

Figure 2 presents results of scaling C(k) with k for (a) ACD and (b) JWAD. The dashed line in (a) has a slope of -1, while the fitting exponent, $\beta$, is 0.6 for JWAD. The solid lines correspond to the average clustering coefficient. In the case of the ACD, the average clustering coefficient is quite high at 0.35, which can be regarded as indicating the small-world property. In the case of the JWAD, the average clustering coefficient is 0.04, which indicates that the complete network basically consists of many star graphs connected together. As both networks conform well to a power law, we may conclude that both networks have intrinsic hierarchies.




(a). ACD (b). JWAD

**Figure 2.** Clustering coefficient distributions for the two semantic networks

## 11. Graph Clustering: Recurrent Markov Clustering

### 1.17 Algorithm

Jung, et al. (2006) have recently proposed an improvement to Markov Clustering (MCL), called Recurrent Markov Clustering (RMCL), which provides for greater control over the sizes of clusters by making it possible to adjust graph granularity and, thus, the generality of concepts. MCL is an effective method for the detection of patterns and clusters within large and sparsely connected data structures. The first step in the MCL consists of sustaining a random walk across a graph by 'expansions'. The recurrent process incorporates feedback about the states of overlapping clusters prior to the final MCL output stage. This reverse tracing procedure is a key feature of the RMCL making it possible to generate a virtual adjacency matrix for non-overlapping clusters based on the convergent state that emerges from the MCL process. The resultant condensed matrix provides a simpler graph that can highlight the conceptual structures that underlie similar words.

### 1.18 Results

The RMCL algorithm is realized as a series of calculations executed with gridMathematica. Taking the JWAD as an example of the calculation steps in the RMCL, Figure 3 presents the transition in cluster sizes as a function of the MCL process. Starting from the adjacency matrix for co-occurrences, the MCL process finally generated a nearly-idempotent stochastic matrix at the 19th clustering stage with 1,441 hard clusters, where the average number of cluster components is 5.6 with a standard deviation (SD) of 3.1. In contrast, the RMCL resulted in just 759 hard clusters with an average of 1.9 cluster components (SD = 1.5). Among the representative nodes for RMCL clusters, 1,176 nodes (83%) were found to be words that had been presented as stimulus words. Figure 4 presents MCL and RMCL cluster sizes for both the ACD and the JWAD, which illustrate the transitions occurring in downsizing the networks generated from graph clustering. Figure 5 plots the number of components for both MCL and RMCL clusters as a function of frequency. In the case of the ACD, the MCL resulted in 1,408 hard clusters (average cluster size = 6.7, SD = 8.6), while the RMCL resulted in 118 hard clusters, where the average number of cluster components was 11.9 with a rather high SD of 68.6.

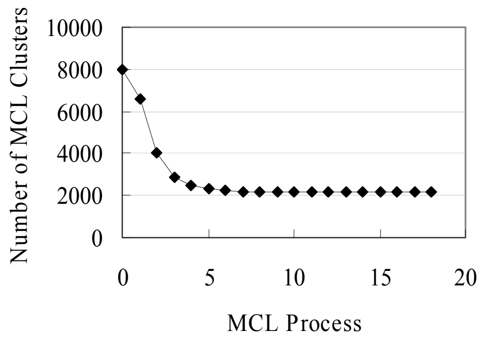



**Figure 3.** Cluster size transitions during MCL process

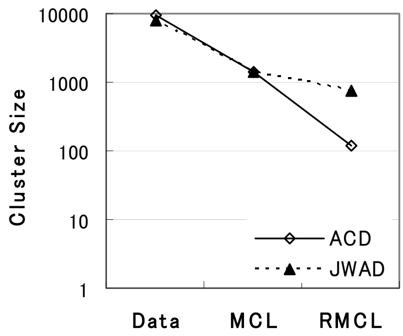
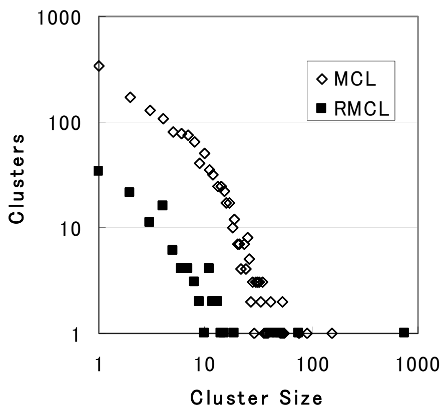
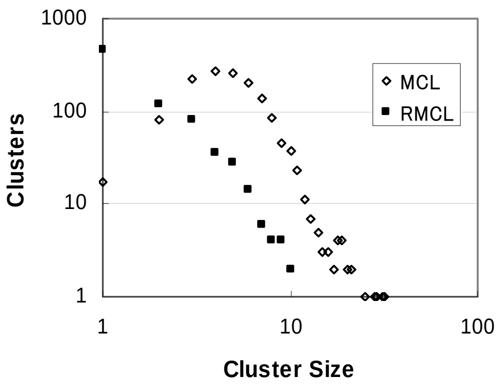



**Figure 4.** Cluster sizes for MCL and RMCL




(a). ACD




(b). JWAD

**Figure 5.** Component size distributions for both the MCL and the RMCL

## 12. Applications of the RMCL

As Widdow, Cederberg, and Dorow (2002) astutely observe, graph visualization is a particularly powerful tool for representing the meanings of words and concepts. In order to utilize the MCL and RMCL clustering results of the networks, we have developed two web-based applications implemented by webMathmatica: the first is an 'Associative Composition Support System (ACSS)' to search for free association words according to different types of association information, while the second is 'RMCLnet' which elucidates the hierarchical architecture of large-scale networks.

### 1.19 The Associative Composition Support System

The free web-based ACSS proposed by Jung et al (2006) seeks to promote associative thinking ability, and so, in turn, to foster language learning and creativity. ACSS is developed based on a database that makes it possible to retrieve three types of associative information such as word-based, concept-based and group-based associations. Such associative information is apparently sufficient to support system users in improving their associative thinking and creativity by encouraging them to move beyond literal, direct and superficial aspects to richer, freer, and more inspired conceptual associations. The variety of links between words can foster free, flexible, integrative, and imaginative thinking, while simultaneously encouraging users to discover the implicit relevance of words and even to occasionally fill in the semantic gaps between words with imaginative creations.

Figure 6 presents a screen shot of the main page for the ACSS system. Users can access the online system at http://atheneum.dp.hum.titech.ac.jp/semnet/ACSS/index.jsp. The entire interface on the user side is controlled by Javascript. When retrieval requirements are sent to the remote web server, search results are calculated in real-time by WebMathematica through the JSP and Mathematica kernel. The database was constructed in the form of a semantic network and is stored on the web server after calculating original Japanese word associations with GridMathematica. System users can input any two words to see three types of association information.

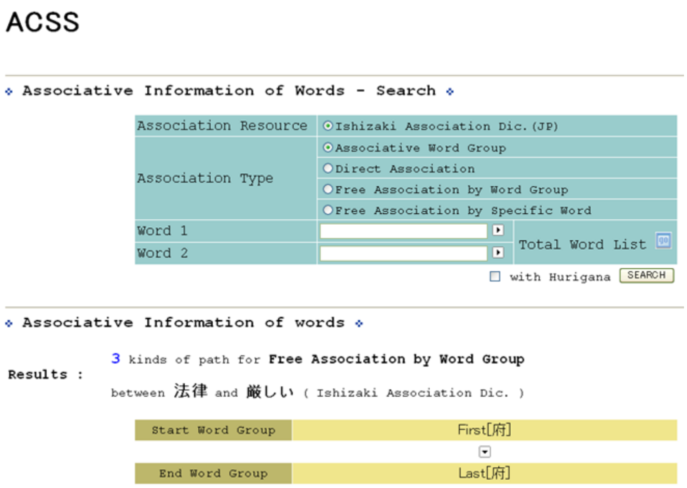
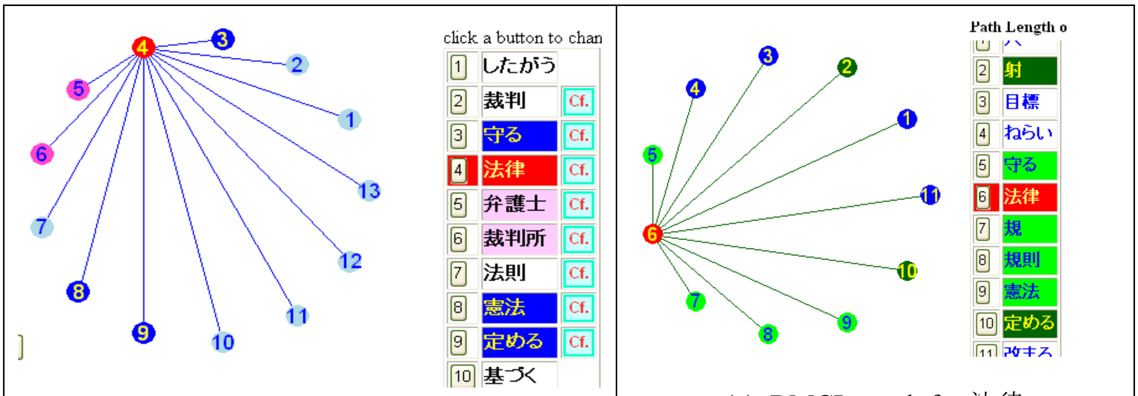



Figure 6. Screen shot of the GUI to the ACSS system

### 1.20 RMCLnet

Graph visualization of the semantic structures generated through MCL and RMCL clustering is implemented with webMathematica, employing basic techniques drawing on java servlet/JSP technology (Miyake, 2006). webMathematica can handle interactive calculations and visualization is realized by integrating Mathematica with a web server. The web server employs Apache2 as its http application server and Tomcat5 as a servlet/JSP engine. The URL for RMCLnet is http://perrier.dp.hum.titech.ac.jp/semnet/RmclNet/index.jsp.

Clustering results from both the MCL and RMCL processes can dynamically represent the relationships between words, with MCL components possibly corresponding to concepts (Figure 7). The implementation method is quite straightforward, as it is sufficient to simply store the multiple files that are created automatically when the RMCL process is executed. The system can simultaneously represent results for both the ACD and the JWAD, making it possible to examine the structural similarities and differences between the two semantic networks, which can yield interesting insights into the nature of word associations and how graph clustering functions.




(a). MCL result for 法律 'law' (a). RMCL result for 法律

Figure 7. Screen shot of the RMCLnet

### 13. Conclusions

In summary, this paper has reported on the application of graph clustering methodologies to the analysis of semantic network representations of Japanese word associations. After outlining two separate large-scale databases of Japanese word associations, the paper analyzed the characteristics of two semantic network representations of Japanese word associations. In addition to the calculation of degree distributions for the networks, which indicate that the networks are scale-free, average clustering coefficient distributions for nodes were found to conform to a power law, indicating that the networks have hierarchical organizations. Moreover, the ACD was found to have a high average clustering coefficient value, suggesting the small-world property, while the lower value for the JWAD network suggests it has less interconnectivity.

Finally, we briefly introduced two web-based applications as examples that utilize RMCL clustering results. The network representation application is useful in elucidating the structures within hierarchically-organized semantic spaces, which makes it an especially appealing approach to the visualization of large-scale linguistic knowledge resources.

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# Construction of the Japanese Word Association Database: Graph Analyses of Initial JWAD Network Representation(1)

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**Abstract:** The paper reports on the construction of the Japanese Word Association Database (JWAD) as the central component of a research project seeking to investigate the complex nature of lexical knowledge by mapping out the associative networks that exist between Japanese words. After outlining the ongoing construction of the JWAD, the paper describes the initial JWAD network representation, focusing on the application of both graph theory analyses to examine its structural properties and clustering techniques to capture its hierarchical structures. Finally, the paper comments on future work for the research project in identifying and classifying the range of associative relationships within both collected association sets and groups of related items automatically clustered together.

**Keywords:** Japanese Word Association Database (JWAD), JWAD network representation, Associative knowledge, Network analyses, Graph clustering

## 1. Introduction

As a particularly promising approach to investigating the complex nature of lexical knowledge, which is undeniably a fundamental task for cognitive scientists seeking to probe into the intricacies of higher human cognitive functions, this paper reports on a research project that is exploring word association knowledge by mapping out the associative networks that exist between Japanese words. Although association has long been recognized as a basic mechanism of human cognition (Cramer, 1968; Deese, 1965), surprisingly little attention has been given to word association knowledge within the areas of computational linguistics and natural language processing research. However, as Sinopalnikova and Smrž (2004) suggest, word association databases can usefully supplement the range of traditional language resources, such as large-scale corpora, dictionaries and thesauri, and can potentially be utilized in the development of resources, such as WordNet (Fellbaum, 1998).

(1) The present paper is financially supported by a Grant-in-Aid for Scientific Research (Kakenhi) from the Japanese Society for the Promotion of Science (Project number: 18500200; Project title: Mapping lexical knowledge through the construction and application of a large-scale database of Japanese word associations).

This paper reports on the ongoing construction of the Japanese Word Association Database (JWAD) (Joyce, 2005; 2006; 2007), which aims to be large-scale language resource in terms of both the size of its survey corpus and the numbers of word association responses collected. Specifically, this paper describes the initial association network representation created from the JWAD. In that context, the paper outlines the application of graph theory analyses in order to examine the network representation's structural properties and the application of clustering techniques as a promising approach to capturing and visualizing the hierarchical structures within the association network space (Joyce & Miyake, 2008; Miyake, Joyce, Jung, & Akama, 2007). Finally, the paper briefly reflects on future work in identifying and classifying the range of associative relationships that exist both within the JWAD association sets and within automatically clustered word groups.

## 2. Ongoing Construction of the Japanese Word Association Database

Although comprehensive databases of word association norms have existed for some time for the English language (i.e., Moss and Older (1996) consists of norms for approximately 2,400 British English words and Nelson, McEvoy and Schreiber's (1998) database includes roughly 5,000 American English words), there has been a serious lack of comparative databases for the Japanese language (i.e., Umemoto (1969) provides norms for a very limited set of just 210 Japanese words). While Okamoto and Ishizaki's (2001) Associative Concept Dictionary (ACD) for 1,656 nouns represents a clear improvement (even given serious concerns at the fact that response category was specified within the association task), the JWAD aims to develop into a very large-scale database of word association norms for the Japanese language both in terms of the number of stimulus items and the numbers of word association responses collected for each stimulus item.

Currently, the JWAD survey list consists of 5,000 basic Japanese kanji and words. The majority of word association responses collected so far have come from two questionnaire surveys that were administered to native Japanese university students (N = 1481). The first survey was conducted to obtain up to 50 word association responses for a random sample of 2,000 items, and the second was conducted to obtain up to ten responses for the remaining survey items. The JWAD is based on the free word association task where respondents are asked to response with the first semantically-related Japanese word that comes to mind on reading the stimulus item. In total, approximately 148,100 word association responses were collected from these two surveys.

Version 1 of the JWAD, which is publicly available, consists of the word association responses for a random sample of 2,099 items which were presented to up to 50 respondents. After checking the data for orthographic consistency and orthographic variants, some basic coding was applied to the association responses. As illustrated in Table 1, the main codes classify responses in terms of their general appropriateness. The vast majority of responses are semantic associations, as the ideal type of data, but responses are sometimes motivated by phonological and orthographic similarities, and also include a number of transcript responses where the response is basically the stimulus item in a different script.

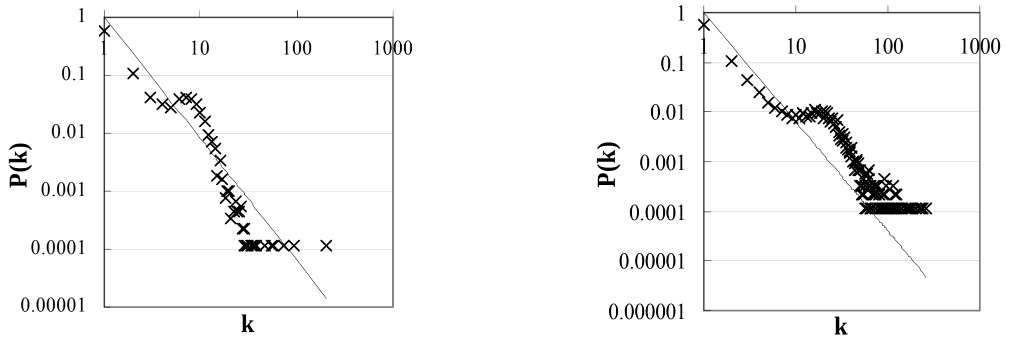
Table 1. *Examples of some of the JWAD Version 1 codes*

| Code and percentages | Examples |
|---|---|
| Semantic association (SA)<br>95.2% | 耕す (plow, cultivate) → 畑 (field)<br>涼しい (cool) → 風 (breeze, wind) |
| Phonological association (PA)<br>0.6% | いる /iru/ (exist; need) → いるか /iruka/ (dolphin)<br>しまう /shimau/ → しまうま /shimauma/ (zebra) |
| Orthographic association (OA)<br>0.5% | 赤 (red) → 赤川 /akakawa/ /akagawa/ (proper noun)<br>有様 (condition, state) → 殿様 ((feudal) lord) |
| Transcription response (TR)<br>2.2% | なく /naku/ → 泣く /naku/ (cry, weep)<br>地味 /jimi/ (plain) → じみ /jimi/ |

While the questionnaire surveys were essential for the initial collections of responses, in order to overcome the preparation and data inputting burdens involved with the traditional paper format and to collect the large-scale quantities of association responses required in constructing the JWAD, a web-based version of the word association survey has been developed (http://nerva.dp.hum.titech.ac.jp/terry/index.jsp). Since its launch, approximately 29,770 word association responses have been collected via the web-based survey. Version 2 of the JWAD will be prepared once at least 50 association responses have been collected and coded for all of the stimulus items in the current survey corpus, and a future expansion of the JWAD project will be to increase the survey list by adding between 3,000 to 5,000 new items.

## 3. Graph Analyses of Initial JWAD Network Representation

This section describes the application of graph theory analyses to the initial association network representation created from the JWAD (Joyce & Miyake, 2008). For comparison purposes, a network representation was also created for Okamoto and Ishizaki's (2001) ACD. In constructing the JWAD network representation, only response words with a frequency of two or more were used, which resulted in a network graph consisting of 8,970 words. The same criterion was applied in constructing the ACD network representation, which resulted in a network graph consisting of 8,951. Thus, the two networks are of very similar sizes.




(a) JWAD network (b) ACD network

**Figure 1:** *Degree distributions for the JWAD and ACD networks*

The first analysis applied to the network representations was in terms of degree distributions. Degree refers to the number of words that are connected to a given word. Barabasi and Albert (1999) argue that in networks with scale-free structures the degree distribution, P(k), conforms to a power law that can be represented as:

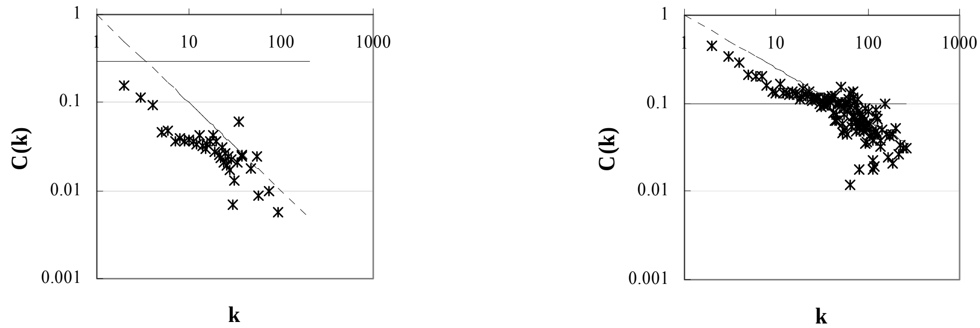
$$P(k) \approx k^{-r} \qquad (1)$$

The analysis results for degree distributions for the two networks are presented in Figure 1, which shows that both networks conform to a power law: the exponent, r, is 2.1 for the JWAD network and 2.2 for the ACD network. The second related analysis computed average degree values for the two networks. For the JWAD network, the average degree value is 3.3 (0.03%) for the 8,970 nodes, while it was 7.0 (0.08%) for the 8,951 nodes of the ACD network. These findings clearly indicate that both networks exhibit a pattern of sparse connectivity, suggesting that the two networks are scale-free in nature.

The next analysis focuses on clustering coefficients, which is a notion proposed by Watts and Strogatz (1998) in their study of social networks as an appropriate index of the interconnectivity strength between neighboring nodes in a graph. In the conducted analysis, the clustering coefficient of n nodes is calculated with Equation (2).

$$C(n) = \frac{\text{number of links among n's neighbors}}{N(n) \times (N(n)-1)/2} \qquad (2)$$

where N(n) represents the number of adjacent nodes. Equation (2) yields a value between 0 and 1, where star sub-graph would have a clustering coefficient value of 0 and an entirely connected graph would have a value of 1. Ravasz and Barabasi (2003) have proposed a clustering coefficient dependence on node degree, as an index of the hierarchical structures found in actual networks, such as the World Wide Web. Accordingly, the hierarchical nature of a network can be characterized in terms of the average clustering coefficient, C(k), of nodes with k degrees, which follows a scaling law of $C(k) \approx k^{-\beta}$ where $\beta$ is the hierarchical exponent.




(a) JWAD network (b) ACD network

**Figure 2:** *Clustering coefficient distributions for the JWAD and ACD networks*

As presented in Figure 2, the clustering coefficient distribution results, with average clustering coefficients of 0.03 for the JWAD network and 0.1 for the ACD network, indicate that both networks conform well to a power law, suggesting that both networks have intrinsic hierarchies.

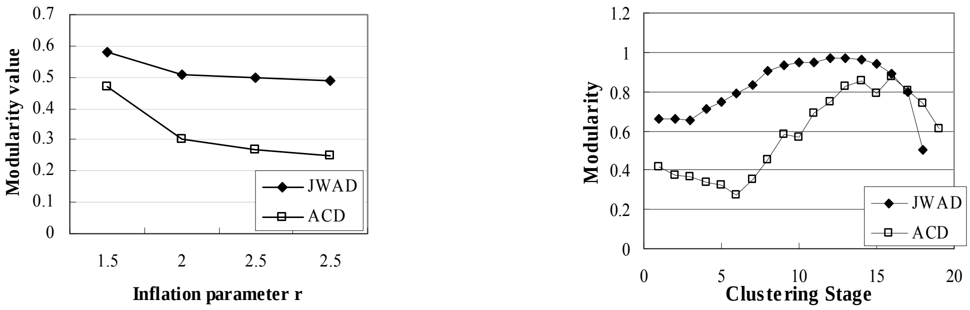
## 4. Graph Clustering

This section briefly outlines some graph clustering techniques—from the original Markov Clustering (MCL) algorithm (van Dongen, 2000), the enhanced Recurrent (RMCL) algorithm (Jung, Miyake & Akama, 2006), to the combination of RMCL and modularity (Newman & Girvan, 2004) employed in this study—and reports on their application to the two association networks.

Proposed by van Dongen (2000), MCL is a bottom-up classification method for graphs, which is particularly effective in detecting the patterns within large and sparsely connected data structures. It is a relatively simple algorithm that essentially simulates a random walk across a graph, taking an adjacency matrix as its input and converging on a state where all nodes belong to only one cluster as its output. However, one problem with the MCL is its lack of control over the distribution in generated cluster sizes, with a tendency to either yield many isolated single word clusters or an exceptionally large core cluster formed with the majority of nodes. In order to provide some control over cluster sizes, Jung, Miyake, and Akama (2006) have proposed an enhancement of the MCL method called Recurrent Markov Clustering (RMCL). RMCL achieve this improvement through a recurrent process that gives feedback about the states of overlapping clusters prior to the final MCL output stage. The feedback makes it possible to generate a virtual adjacency matrix for non-overlapping clusters, with this condensed matrix yielding a simpler graph. A further development of the graph clustering technique Joyce and Miyake (2008) is to combine the RMCL algorithm with the modularity index advocated by Newman and Girvan (2004). As an index for assessing the quality of divisions within a network, the modularity Q value highlights differences in edge distributions for a random graph and one with meaningful partitions. Modularity Q is defined by Equation (3).

$$Q = \sum_i (e_{ii} - a_i^2) \qquad (3)$$

where $i$ is the number of cluster $c_i$, $e_{ii}$ is the proportion of internal links in the whole graph and $a_i$ is the expected proportion of $c_i$'s edges calculated as the total number of degrees in $c_i$ divided by the sum of degrees for the whole graph. The combination of the RMCL and the modularity index is achieved by employing the modularity index in optimizing the inflation parameter within the clustering stages of the RMCL process.




(a) MCL inflation parameter

(b) MCL clustering stages

**Figure 3:** *Basic clustering results*

While it would be reasonable to set the inflation parameter, r, according to local peaks in the Q value, because there are no discernable peaks for Q in the results presented in panel (a) of Figure 3, the inflation parameter was set to 1.5, which produced the highest Q values. Panel (b) of Figure 3 plots modularity as a function of the clustering stage, and indicates that Q values peaked at stage 12 for the JWAD network and at stage 14 for the ACD network. Thus, those clustering stages were used in the RMCL process.

Applying the graph clustering methods to the JWAD network yielded 1,144 MCL hard clusters (average cluster size of 5.5, SD = 7.2) and 1,084 RMCL hard clusters (average cluster size of 1.1, SD = 0.28). A similar reduction in the number of clusters was observed for the ACD network, where the methods yielded 642 MCL hard clusters (average cluster size of 7.5, SD = 56.3) and 601 RMCL hard clusters (average cluster size of 1.1, SD = 0.42). A particularly interesting application for graph clustering techniques that can control for cluster sizes will be in automatically constructing a hierarchically-organized semantic space as a means to visualizing associative knowledge, as the schematic representation in Figure 4 seeks to illustrate.

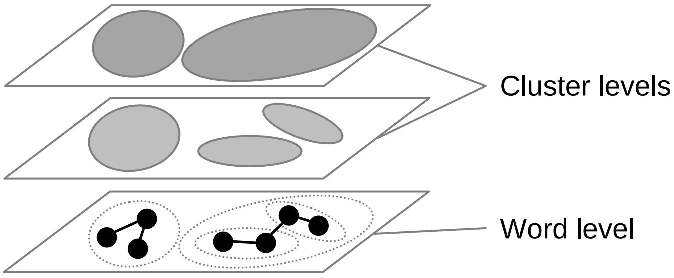



**Figure 4:** *Schematic representation of how MCL and RMCL graph clustering methods can be used in the creation of a hierarchically-structured semantic space based on the JWAD network*

## 5. Lexical Association Network Maps and Generated Graph Clusters

One of the prime objectives for the research project of constructing the JWAD is to utilize the database in the development of lexical association network maps that capture and highlight the association patterns that exist between Japanese words (Joyce, 2005, 2006, 2007). The central component of a lexical association network map is the set of forward associations elicited by a target word by more than two respondents, together with the strengths of those associations. For example, Figure 5 presents the lexical association network map for the Japanese word 冬 meaning 'winter'. When fully developed, lexical association network maps will also include levels and strengths of backward associations and the levels and strengths of associations between all members of an associate set.

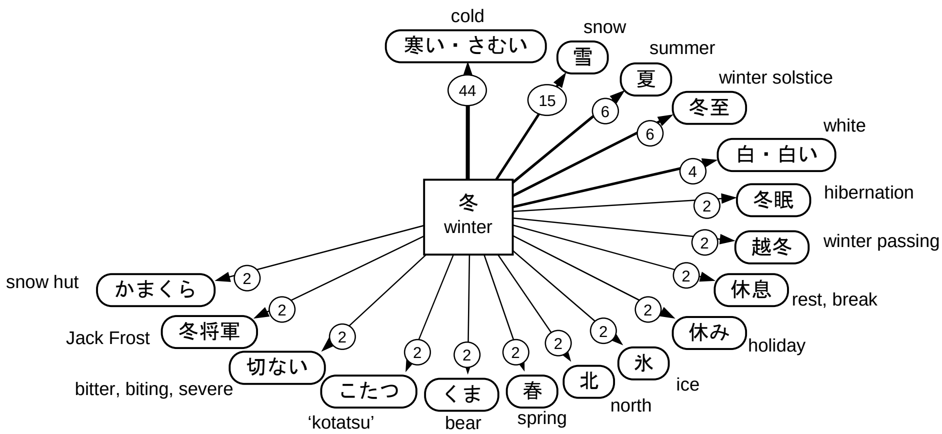



**Figure 5:** *Forward association set for 冬 'winter'. The numbers indicate the percentage of elicited responses for the target word*

**Table 2:** *Forward associations and generated MCL clusters for a set of emotional words*

| Stimulus | Forward associations | MCL clustered words |
|---|---|---|
| しあわせ (happy) | 幸福 (happiness) (25), 家族 (family) (6), 手をたたこう (clap hands) (4), 愛 (love) (4), つかむ (seize) (4), 楽しい (pleasant) (4) | しあわせ (happy), 幸福 (happiness), 手をたたこう (clap hands) |
| うれしい・嬉しい (happy) | 笑顔 (smiling face) (13), 楽しい (pleasant) (13), 喜び (joy) (10), ハッピー (happy) (10), しあわせ (happy) (7) | うれしい・嬉しい (happy), 歓喜 (delight), 喜 (joy), 喜び (joy), 喜ぶ (be glad), 喜寿 (77th birthday), 怒 (anger), 喜怒哀楽 (human emotions), 悲しむ (be sad), 大喜利 (final act of *Rakugo*) |
| さびしい・寂しい (lonely) | 一人 (alone; 1 person) (25), 孤独 (solitude) (8), 独り (alone) (5), 冬 (winter) (3), 夜 (night) (3), 暗い (dark) (3), 気持ち (feeling) (3), 悲しい (sadness) (3) | さびしい (lonely), 一人 (alone; one person), 独り (alone) |
| 悲しい (sad) | 涙 (tears) (36), 泣く (cry) (14), さびしい (lonely) (6), うれしい (happy) (6), 死 (death) (4), 別れ (parting) (4) | 悲しい (be sad), 悲しみ (sadness), 寂しい (lonely), 涙 (tears), 流す (shed) |

Although the lexical association network maps were initially envisaged mainly at the single word level, the basic approach to mapping out associations can be extended to small domains and beyond. Table 5 presents the forward association sets for a small set of emotion words. Interestingly, while the positive emotion synonyms words of しあわせ (happy) and 嬉しい (happy) have strong associations to a small set of other close synonyms, including 幸福 (happiness), ハッピー (happy), 喜び (joy), and 楽しい (pleasant), the negative emotion words of 寂しい (lonely) and 悲しい (sad) primarily elicit word association responses that can be regarded as having either causal or resultant relationships, including 一人 (alone; 1 person), 孤独 (solitude) and 独り (alone) in the case of 寂しい and 涙 (tears) and 泣く (cry) in the case of 悲しい. Although the creation of small domain association maps can provide interesting insights like this related to association knowledge, the efforts required to manually identify and visualize even relatively small domains are not inconsequential. The clustering methods outlined in this paper, however, would seem to offer an effective way to automatically identify and visualize sets of related words as generated clusters. Table 5 also presents the generated MCL clusters from the JWAD network, and shows that many of the important word associations are clustered together within the same groups. In addition to identifying many of the important associates, the clustering results also include other words that are not part of the present association sets, but which are clearly related, at least at a more general level.

## 6. Future Work: Classifying Word Associations

In concluding the present outline of the construction of the JWAD and the application of graph analyses and graph clustering techniques to the initial JWAD network representation, this paper briefly comments on the future work for the research project. In addition to the ongoing construction of the JWAD collecting more word association responses via the web-based word association survey and making future versions of the JWAD publicly available, one particularly important task will be to identify and classify the range of associative relationships within both collected association sets and the clustered word groups. Table 3 presents an initial tentative attempt to classify the association set for 冬. Although this classification task will be a major undertaking, it will be potentially be of significance for the development of more sophisticated language resources.

**Table 3:** *Tentative attempt at classifying the forward associations elicited for 冬*

| Associative relationship | Description | Examples |
|---|---|---|
| Modification | Attribute: Temperate | 寒い・さむい |
| Modification | Attribute: Color | 白・白い |
| Modification | Attribute: Emotion | 切ない |
| Lexical siblings | Hyponyms of 'seasons' | 夏, 春 |
| Typically associated | Meteorological phenomena | 雪, 氷 |
| Typically associated | Activity | 冬眠, 越冬, 休憩, 休み |
| Typically associated | Cultural artifacts | こたつ, かまくら |
| Typically associated | Time | 冬至 |
| Typically associated | Location | 北 |
| Typically associated | Animal | くま |
| Typically associated | Cultural symbolization | 冬将軍 |

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# Capturing the Structures in Association Knowledge: Application of Network Analyses to Large-Scale Databases of Japanese Word Associations

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**Abstract.** Within the general enterprise of probing into the complexities of lexical knowledge, one particularly promising research focus is on word association knowledge. Given Deese's [1] and Cramer's [2] convictions that word association closely mirror the structured patterns of relations that exist among concepts, as largely echoed Hirst's [3] more recent comments about the close relationships between lexicons and ontologies, as well as Firth's [4] remarks about finding a word's meaning in the company it keeps, efforts to capture and unravel the rich networks of associations that connect words together are likely to yield interesting insights into the nature of lexical knowledge. Adopting such an approach, this paper applies a range of network analysis techniques in order to investigate the characteristics of network representations of word association knowledge in Japanese. Specifically, two separate association networks are constructed from two different large-scale databases of Japanese word associations: the Associative Concept Dictionary (ACD) by Okamoto and Ishizaki [5] and the Japanese Word Association Database (JWAD) by Joyce [6] [7] [8]. Results of basic statistical analyses of the association networks indicate that both are scale-free with small-world properties and that both exhibit hierarchical organization. As effective methods of discerning associative structures with networks, some graph clustering algorithms are also applied. In addition to the basic Markov Clustering algorithm proposed by van Dongen [9], the present study also employs a recently proposed combination of the enhanced Recurrent Markov Cluster algorithm (RMCL) [10] with an index of modularity [11]. Clustering results show that the RMCL and modularity combination provides effective control over cluster sizes. The results also demonstrate the effectiveness of graph clustering approaches to capturing the structures within large-scale association knowledge resources, such as the two constructed networks of Japanese word associations.

**Keywords:** association knowledge, lexical knowledge, network analyses, large-scale databases of Japanese word associations, Associative Concept Dictionary (ACL), Japanese Word Association Database (JWAD), association network representations, graph clustering, Markov clustering (MCL), recurrent Markov clustering (RMCL), modularity.

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## 1 Introduction

Reflecting the central importance of language as a key to exploring and understanding the intricacies of higher human cognitive functions, a great deal of research within the various disciplines of cognitive science, such as psychology, artificial intelligence, computational linguistics and natural language processing, has understandably sought to investigate the complex nature of lexical knowledge. Within this general enterprise, one particularly promising research direction is to try and capture the structures of word association knowledge. Consistent with both Firth's assertion [4] that a word's meaning resides in the company it keeps, as well as the notion proposed by Deese [1] and Cramer [2] that, as association is a basic mechanism of human cognition, word associations closely mirror the structured patterns of relations that exist among concepts, which is largely echoed in Hirst's observations about the close relationships between lexicons and ontologies [3], attempts to unravel the rich networks of associations that connect words together can undoubtedly provide important insights into the nature of lexical knowledge.

While a number of studies have reported reasonable successes in applying versions of the multidimensional space model, such as Latent Semantic Analysis (LSA) and multidimensional scaling, to the analysis of texts, the methodologies of graph theory and network analysis are especially suitable for discerning the patterns of connectivity within large-scale resources of association knowledge and for perceiving the inherent relationships between words and word groups. A number of studies have, for instance, recently applied graph theory approaches in investigating various aspects of linguistic knowledge resources [9] [12], such as employing graph clustering techniques in detecting lexical ambiguity and in acquiring semantic classes as alternatives to computational methods based on word frequencies [13].

Of greater relevance to the present study are the studies conducted by Steyvers, Shiffrin, and Nelson [14] and Steyvers and Tenenbaum [15] which both focus on word association knowledge. Specifically, both studies draw on the *University of South Florida Word Association, Rhyme, and Word Fragment Norms*, which includes one of the largest databases of word associations for American English compiled by Nelson, McEvoy, and Schreiber [16]. Steyvers and Tenenbaum [14], for instance, applied graph theory and network analysis techniques in order to examine the structural features of three semantic networks—one based on Nelson, et al [16], one based on WordNet [17], and one based on Roget's thesaurus [18]—and observed interesting similarities between the three networks in terms of their scale-free patterns of connectivity and small-world structures. In a similar vein, the present study applies a range of network analysis approaches in order to investigate the characteristics of graph representations of word association knowledge in Japanese. In particular, two semantic networks are constructed from two separate large-scale databases of Japanese word associations: namely, the Associative Concept Dictionary (ACD) compiled by Okamoto and Ishizaki [5] and the Japanese Word Association Database (JWAD), under ongoing construction by Joyce [6] [7] [8].

In addition to applying some basic statistical analyses to the semantic network representations constructed from the large-scale databases of Japanese word associations, this study also applies some graph clustering algorithms which are effective methods of capturing the associative structures present within large and sparsely connected resources of linguistic data. In that context, the present study also compares the basic Markov clustering algorithm proposed by van Dongen [9] with a recently proposed combination of the enhanced Recurrent Markov Clustering (RMCL) algorithm developed by Jung, Miyake, and Akama [10] and Newman and Girvan's measure of modularity [11]. Although the basic Markov clustering algorithm is widely known to be an effective approach to graph clustering, it is also recognized to have an inherent problem relating to cluster sizes, for the algorithm tends to yield either an exceptionally large core cluster or many isolated clusters consisting of single words. The RMCL has been developed expressly to overcome the cluster size distribution problem by making it possible to adjust the proportion in cluster sizes. The combination of the RMCL graph clustering method and the modularity measurement provides even greater control over cluster sizes. As an extremely promising approach to graph clustering, this effective combination is being applied to the semantic network representations of Japanese word associations in order to automatically construct condensed network representations. One particularly attractive application for graph clustering techniques that are capable of controlling cluster sizes is in the construction of hierarchically-organized semantic spaces, which certainly represents an exciting approach to capturing the structures within large-scale association knowledge resources.

This paper applies a variety of graph theory and network analysis methods in analyzing the semantic network representations of large-scale Japanese word association databases. After briefly introducing in Section 2 the two Japanese word association databases, the ACD and the JWAD, which the semantic network representations analyzed in this study were constructed from, Section 3 presents the results from some basic statistical analyses of the network characteristics, such as degree distributions and average clustering coefficient distributions for nodes with degrees. Section 4 focuses on methods of graph clustering. Following short discussions of the relative merits of the MCL algorithm, the enhanced RMCL version and the combination of RMCL and modality, the graph clustering results for the two association network representations are presented. Section 5 provides a short introduction to the RMCLNet web application which makes the clustering results for the two Japanese word association networks publicly available. Finally, Section 6 summarizes the results from the various graph theory and network analysis methods applied in this study, and fleetingly mentions some interesting directions for future research in seeking to obtain further insights into the complex nature of association knowledge.

## 2 Network Representations of Japanese Word Associations

This section briefly introduces the Associative Concept Dictionary (ACD) [5] and the Japanese Word Association Database (JWAD) [6] [7] [8], which are both large-scale databases of Japanese word associations. The two network representations of word association knowledge constructed from the databases are analyzed in some detail in the subsequent sections.

Compared to the English language for which comprehensive word association normative data has existed for some time, large-scale databases of Japanese word associations have only been developed over the last few years. Notable normative data for English includes the 40-50 responses for some 2,400 words of British English collected by Moss and Older [19] and, as noted earlier, the American English norms compiled by Nelson and his colleagues [16] which includes approximately 150 responses for a list of some 5,000 words. Although the early survey by Umemoto [20] gathered free associations from 1,000 university students, the very limited set of just 210 words only serves to highlight the serious lack of comparative databases of word associations for Japanese that has existed until relatively recently. While the ACD and the JWAD both represent substantial advances in redressing the situation, the ongoing JWAD project, in particular, is strongly committed to the construction of a very large-scale database of Japanese word associations, and seeks to eventually surpass the extensive American English norms [16] in both the size of its survey corpus and the levels of word association responses collected.

### 2.1 The Associative Concept Dictionary (ACL)

The ACD was created by Okamoto and Ishizaki [5] from word association data with the specific intention of building a dictionary stressing the hierarchal structures between certain types of higher and lower level concepts. The data consists of the 33,018 word association responses provided by 10 respondents according for 1,656 nouns. While arguably appropriate for its dictionary-building objectives, a major drawback with the ACD data is the fact that response category was specified as part of the word association experiment used in collecting the data. The participants were asked to respond to a presented stimulus word according to one of seven randomly presented categories (hypernym, hyponym, part/material, attribute, synonym, action and environment). Accordingly, the ACD data tells us very little about the wide range of associative relations that the free word association task taps into.

In constructing the semantic network representation of the ACD database, only response words with a response frequency of two or more were extracted. This resulted in a network graph consists of 8,951 words.

### 2.2 The Japanese Word Association Database (JWAD)

Under ongoing construction, the JWAD is the core component in a project to investigate lexical knowledge in Japanese by mapping out Japanese word associations [6] [7] [8]. Version 1 of the JWAD consists of the word association responses to a list of 2,099 items which were presented to up to 50 respondents [21]. The list of 2,099 items was randomly selected from the initial project corpus of 5,000 basic Japanese kanji and words. In marked contrast to the ACD and its specification of categories to which associations should belong, the JWAD employs the free word association task in collecting association responses. Accordingly, the JWAD data more faithfully reflects the rich and diverse nature of word associations. Also, in sharp contrast to the ACD, which only collected associations for a set of nouns, the JWAD is surveying words belonging to all word classes.

Similar to the ACD network graph, in constructing the semantic network representation of the JWAD, only response words with a frequency of two or more were selected. In the case of the JWAD, this resulted in a network graph consisting of 8,970 words, so the two networks are of very similar sizes.

## 3 Analyses of the Association Network Structures

This section reports on initial comparisons of the ACD network and the JWAD network based on some basic statistical analyses of their network structures.

Graph representation and the techniques of graph theory and network analysis are particularly appropriate methods for examining the intricate patterns of connectivity that exist within large-scale linguistic knowledge resources. As discussed in Section 1, Steyvers and Tenenbaum [15] have illustrated the potential of such techniques in their noteworthy study that examined the structural features of three semantic networks. Based on their calculations of a range of statistical features, such as the average shortest paths, diameters, clustering coefficients, and degree distributions, they argued that the three networks exhibited similarities in terms of their scale-free patterns of connectivity and small-world structures. Following their basic similar approach, we analyze the structural characteristics of the two association networks by calculating the statistical features of degree distribution and clustering coefficient, which is an index of the interconnectivity strength between neighboring nodes in a graph.

### 3.1 Degree distributions

Based on their computations of degree distributions, Balabasi and Albert [22] argue that networks with scale-free structures have a degree distribution, $P(k)$, that conforms to a power law, which can be expressed as follows:

$$P(k) \approx k^{-r}$$

The results of analyzing degree distributions for the two association networks are presented in Figure 1, overleaf. As the figure clearly shows, P(k) for both association networks conforms to a power law: the exponent value, r, is 2.2 for the ACD network (panel a) and 2.1 for the JWAD network (panel b).

For the ACD network, the average degree value is 7.0 (0.08%) for 8,951 nodes, while in the case of the JWAD network, the average degree value is 3.3 (0.03%) for the 8,970 nodes. As these results clearly indicate that the networks exhibit a pattern of sparse connectivity, we may say that the two association networks both possess the characteristics of a scale-free network.

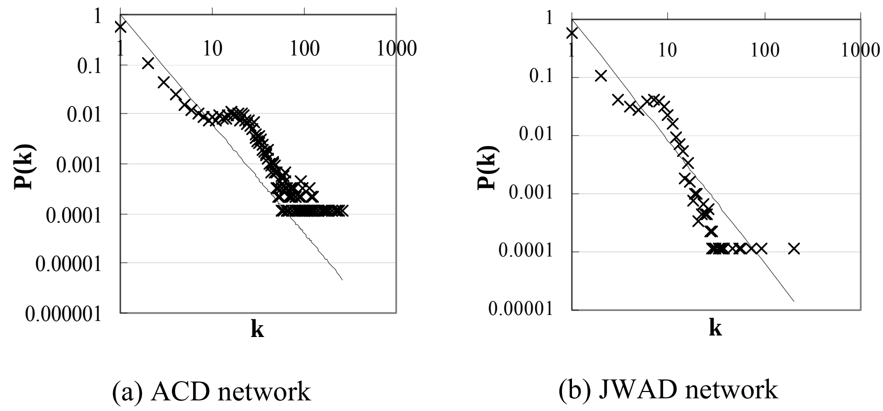



Fig. 1. Degree distributions for the ACD network (panel A) and the JWAD network (panel B).

### 3.2 Clustering coefficients

The association networks are next compared in terms of their clustering coefficients, which is an index of the interconnectivity strength between neighboring nodes in a graph. Watts and Strogatz [23] proposed the notion of clustering coefficient as an appropriate index of the degree of connections between nodes in their study of social networks that investigated the probabilities of an acquaintance of an acquaintance also being one of your acquaintances.

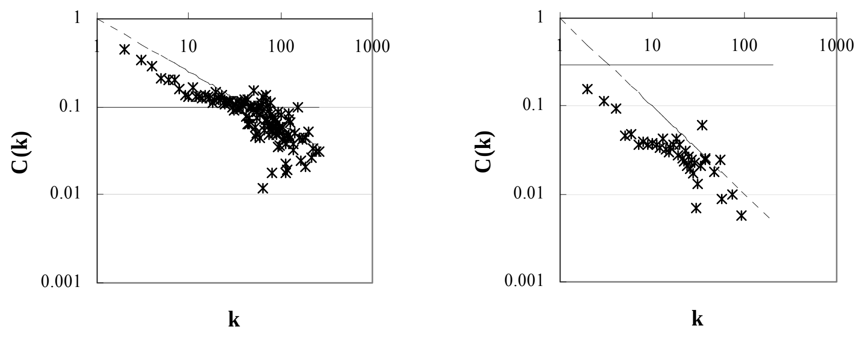
In this study, we define the clustering coefficient of n nodes as:

$$C(n) = \frac{\text{number of links among n's neighbors}}{N(n) \times (N(n) - 1) / 2}$$

where N(n) represents the number of adjacent nodes. The equation yields a clustering coefficient value between 0-1; while a star-like sub-graph would have a clustering coefficient value of 0, a complete graph with all nodes connected would have clustering coefficient of 1.

Similarly, Ravasz and Barabasi [24] (2003) advocate the notion of clustering coefficient dependence on node degree, based on the hierarchical model of $C(k) \approx k^{-1}$ [25], as an index of the hierarchical structures encountered in real networks, such as the World Wide Web. Accordingly, the hierarchical nature of a network can be characterized using the average clustering coefficient, C(k), of nodes with k degrees, which will follow a scaling law, such as $C(k) \approx k^{-\beta}$ where $\beta$ is the hierarchical exponent. The results of scaling C(k) with k for the ACD network (panel a) and for the JWAD network (panel b) are presented in Figure 2, overleaf.

The solid lines in the figure correspond to the average clustering coefficient. The ACD network has an average clustering coefficient of 0.1, while the value is 0.03 for the JWAD network. As both networks conform well to a power law, we may conclude that they both possess intrinsic hierarchies.




(a) ACD network (b) JWAD network

Fig. 2. Clustering coefficient distributions for the ACD network (panel A) and the JWAD network (panel B).

## 4 Graph Clustering

This section focuses on some graph clustering techniques and reports on the application of graph clustering to the two constructed association network representations based on the large-scale Japanese word association databases. Specifically, after considering the relative merits of the original MCL algorithm [9], the enhanced RMCL algorithm [10], and the combination of RMCL and modality [11] employed in the present study, we briefly present and discuss the results of applying these methods to the two association network representations.

### 4.1 Markov Clustering

Markov Clustering (MCL) is widely recognized as an effective method for detecting the patterns and clusters within large and sparsely connected data structures. The MCL algorithm is based on random walks across a graph, which, by utilizing the two simple algebraic operations of expansion and inflation, simulates the flow over a stochastic transition matrix in converging towards equilibrium states for the stochastic matrix. Of particular relevance to the present study is the fact that the inflation parameter, r, influences the clustering granularity of the process. In other words, if the value of r is set to be high, then the resultant clusters will tend to be small in size. While this parameter is typically set to be r = 2, a value of 1.6 has been taken as a reasonable value in creating a dictionary of French synonyms [26].

Although MCL is clearly an effective clustering technique, particularly for large-scale corpora [13] [14], the method, however, undeniably suffers from its lack of control over the distribution in cluster sizes that it generates. The MCL has a problematic tendency to either yield many isolated clusters that consist of just a single word or to yield an exceptionally large core cluster that effectively includes the majority of the graph nodes.

### 4.2 Recurrent Markov Clustering

In order to overcome this shortcoming with the MCL method, Jung, Miyake, and Akama [10] have recently proposed an improvement to the basic MCL method called Recurrent Markov Clustering (RMCL), which provides some control over cluster sizes by adjusting graph granularity. Basically, the recurrent process achieves this by incorporating feedback about the states of overlapping clusters prior to the final MCL output stage. As a key feature of the RMCL, the reverse tracing procedure makes it possible to generate a virtual adjacency matrix for non-overlapping clusters based on the convergent state resulting from the MCL process. The resultant condensed matrix provides a simpler graph, which can highlight the conceptual structures that underlie similar words.

### 4.3 Modularity

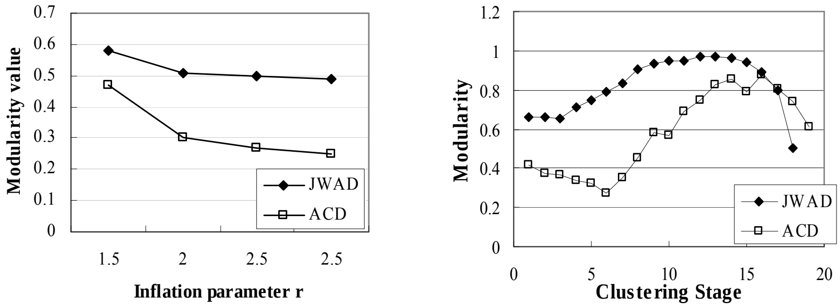
According to Newman and Girvan [11], modularity is a particularly useful index for assessing the quality of divisions within a network. The modularity Q value can highlight differences in edge distributions between a graph of meaningful partitions and a random graph under the same vertices conditions (in terms of numbers and sum of their degrees). The modularity index is defined as:

$$Q = \sum_i (e_{ii} - a_i^2)$$

where $i$ is the number of cluster $c_i$, $e_{ii}$ is the proportion of internal links in the whole graph and $a_i$ is the expected proportion of $c_i$'s edges calculated as the total number of degrees in $c_i$ divided by the sum of degrees for the whole graph. In practice, high Q values are rare, with values generally falling within the range of about 0.3 to 0.7. The present study employs a combination of RMCL clustering algorithm with this modularity index in order to optimize the appropriate inflation parameter within the clustering stages of the RMCL process. The RMCL results reported in this paper are all based on the combination of the RMCL clustering method and modularity.

### 4.3 Clustering Results

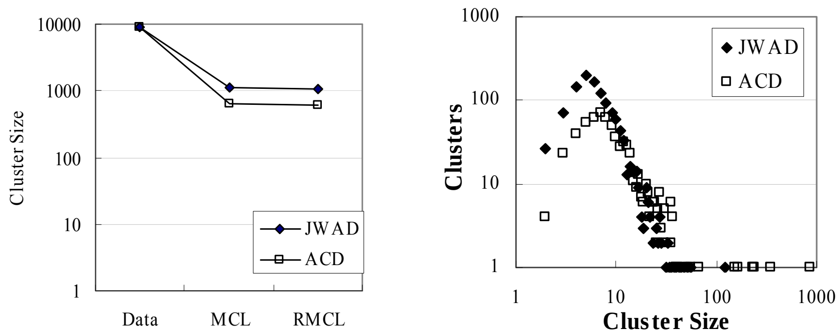
The MCL and the RMCL algorithm were implemented as a series of calculations that are executed with gridMathematica. The MCL process generated a nearly-idempotent stochastic matrix at around the 20th clustering stage.




(a) Inflation parameter for MCL

(b) MCL clustering stage

Fig. 3. Basic clustering results, with panel a presenting modularity values as a function of r and panel b indicating modularity values as a function of the MCL clustering stage.




(a) Cluster sizes for MCL and RMCL

(b) Distributions in cluster sizes of MCL

Fig. 4. Clustering results for MCL and RMCL, with panel a showing cluster sizes and panel b showing distributions for the MCL algorithm

In terms of determining a reasonable value for the r parameter, while it is usual to identify local peaks in the Q value, as Figure 3(a), which plots modularity as a function of r, indicates there are no discernable no peaks in the Q value. Accordingly, the highest value of r equals 1.5 was taken for the inflation parameter. Plotting modularity as a function of the clustering stage, Figure 3(b) indicates that values of Q value peaked at stage 14 in the case of the ACD network and at stage 12 for the JWAD network. Accordingly, these clustering stages were used in the RMCL process.

Figure 4(a) presents the MCL and the RMCL cluster sizes for both the ACD network and the JWAD network, illustrating the downsizing transitions that took place during the graph clustering process. Figure 4(b) plots the frequencies of cluster sizes for the results of MCL clustering. In the case of the ACD network, the MCL algorithm resulted in 642 hard clusters, with an average cluster size of 7.5 and an SD of 56.3, while the RMCL yielded 601 clusters, where the average number of cluster components was 1.1 with an SD of 0.42. In the case of the JWAD network, the MCL resulted in 1,144 hard clusters, with an average cluster size of 5.5 and an SD of 7.2, while the RMCL yielded 1,084 clusters, where the average number of cluster components was 1.1 with an SD of 0.28.

### 4.4 Discussion

In section 4.3, we presented the quantitative results of applying the MCL and the RMCL graph clustering algorithms to the two association networks in terms of the numbers of resultant clusters produced and the distributions in cluster sizes for each network by each method. In this section, we present a few of the clusters generated by the clustering methods in illustrating the potential of the clustering approach as an extremely useful tool for automatically identifying groups of related words and the relationships between the words within the groupings.

One objective of the project developing the JWAD is to utilize the database in the development of lexical association network maps that capture and highlight the association patterns that exist between Japanese words [6] [7] [8]. Essentially, a lexical association network map represents a set of forward associations elicited by a target word by more than two respondents (and the strengths of those associations), together with backward associations (both their numbers and associative strengths), as well as the levels and strengths of associations between all members of an associate set [6]. While the lexical association network maps were first envisaged primarily at the single word level, the basic approach to mapping out associations can be extended to small domains and beyond, as the example in Figure 5 illustrates with a map building from and contrasting a small set of emotion words. Interestingly, this association map suggests that the positive emotion synonym words of しあわせ (happy) and 嬉しい (happy) have strong associations to a small set of other close synonyms, but that the negative emotion words of 寂しい (lonely) and 悲しい (sad) primarily elicit word association responses that can be regarded as having causal or resultant relationships. While the creation of such small domain association maps is likely to provide similarly interesting insights concerning association knowledge, the efforts required to manually identify and visualize even relatively small domains are not inconsequential. However, the clustering methods presented in this section represent a potentially very appealing way of automatically identifying and visualizing sets of related words as generated clusters.

Table 1 presents the word clusters for the target words of しあわせ (happy) and 寂しい (lonely) that were generated by the MCL algorithm for the JWAD network. Comparing the sets of associations for these two words in Figure 5 based on the JWAD with the word clusters in Table 1, clearly there are many words that are common to both. The additional words included in the MCL word clusters in Table 1 serve to demonstrate how the automatic clustering process can be a powerful technique for identifying more implicit, but nevertheless interesting patterns of association within collections of words that are mediated through indirect connections via closely related items.

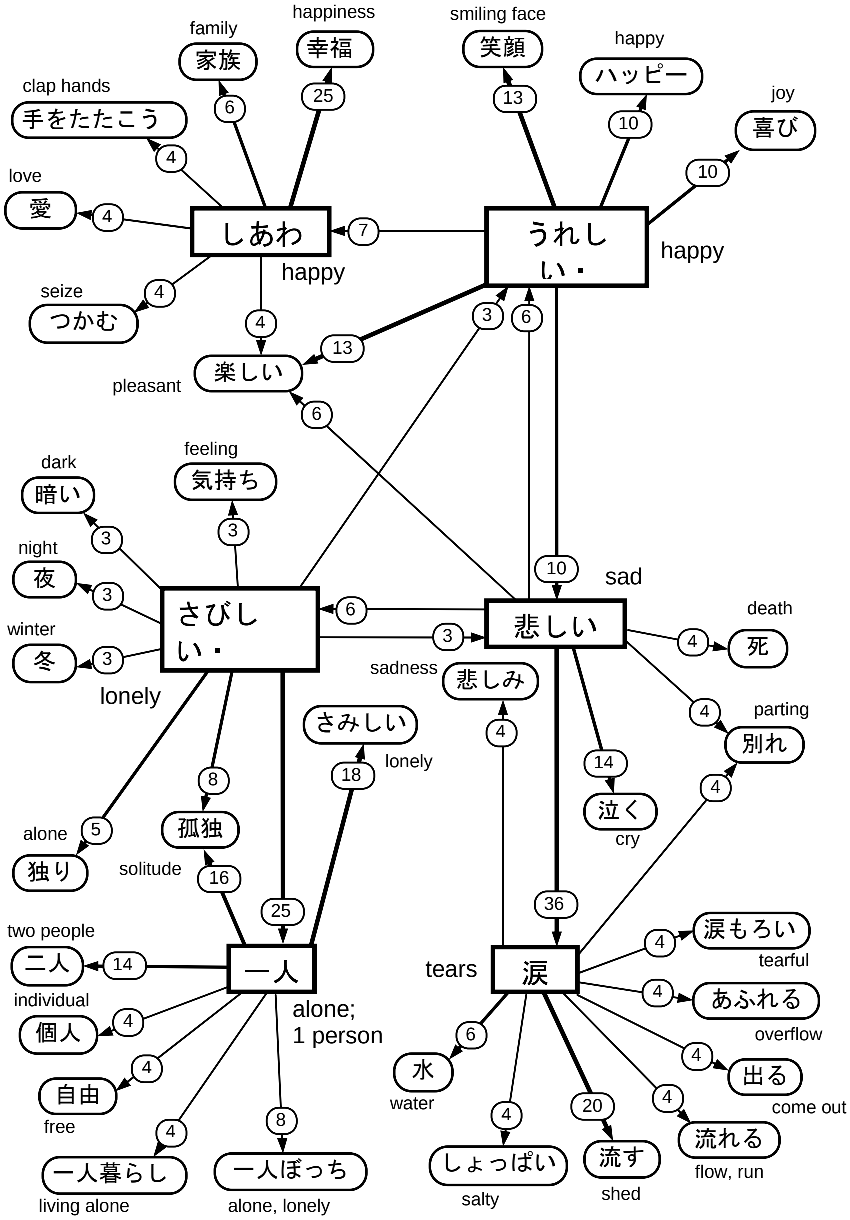



Fig. 5. Example of lexical association network map building from and contrasting a small set of emotion words within the JWAD. The numbers on the arrows indicate response frequencies as percentages of the respective association sets.

Table 1. Examples of clusters for the JWAD network generated by the MCL algorithm.

| |
|---|
| 手をたたこう (clap hands) 幸福 (happiness) しあわせ (happy) |
| 怒 (anger) 嬉しい (happy) 歓喜 (delight) 喜 (joy) 喜び (joy) 喜ぶ (be glad) 喜寿 (77th birthday) 喜怒哀楽 (human emotions) 悲しむ (be sad) 大喜利 (final act in a *Rakugo* performance) |
| 独り (alone) 一人 (alone; one person) さびしい (lonely) |
| 寂しい (lonely) 悲しみ (sadness) 悲しい (be sad) 涙 (tears) 流す (shed) |
| 負け (defeat) 涙 (tears) くやしい (regrettable) |

Similarly, Table 2 presents word clusters for the ACD network generated by the MCL algorithm, which illustrates how effective the clustering methods are in grouping together words that have a synonymous relationship.

Table 2. Examples of words in the ACD network clustered together by the MCL algorithm.

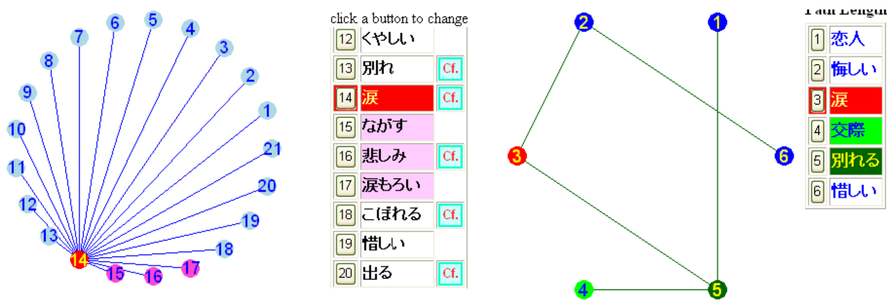
| |
|---|
| 結納 (engagement gift) 幸せ (happy) 入籍 (entry in family register) 式場 (ceremonial hall) 結婚 (marriage) 婚約 (engagement) 同棲 (cohabiting) 冠婚葬祭 (important ceremonial occasions) |
| 貰う (receive) 嬉しい (happy) お駄賃 (tip) ありがたい (thanks) 褒美 (reward) 収入 (income) 小づかい (pocket money) |
| 冬 (winter) 寒さ (coldness) 初冬 (early winter) 真冬 (midwinter) 寂しい (lonely) ウィンター (winter) 暖冬 (warm winter) |
| 純粋 (pure) 分泌液 (secretion) 嬉し涙 (tears of joy) なみだ (tears) 溢れる (overflow) 悲しい事 (sad incident) 悔し涙 (vexation) |
| 後悔 (regret) 反省 (reflection) 悔やむ (be sorry) 悔しさ (chagrin) 悔しい (regrettable) |

## 5 RMCLNet

This section briefly introduces RMCLNet [26], which is a web application to make publicly available the clustering results for the ACD and the JWAD networks, in a spirit of seeking to foster a wider appreciation for the interesting contributions that investigations of word association knowledge can yield for our understandings of lexical knowledge in general.

As Widdow, Cederberg, and Dorow astutely observe [28], graph visualization is a particularly powerful tool for representing the meanings of words and concepts [24]. The graph visualization of the structures generated through both the MCL and the RMCL clustering methods is being implemented with webMathematica and utilizing some standard techniques of java servlet/JSP technology. Because webMathematica is capable of processing interactive calculations, the graph visualization is realized by integrating Mathematica with a web server that uses Apache2 as its http application server and Tomcat5 as its servlet/JSP engine.

The visualization system can highlight the relationships between words by dynamically presenting both MCL and RMCL clustering results for both the ACD and the JWAD networks, as the screen shots in Figure 6 illustrate. Implementation of the visualization system is relatively straightforward, basically only requiring storage of the multiple files that are automatically generated during execution of the RMCL algorithm. The principle feature of the system is that it is capable of simultaneously presenting clustering results for both the ACD and the JWAD networks, making it possible to compare the structural similarities and differences between the two association networks. Such comparisons can potentially provide useful hints for further investigations concerning the nature of word associations and graph clustering.




(a). MCL result for 涙

(a). RMCL result for 涙

Fig. 6. Screen shots of RMCLNet, illustrating visualizations of MCL clustering results (panel a) and of RMCL clustering results (panel b) for the Japanese word 涙 'tears'.

## 6 Conclusions

As a promising approach to capturing and unraveling the rich networks of associations that connect words together, this study has applied a range of network analysis techniques in order to investigate the characteristics of network representations of word association knowledge in Japanese. In particular, the study constructed and analyzed two separate Japanese association networks. One network was based on the Associative Concept Dictionary (ACD) by Okamoto and Ishizaki [5], while the other was based on the Japanese Word Association Database (JWAD) by Joyce [6] [7] [8]. The results of initial analyses of the two networks—focusing on degree distributions and average clustering coefficient distributions for nodes with degrees—revealed that the two networks both possess the characteristics of a scale-free network and that both possess intrinsic hierarchies.

The study also applied some graph clustering algorithms to the association networks. While graph clustering undoubtedly represents an effective approach to capturing the associative structures within large-scale knowledge resources, there are still some issues that warrant further investigation. One purpose of the present study has been to examine improvements to the basic MCL algorithm [9], by extending on the enhanced RMCL version [10]. In that context, this study applied a combination of RMCL graph clustering method and the modularity measurement as a means of achieving greater control over the sizes of clusters generated during the execution of the clustering algorithms. For both association networks, the combination of the RMCL algorithm with the modularity index resulted in fewer clusters.

This paper also illustrated the fact that clustering methods represent a potentially very appealing way of automatically identifying and visualizing sets of related words as generated clusters by looking at some of the clustered words generated by the MCL algorithm. The examples presented in Tables 1 and 2 suggest that automatic clustering techniques can be useful for identifying, beyond simply the direct association relationship, more implicit and indirect patterns of association within collections of words as mediated by closely related items, and for grouping together words that have synonymous relationships. The paper also briefly introduced the RMCLNet which is a web application specifically developed to make the clustering results for the ACD and the JWAD networks publicly available. It is hoped that further investigations into the rich structures of association knowledge by comparing the structural similarities and differences between the two association networks can provide useful hints concerning both the nature of word associations and graph clustering.

As alluded to at times in the discussions, much of the research outlined in this paper forms part of a larger ongoing research project that is seeking to capture the structures inherent within association knowledge. In concluding this paper, it is appropriate to acknowledge some limitations with the present study and to fleetingly sketch out some avenues to be explored in the future. One concern to note is that, while the ACD database and Version 1 of the JWAD are of comparable sizes and both can be regarded as being reasonably large-scale, some characteristics of the present two semantic network representations of Japanese word associations may be reflecting characteristics of the foundational databases. As already noted, the ongoing JWAD project is committed to constructing a very large-scale database of Japanese word associations, and as the database expands with both more responses and more extensive lexical coverage and new versions of the JWAD are compiled, new versions of the JWAD semantic network will be constructed and analyzed in order to trace its growth and development.

While much of the discussions in section 4 focused on the important issue of developing and exercising some control over the sizes of clusters generated through graph clustering, the authors also recognize the need to evaluate generated clusters in terms of their semantic consistency. The presented examples of word clusters indicate that clustering methods can be effectively employed in automatically grouping together words related words based on associative relationships. However, essential tasks for our future research into the nature of association knowledge will be to develop a classification of elicited association responses in the JWAD in terms of their associative relationships to the target word and to apply the classification in evaluating the associative relationships between the components of generated clusters. While the manual inspection of generated clusters is undeniably very labor intensive, the work is likely to have interesting implications for the recent active development of various classification systems and taxonomies within thesauri and ontology research.

Finally, one direct extension of the present research will be the application of the MCL and the RMCL graph clustering methods to the dynamic visualization of the hierarchical structures within semantic spaces, as the schematic representation in Figure 7 illustrates. The combination of constructing large-scale semantic network representations of Japanese word associations, such as the JWAD network, and applying graph clustering techniques to the resultant network is undoubtedly a particularly promising approach to capturing, unraveling and comprehending the complex structural patterns within association knowledge.

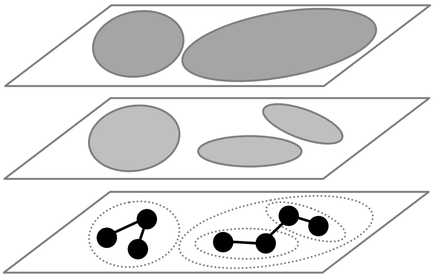



Fig. 7. Schematic representation of how the MCL and the RMCL graph clustering methods can be used in the creation of a hierarchically-structures semantic space based on an association network.

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## Appendix 1

## Japanese Word Association Database Survey Corpus of 4,998 Basic Japanese Kanji and Words

V1 items are the random sampled 2,099 items for which the word association response sets have been coded and made publically available as version 1 of the Japanese Word Association Database (JWAD-V1).

| | | |
|---|---|---|
| 00001 | ああ | V1 |
| 00002 | 愛 | |
| 00003 | 挨拶 | |
| 00004 | 合図 | V1 |
| 00005 | 愛する | V1 |
| 00006 | 間 | |
| 00007 | 相手 | |
| 00008 | あいにく | V1 |
| 00009 | アイロン | V1 |
| 00010 | あう | V1 |
| 00011 | 会う | |
| 00012 | 合う | |
| 00013 | 会 | |
| 00014 | 合 | V1 |
| 00015 | 遭 | V1 |
| 00016 | 青 | V1 |
| 00017 | 青い | |
| 00018 | 仰 | V1 |
| 00019 | 赤 | V1 |
| 00020 | 赤い | |
| 00021 | 赤ちゃん | |
| 00022 | あがる | |
| 00023 | 上がる | V1 |
| 00024 | 明るい | |
| 00025 | 秋 | V1 |
| 00026 | 商 | |
| 00027 | 明らか | V1 |
| 00028 | あきらめる | |
| 00029 | 飽きる | |
| 00030 | あく | |
| 00031 | 開く | V1 |
| 00032 | 開 | |
| 00033 | 握手 | |
| 00034 | アクセント | V1 |
| 00035 | あくび | V1 |
| 00036 | 悪魔 | V1 |
| 00037 | あげどうふ | V1 |
| 00038 | あける | |
| 00039 | 明ける | |
| 00040 | あげる | |
| 00041 | 上げる | |
| 00042 | 挙 | |
| 00043 | あこがれる | V1 |
| 00044 | 朝 | V1 |
| 00045 | 浅い | V1 |
| 00046 | 浅 | |
| 00047 | あさって | V1 |
| 00048 | 脚 | |
| 00049 | 足 | V1 |
| 00050 | 味 | |
| 00051 | アジア | V1 |
| 00052 | 足跡 | V1 |
| 00053 | あした | |
| 00054 | 明日 | |
| 00055 | 味わう | |
| 00056 | あす | |
| 00057 | 預かる | |
| 00058 | 預ける | V1 |
| 00059 | 汗 | |
| 00060 | あせる | V1 |
| 00061 | 焦る | |
| 00062 | あそこ | |
| 00063 | 遊び | |
| 00064 | 遊ぶ | |
| 00065 | 価 | V1 |
| 00066 | 値 | |

| | | |
|---|---|---|
| 00067 | 与える | |
| 00068 | 暖かい | |
| 00069 | 温 | |
| 00070 | 暖 | |
| 00071 | 暖める | |
| 00072 | 頭 | |
| 00073 | 新しい | |
| 00074 | 新 | |
| 00075 | あたりまえ | V1 |
| 00076 | 当たり前 | |
| 00077 | あたる | V1 |
| 00078 | 当たる | V1 |
| 00079 | 当 | |
| 00080 | あちら | V1 |
| 00081 | 圧 | V1 |
| 00082 | あつい | |
| 00083 | 厚い | |
| 00084 | 暑い | |
| 00085 | 熱い | |
| 00086 | 厚 | |
| 00087 | 暑 | |
| 00088 | 扱う | V1 |
| 00089 | あっち | |
| 00090 | 圧迫 | |
| 00091 | 集まる | |
| 00092 | 集 | |
| 00093 | 集める | V1 |
| 00094 | 当てる | |
| 00095 | 充 | |
| 00096 | 後 | V1 |
| 00097 | 跡 | V1 |
| 00098 | 穴 | V1 |
| 00099 | あなた | |
| 00100 | あに | |
| 00101 | 兄 | |
| 00102 | あね | |
| 00103 | 姉 | V1 |
| 00104 | あの | V1 |
| 00105 | アパート | |
| 00106 | あひる | V1 |
| 00107 | 浴びる | V1 |
| 00108 | 危ない | V1 |
| 00109 | 危 | V1 |
| 00110 | 油 | V1 |
| 00111 | あま | V1 |
| 00112 | 甘い | |
| 00113 | 雨戸 | |
| 00114 | あまり | |
| 00115 | 余 | |
| 00116 | あまる | |
| 00117 | 余る | V1 |
| 00118 | 網 | |
| 00119 | 編む | V1 |
| 00120 | 雨 | V1 |
| 00121 | 謝る | V1 |
| 00122 | 誤 | |
| 00123 | 謝 | V1 |
| 00124 | 荒い | V1 |
| 00125 | 粗い | V1 |
| 00126 | 洗う | |
| 00127 | 洗 | V1 |
| 00128 | 争う | |
| 00129 | 争 | |
| 00130 | 改まる | V1 |
| 00131 | 改 | |
| 00132 | あらっ | V1 |
| 00133 | あらゆる | V1 |
| 00134 | あらわす | |
| 00135 | 現わす | V1 |
| 00136 | 表わす | |
| 00137 | 現 | V1 |
| 00138 | 現われる | |
| 00139 | ありがたい | V1 |
| 00140 | ありがとう | V1 |
| 00141 | 有様 | V1 |
| 00142 | 有る | |
| 00143 | 在 | |
| 00144 | あるいは | |
| 00145 | 歩く | |
| 00146 | あれ | |
| 00147 | あれっ | |
| 00148 | 合わせる | |
| 00149 | 慌てる | V1 |
| 00150 | あわてる | |

| | | |
|---|---|---|
| 00151 | 案 | V1 |
| 00152 | 案外 | |
| 00153 | 暗記 | V1 |
| 00154 | 安心 | V1 |
| 00155 | 安全 | V1 |
| 00156 | あんな | V1 |
| 00157 | 案内 | |
| 00158 | い | |
| 00159 | 以 | |
| 00160 | 委 | |
| 00161 | 意 | |
| 00162 | 胃 | |
| 00163 | 遺 | |
| 00164 | 医 | V1 |
| 00165 | 良い | V1 |
| 00166 | いい | |
| 00167 | いいえ | V1 |
| 00168 | イーメール | |
| 00169 | いいん | V1 |
| 00170 | 委員 | |
| 00171 | 医院 | |
| 00172 | 言う | |
| 00173 | 言 | V1 |
| 00174 | いえ | |
| 00175 | 家 | V1 |
| 00176 | 硫黄 | |
| 00177 | いか | V1 |
| 00178 | 以下 | V1 |
| 00179 | 烏賊 | V1 |
| 00180 | いがい | V1 |
| 00181 | 以外 | |
| 00182 | 意外 | V1 |
| 00183 | いかが | V1 |
| 00184 | 行き | |
| 00185 | 域 | |
| 00186 | 息 | V1 |
| 00187 | 勢い | |
| 00188 | 勢 | |
| 00189 | 行き先 | |
| 00190 | 生きる | |
| 00191 | 行く | |
| 00192 | 行 | V1 |
| 00193 | 幾つ | |
| 00194 | 幾ら | V1 |
| 00195 | 池 | |
| 00196 | いけない | V1 |
| 00197 | 生け花 | V1 |
| 00198 | 意見 | |
| 00199 | 以後 | |
| 00200 | 潔 | V1 |
| 00201 | 勇ましい | V1 |
| 00202 | 意志 | V1 |
| 00203 | いし | V1 |
| 00204 | 意思 | |
| 00205 | 石 | |
| 00206 | 意識 | V1 |
| 00207 | いじめる | |
| 00208 | 医者 | V1 |
| 00209 | いじょう | |
| 00210 | 以上 | |
| 00211 | 異常 | V1 |
| 00212 | 椅子 | V1 |
| 00213 | 泉 | |
| 00214 | イスラム教 | V1 |
| 00215 | 以前 | |
| 00216 | 忙しい | V1 |
| 00217 | 急ぐ | V1 |
| 00218 | 急 | V1 |
| 00219 | 板 | |
| 00220 | 痛 | |
| 00221 | 痛い | V1 |
| 00222 | 致す | |
| 00223 | いたずら | V1 |
| 00224 | いただきます | V1 |
| 00225 | いただく | |
| 00226 | 頂 | V1 |
| 00227 | いたむ | V1 |
| 00228 | 痛む | |
| 00229 | 至 | V1 |
| 00230 | いち | |
| 00231 | 位置 | |
| 00232 | 一 | |
| 00233 | 一応 | |
| 00234 | いちご | |

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|---|---|---|
| 00235 | 一二三 | |
| 00236 | 市場 | V1 |
| 00237 | 一番 | V1 |
| 00238 | 一部 | |
| 00239 | 五日 | V1 |
| 00240 | 一切 | |
| 00241 | いっしょ | V1 |
| 00242 | 一生 | |
| 00243 | いっしょうけんめい | |
| 00244 | 一生懸命 | V1 |
| 00245 | いっそう | |
| 00246 | 一層 | V1 |
| 00247 | 一致 | |
| 00248 | 五つ | |
| 00249 | 一定 | |
| 00250 | いっぱい | |
| 00251 | 一般 | |
| 00252 | 一方 | |
| 00253 | いつも | |
| 00254 | 糸 | |
| 00255 | いとこ | V1 |
| 00256 | 営 | V1 |
| 00257 | 挑 | |
| 00258 | 否 | |
| 00259 | 以内 | |
| 00260 | いなか | |
| 00261 | 田舎 | V1 |
| 00262 | 犬 | V1 |
| 00263 | 稲 | V1 |
| 00264 | 命 | |
| 00265 | 祈り | |
| 00266 | 祈る | V1 |
| 00267 | 違反 | V1 |
| 00268 | 今 | |
| 00269 | 意味 | V1 |
| 00270 | いも | |
| 00271 | いもうと | V1 |
| 00272 | 妹 | V1 |
| 00273 | いや | |
| 00274 | いやいや | |
| 00275 | いよいよ | |
| 00276 | 以来 | |
| 00277 | いらっしゃいませ | |
| 00278 | いらっしゃる | V1 |
| 00279 | 入口 | V1 |
| 00280 | いる | V1 |
| 00281 | 居る | |
| 00282 | 居 | V1 |
| 00283 | 射 | V1 |
| 00284 | 要る | V1 |
| 00285 | 衣類 | V1 |
| 00286 | 入 | |
| 00287 | 入れる | |
| 00288 | 色 | V1 |
| 00289 | いろいろ | V1 |
| 00290 | いろり | V1 |
| 00291 | 岩 | |
| 00292 | いわう | |
| 00293 | 祝う | |
| 00294 | 祝 | V1 |
| 00295 | いわし | V1 |
| 00296 | いわゆる | V1 |
| 00297 | 員 | |
| 00298 | 院 | V1 |
| 00299 | インキ | |
| 00300 | インク | |
| 00301 | 印刷 | |
| 00302 | 印象 | |
| 00303 | インターネット | |
| 00304 | インターン | V1 |
| 00305 | インチキ | |
| 00306 | インテリ | V1 |
| 00307 | インフレ | |
| 00308 | 宇 | |
| 00309 | ウイスキー | V1 |
| 00310 | ウール | V1 |
| 00311 | 上 | |
| 00312 | 植木 | |
| 00313 | 植 | V1 |
| 00314 | 植える | |
| 00315 | うお | V1 |
| 00316 | うがい | V1 |
| 00317 | うかがう | V1 |

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|---|---|---|
| 00318 | 伺う | |
| 00319 | 浮かぶ | V1 |
| 00320 | 雨季 | V1 |
| 00321 | 浮く | V1 |
| 00322 | 受け入れる | V1 |
| 00323 | 承 | V1 |
| 00324 | 受付 | |
| 00325 | 受け付ける | |
| 00326 | 受け取り | |
| 00327 | 受け取る | V1 |
| 00328 | 受身 | V1 |
| 00329 | うける | |
| 00330 | 受ける | |
| 00331 | 受 | V1 |
| 00332 | 動 | |
| 00333 | 動かす | |
| 00334 | 動く | V1 |
| 00335 | うさぎ | V1 |
| 00336 | 牛 | |
| 00337 | 氏 | |
| 00338 | 失 | V1 |
| 00339 | 失う | V1 |
| 00340 | 後ろ | |
| 00341 | 渦 | |
| 00342 | うすい | V1 |
| 00343 | 薄い | |
| 00344 | うそ | |
| 00345 | うた | V1 |
| 00346 | 歌 | |
| 00347 | 歌う | |
| 00348 | 疑 | |
| 00349 | 疑い | V1 |
| 00350 | 疑う | V1 |
| 00351 | 内 | |
| 00352 | 打ち合わせ | |
| 00353 | 打ち切る | |
| 00354 | 打ち込む | V1 |
| 00355 | 宇宙 | V1 |
| 00356 | うちわ | |
| 00357 | 内訳 | |
| 00358 | うつ | |
| 00359 | 撃 | V1 |
| 00360 | 打 | |
| 00361 | 打つ | |
| 00362 | 討 | |
| 00363 | うっかり | |
| 00364 | 美しい | V1 |
| 00365 | うつす | V1 |
| 00366 | 映す | |
| 00367 | 写す | |
| 00368 | 移 | |
| 00369 | 移す | |
| 00370 | 映 | V1 |
| 00371 | 写 | |
| 00372 | うつる | |
| 00373 | 映る | |
| 00374 | 写る | |
| 00375 | 移る | |
| 00376 | 器 | |
| 00377 | 腕 | V1 |
| 00378 | うどん | |
| 00379 | 乳母 | |
| 00380 | 馬 | V1 |
| 00381 | うまい | |
| 00382 | 生まれ | V1 |
| 00383 | 生まれる | |
| 00384 | 海 | |
| 00385 | 産む | V1 |
| 00386 | 産 | |
| 00387 | 梅 | V1 |
| 00388 | 梅干 | V1 |
| 00389 | 埋める | |
| 00390 | 敬 | |
| 00391 | うら | |
| 00392 | 裏 | |
| 00393 | うらむ | V1 |
| 00394 | 恨む | V1 |
| 00395 | うらやましい | V1 |
| 00396 | 売り上げ | |
| 00397 | 売り切れ | V1 |
| 00398 | 売り場 | |
| 00399 | 雨量 | |
| 00400 | 得る | V1 |
| 00401 | 売 | |

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|---|---|---|
| 00402 | 売る | |
| 00403 | うるさい | V1 |
| 00404 | うるし | |
| 00405 | うれしい | |
| 00406 | 嬉しい | |
| 00407 | 熟 | V1 |
| 00408 | 浮気 | |
| 00409 | 上着 | V1 |
| 00410 | うわさ | |
| 00411 | うん | |
| 00412 | 運 | |
| 00413 | 運送 | V1 |
| 00414 | 運賃 | |
| 00415 | 運転 | |
| 00416 | 運転手 | |
| 00417 | うんと | |
| 00418 | うんどう | V1 |
| 00419 | 運動 | |
| 00420 | 運動場 | V1 |
| 00421 | 運搬 | V1 |
| 00422 | 運命 | V1 |
| 00423 | え | |
| 00424 | 絵 | |
| 00425 | 柄 | |
| 00426 | 英 | |
| 00427 | 衛 | |
| 00428 | 永遠 | |
| 00429 | 映画 | |
| 00430 | 影響 | |
| 00431 | 英語 | V1 |
| 00432 | 英国 | V1 |
| 00433 | えいせい | V1 |
| 00434 | 衛星 | V1 |
| 00435 | 衛生 | |
| 00436 | 栄養 | |
| 00437 | ええ | V1 |
| 00438 | えがく | V1 |
| 00439 | 描く | V1 |
| 00440 | 液 | |
| 00441 | 益 | |
| 00442 | 駅 | V1 |
| 00443 | 液体 | V1 |
| 00444 | えさ | |
| 00445 | エスカレーター | |
| 00446 | 枝 | |
| 00447 | えび | |
| 00448 | 偉い | V1 |
| 00449 | えらぶ | V1 |
| 00450 | 選 | V1 |
| 00451 | 選ぶ | |
| 00452 | えり | |
| 00453 | 獲 | |
| 00454 | エレベーター | V1 |
| 00455 | 円 | V1 |
| 00456 | 演 | V1 |
| 00457 | 延期 | |
| 00458 | 演劇 | V1 |
| 00459 | エンジン | |
| 00460 | 遠足 | |
| 00461 | 鉛筆 | |
| 00462 | 遠慮 | V1 |
| 00463 | お | |
| 00464 | 尾 | |
| 00465 | おあいそ | V1 |
| 00466 | おいしい | |
| 00467 | 追い出す | V1 |
| 00468 | 追い付く | |
| 00469 | おう | |
| 00470 | 央 | V1 |
| 00471 | 往 | V1 |
| 00472 | 応 | |
| 00473 | 王 | |
| 00474 | 追 | |
| 00475 | 追う | |
| 00476 | 応急 | |
| 00477 | 横断 | V1 |
| 00478 | 往復 | V1 |
| 00479 | 応用 | |
| 00480 | 多い | V1 |
| 00481 | 多 | V1 |
| 00482 | おおかた | |
| 00483 | 大きい | |
| 00484 | 大きな | V1 |
| 00485 | 多く | |

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|---|---|---|
| 00486 | おおぜい | |
| 00487 | 大勢 | |
| 00488 | オーバー | V1 |
| 00489 | 公 | |
| 00490 | おおよそ | |
| 00491 | おおらか | V1 |
| 00492 | 丘 | V1 |
| 00493 | おかあさま | |
| 00494 | おかあさん | |
| 00495 | おかえりなさい | |
| 00496 | おかげ | |
| 00497 | おかしい | |
| 00498 | おかす | |
| 00499 | 犯 | V1 |
| 00500 | おかず | V1 |
| 00501 | 拝 | V1 |
| 00502 | 拝む | V1 |
| 00503 | 沖 | V1 |
| 00504 | 補う | V1 |
| 00505 | 置き場 | |
| 00506 | おきる | |
| 00507 | 起 | V1 |
| 00508 | 起きる | |
| 00509 | 奥 | V1 |
| 00510 | 億 | |
| 00511 | 置 | V1 |
| 00512 | 置く | |
| 00513 | おくさま | |
| 00514 | おくさん | V1 |
| 00515 | 屋上 | |
| 00516 | おくらす | |
| 00517 | 遅らす | V1 |
| 00518 | 贈り物 | V1 |
| 00519 | おくる | |
| 00520 | 送 | |
| 00521 | おくれる | V1 |
| 00522 | 遅れる | V1 |
| 00523 | おこす | V1 |
| 00524 | 行う | |
| 00525 | 起こる | |
| 00526 | 怒る | |
| 00527 | 興 | |
| 00528 | おごる | |
| 00529 | 押さえる | |
| 00530 | 幼い | V1 |
| 00531 | おさまる | V1 |
| 00532 | 収まる | |
| 00533 | 収 | V1 |
| 00534 | おさめる | V1 |
| 00535 | 修 | V1 |
| 00536 | 納 | V1 |
| 00537 | 納める | V1 |
| 00538 | おじ | V1 |
| 00539 | 惜しい | V1 |
| 00540 | おしい | |
| 00541 | おじいさん | |
| 00542 | 押し入れ | |
| 00543 | 教 | |
| 00544 | 教える | |
| 00545 | おじぎ | |
| 00546 | おじさん | |
| 00547 | おじょうさん | V1 |
| 00548 | お嬢さん | |
| 00549 | おす | |
| 00550 | 押す | V1 |
| 00551 | 推 | |
| 00552 | 雄 | V1 |
| 00553 | おせじ | V1 |
| 00554 | 遅い | |
| 00555 | 恐らく | V1 |
| 00556 | おそれおおい | |
| 00557 | 恐れる | V1 |
| 00558 | 恐ろしい | |
| 00559 | お大事に | |
| 00560 | おだやか | |
| 00561 | おちつく | V1 |
| 00562 | 落ちる | |
| 00563 | おっしゃる | V1 |
| 00564 | 夫 | |
| 00565 | 音 | V1 |
| 00566 | おとうさん | |
| 00567 | お父さん | V1 |
| 00568 | 弟 | |
| 00569 | 男 | V1 |

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|---|---|---|
| 00570 | おとす | |
| 00571 | 落とす | |
| 00572 | おとそ | |
| 00573 | おととい | |
| 00574 | おととし | |
| 00575 | おとな | |
| 00576 | 大人 | |
| 00577 | おとなしい | |
| 00578 | 踊り | V1 |
| 00579 | 劣る | V1 |
| 00580 | 踊る | |
| 00581 | おとろえる | V1 |
| 00582 | 衰える | |
| 00583 | 驚く | V1 |
| 00584 | おなか | V1 |
| 00585 | 同 | |
| 00586 | 同じ | |
| 00587 | 鬼 | V1 |
| 00588 | 己 | |
| 00589 | おば | V1 |
| 00590 | おばあさん | |
| 00591 | おばけ | V1 |
| 00592 | おばさん | |
| 00593 | おはよう | V1 |
| 00594 | おび | |
| 00595 | 帯 | |
| 00596 | おふくろ | |
| 00597 | おぼえる | V1 |
| 00598 | 覚える | |
| 00599 | 覚 | |
| 00600 | おぼれる | |
| 00601 | おまえ | |
| 00602 | おむすび | |
| 00603 | オムレツ | |
| 00604 | おめでとう | V1 |
| 00605 | 重 | |
| 00606 | 重い | V1 |
| 00607 | 思い出す | V1 |
| 00608 | 思い出 | |
| 00609 | 思 | |
| 00610 | 思う | |
| 00611 | おもしろい | V1 |
| 00612 | 面白い | V1 |
| 00613 | おもちゃ | V1 |
| 00614 | おもて | |
| 00615 | 主 | |
| 00616 | 主に | |
| 00617 | 親 | |
| 00618 | 親子 | |
| 00619 | おやじ | |
| 00620 | おやすみなさい | |
| 00621 | 泳ぐ | |
| 00622 | 泳 | |
| 00623 | およそ | |
| 00624 | および | |
| 00625 | 及び | |
| 00626 | 織物 | |
| 00627 | おりる | |
| 00628 | オリンピック | |
| 00629 | 織 | V1 |
| 00630 | 織る | |
| 00631 | 折 | V1 |
| 00632 | 折る | V1 |
| 00633 | 折れる | |
| 00634 | 卸売 | |
| 00635 | おろす | V1 |
| 00636 | 降ろす | |
| 00637 | 降 | |
| 00638 | 終 | |
| 00639 | 終わり | |
| 00640 | 終わる | V1 |
| 00641 | 恩 | V1 |
| 00642 | 音楽 | V1 |
| 00643 | 温泉 | |
| 00644 | 温度 | |
| 00645 | 女 | |
| 00646 | 音読み | |
| 00647 | か | |
| 00648 | 可 | |
| 00649 | 科 | |
| 00650 | 課 | |
| 00651 | 貨 | V1 |
| 00652 | 蚊 | V1 |
| 00653 | 賀 | |

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|---|---|---|
| 00654 | カーテン | |
| 00655 | カーブ | V1 |
| 00656 | かい | |
| 00657 | 械 | V1 |
| 00658 | 界 | |
| 00659 | 階 | |
| 00660 | 貝 | V1 |
| 00661 | 害 | V1 |
| 00662 | 海外 | V1 |
| 00663 | 海岸 | V1 |
| 00664 | 会議 | |
| 00665 | 階級 | |
| 00666 | 海峡 | V1 |
| 00667 | 会計 | |
| 00668 | 解決 | |
| 00669 | 蚕 | V1 |
| 00670 | 外交 | V1 |
| 00671 | 外国 | |
| 00672 | 外国語 | |
| 00673 | 外国人 | |
| 00674 | 改札 | |
| 00675 | 開始 | |
| 00676 | 会社 | |
| 00677 | 解釈 | V1 |
| 00678 | 外出 | |
| 00679 | 会場 | |
| 00680 | 回数 | V1 |
| 00681 | 回数券 | |
| 00682 | かいせい | |
| 00683 | 快晴 | V1 |
| 00684 | 改正 | V1 |
| 00685 | 快速 | |
| 00686 | かいだん | V1 |
| 00687 | 階段 | |
| 00688 | 回転 | |
| 00689 | 解剖 | V1 |
| 00690 | 買い物 | |
| 00691 | 改良 | |
| 00692 | 会話 | V1 |
| 00693 | かう | |
| 00694 | 飼 | V1 |
| 00695 | 飼う | |
| 00696 | 買 | V1 |
| 00697 | 買う | |
| 00698 | カウンター | |
| 00699 | かえす | V1 |
| 00700 | 返す | |
| 00701 | 却って | |
| 00702 | 帰 | |
| 00703 | 帰り | |
| 00704 | かえる | V1 |
| 00705 | 帰る | |
| 00706 | 換 | |
| 00707 | 換える | |
| 00708 | 替える | |
| 00709 | 変える | |
| 00710 | 返る | |
| 00711 | 顔 | |
| 00712 | 顔色 | V1 |
| 00713 | 価格 | |
| 00714 | かがく | V1 |
| 00715 | 化学 | |
| 00716 | 科学 | V1 |
| 00717 | 鏡 | V1 |
| 00718 | 輝 | V1 |
| 00719 | 輝く | |
| 00720 | 係 | |
| 00721 | 掛かる | V1 |
| 00722 | かかる | V1 |
| 00723 | かかわる | V1 |
| 00724 | 垣 | |
| 00725 | 書留 | |
| 00726 | 垣根 | |
| 00727 | 限る | V1 |
| 00728 | 限 | V1 |
| 00729 | かく | |
| 00730 | 書く | |
| 00731 | 画 | |
| 00732 | 各 | |
| 00733 | 拡 | V1 |
| 00734 | 格 | |
| 00735 | 角 | |
| 00736 | 閣 | V1 |
| 00737 | 書 | |

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|---|---|---|
| 00738 | 学 | |
| 00739 | 各自 | V1 |
| 00740 | 確実 | |
| 00741 | 学者 | |
| 00742 | 革新 | V1 |
| 00743 | 隠す | |
| 00744 | 画数 | V1 |
| 00745 | 学生 | |
| 00746 | 拡大 | |
| 00747 | 角度 | V1 |
| 00748 | 革命 | |
| 00749 | 学問 | V1 |
| 00750 | 隠れる | V1 |
| 00751 | かげ | |
| 00752 | 陰 | |
| 00753 | 影 | V1 |
| 00754 | かける | V1 |
| 00755 | 掛ける | |
| 00756 | 駆 | |
| 00757 | 欠 | |
| 00758 | 加減 | |
| 00759 | 過去 | |
| 00760 | かご | |
| 00761 | 化合 | |
| 00762 | 囲む | V1 |
| 00763 | 囲 | |
| 00764 | かさ | V1 |
| 00765 | 傘 | |
| 00766 | 火災 | V1 |
| 00767 | 重なる | |
| 00768 | 重ねる | V1 |
| 00769 | 飾り | V1 |
| 00770 | 飾る | V1 |
| 00771 | 火山 | |
| 00772 | 菓子 | V1 |
| 00773 | 火事 | |
| 00774 | 賢い | V1 |
| 00775 | 貸し出す | |
| 00776 | 貸 | V1 |
| 00777 | 貸す | |
| 00778 | 数 | |
| 00779 | ガス | |
| 00780 | かすみ | |
| 00781 | 風 | |
| 00782 | 風邪 | V1 |
| 00783 | 家族 | |
| 00784 | ガソリン | |
| 00785 | かた | |
| 00786 | 型 | V1 |
| 00787 | 肩 | V1 |
| 00788 | 片 | V1 |
| 00789 | 方 | |
| 00790 | かたい | |
| 00791 | 堅い | V1 |
| 00792 | 片仮名 | V1 |
| 00793 | かたち | |
| 00794 | 形 | |
| 00795 | 片付ける | V1 |
| 00796 | 刀 | |
| 00797 | 固まる | |
| 00798 | 固 | V1 |
| 00799 | 片道 | V1 |
| 00800 | 傾く | |
| 00801 | 価値 | |
| 00802 | 活 | V1 |
| 00803 | 勝 | |
| 00804 | 勝つ | |
| 00805 | がっかり | V1 |
| 00806 | がっき | |
| 00807 | 学期 | |
| 00808 | 楽器 | V1 |
| 00809 | かつぐ | V1 |
| 00810 | 担 | V1 |
| 00811 | 格好 | V1 |
| 00812 | 学校 | V1 |
| 00813 | 勝手 | |
| 00814 | 活動 | V1 |
| 00815 | 活発 | |
| 00816 | 合併 | |
| 00817 | かてい | |
| 00818 | 家庭 | |
| 00819 | 過程 | V1 |
| 00820 | 過度 | |
| 00821 | 仮名 | |

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|---|---|---|
| 00822 | 家内 | |
| 00823 | 悲 | |
| 00824 | 悲しい | V1 |
| 00825 | 奏 | |
| 00826 | かならず | V1 |
| 00827 | 必ず | |
| 00828 | 必ずしも | V1 |
| 00829 | かなり | |
| 00830 | かに | |
| 00831 | 金 | |
| 00832 | 鐘 | V1 |
| 00833 | かねつ | |
| 00834 | 加熱 | |
| 00835 | 過熱 | V1 |
| 00836 | 金持ち | |
| 00837 | 可能 | V1 |
| 00838 | 彼女 | V1 |
| 00839 | カバー | |
| 00840 | かばん | |
| 00841 | 株 | V1 |
| 00842 | 歌舞伎 | |
| 00843 | 株式 | |
| 00844 | かぶる | |
| 00845 | 被る | |
| 00846 | 被 | |
| 00847 | 壁 | |
| 00848 | 構 | |
| 00849 | 我慢 | V1 |
| 00850 | かみ | V1 |
| 00851 | 紙 | |
| 00852 | 神 | V1 |
| 00853 | 髪 | |
| 00854 | かみそり | |
| 00855 | 雷 | |
| 00856 | カメラ | V1 |
| 00857 | 科目 | |
| 00858 | かもしれない | V1 |
| 00859 | かゆい | V1 |
| 00860 | 通 | |
| 00861 | 通う | |
| 00862 | 火曜日 | |
| 00863 | から | V1 |
| 00864 | 空 | |
| 00865 | カラー | V1 |
| 00866 | 辛い | V1 |
| 00867 | からし | |
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| 00869 | ガラス | V1 |
| 00870 | からだ | |
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| 00874 | 借り出す | V1 |
| 00875 | 借りる | |
| 00876 | 借 | |
| 00877 | かる | |
| 00878 | 刈る | |
| 00879 | 軽い | |
| 00880 | 軽 | V1 |
| 00881 | カルタ | V1 |
| 00882 | 彼 | V1 |
| 00883 | カレー | V1 |
| 00884 | ガレージ | |
| 00885 | 枯れる | |
| 00886 | カレンダー | |
| 00887 | 過労 | V1 |
| 00888 | かわ | |
| 00889 | 河 | V1 |
| 00890 | 革 | |
| 00891 | 川 | |
| 00892 | 側 | |
| 00893 | 皮 | |
| 00894 | 可愛い | V1 |
| 00895 | かわいい | V1 |
| 00896 | かわいそう | |
| 00897 | かわかす | V1 |
| 00898 | 乾かす | V1 |
| 00899 | 乾く | |
| 00900 | かわせ | V1 |
| 00901 | かわる | V1 |
| 00902 | 代 | |
| 00903 | 変わる | |
| 00904 | かん | |
| 00905 | 缶 | V1 |

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| 00907 | 完 | V1 |
| 00908 | 官 | |
| 00909 | 幹 | |
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| 00912 | 简 | |
| 00913 | 観 | |
| 00914 | 還 | V1 |
| 00915 | 館 | V1 |
| 00916 | 考え | V1 |
| 00917 | 考 | |
| 00918 | 考える | |
| 00919 | かんかく | |
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| 00932 | かんじょう | |
| 00933 | 勘定 | |
| 00934 | 感情 | |
| 00935 | 感じる | V1 |
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| 00940 | 間接 | |
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| 00949 | 乾杯 | V1 |
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| 00952 | 看病 | |
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| 00958 | 黄 | |
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01190 具体的 V1
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01193 下さる
01194 果物
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| 01245 | 苦しむ | V1 |
| 01246 | 車 | V1 |
| 01247 | 暮れ | V1 |
| 01248 | くれる | |
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| 01255 | 加 | |
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| 01455 | 光度 | V1 |
| 01456 | 高度 | |
| 01457 | 行動 | V1 |
| 01458 | 強盗 | |
| 01459 | 交番 | |
| 01460 | こうふく | |
| 01461 | 幸福 | |
| 01462 | 鉱物 | V1 |
| 01463 | 公平 | V1 |
| 01464 | 公務 | V1 |
| 01465 | 公務員 | V1 |
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| 01469 | 合理的 | V1 |
| 01470 | 交流 | |
| 01471 | 考慮 | V1 |
| 01472 | 声 | |
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| 01476 | 肥 | V1 |
| 01477 | コート | |
| 01478 | コード | V1 |
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| 01483 | 小切手 | |
| 01484 | 呼吸 | V1 |
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| 01487 | ごく | |
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| 01499 | ごくろうさま | V1 |
| 01500 | 焦げる | V1 |
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| 01503 | 心地 | V1 |
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| 01505 | 九日 | |
| 01506 | 九つ | V1 |
| 01507 | 心 | V1 |
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| 01521 | 越す | |
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| 01524 | 戸籍 | V1 |
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| 01531 | ごちそう | |
| 01532 | こちら | V1 |
| 01533 | こっか | |
| 01534 | 国家 | |
| 01535 | 国歌 | |
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| 01546 | 孤独 | |
| 01547 | ことし | |
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| 01550 | 異なる | |
| 01551 | ことば | V1 |
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| 01553 | こども | |
| 01554 | 子供 | |
| 01555 | 小鳥 | V1 |
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| 01557 | ことわる | V1 |
| 01558 | 断 | V1 |
| 01559 | 断る | V1 |
| 01560 | 粉 | |
| 01561 | こないだ | |
| 01562 | この | V1 |
| 01563 | このあいだ | |
| 01564 | このごろ | |
| 01565 | ごはん | |
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| 01568 | こぼれる | V1 |
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| 01570 | 細 | V1 |
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| 01572 | 困る | V1 |
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| 01577 | 混 | V1 |

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| 01632 | さあ | |
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| 01634 | 才 | V1 |
| 01635 | 栽 | V1 |
| 01636 | 材 | |
| 01637 | 財 | V1 |
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| 01671 | 魚 | V1 |
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| 01709 | 定 | V1 |
| 01710 | 定める | V1 |
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| 01712 | 冊 | |
| 01713 | 察 | |
| 01714 | 札 | V1 |
| 01715 | 雑 | V1 |
| 01716 | 撮影 | V1 |
| 01717 | 雑音 | |
| 01718 | 作家 | |
| 01719 | 雑貨 | |
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| 01721 | さっき | |
| 01722 | 作曲 | |
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| 01726 | 雑談 | V1 |
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| 01729 | 雑費 | |
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| 01733 | 砂漠 | V1 |
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| 01737 | さびる | V1 |
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| 01739 | サボる | V1 |
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| 01747 | 左右 | V1 |
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| 01750 | さよなら | V1 |
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| 01753 | 再来年 | V1 |
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| 01757 | 更に | |
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| 01759 | 猿 | |
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| 01761 | 騒ぐ | V1 |
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| 01763 | 障 | |
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| 01785 | 史 | V1 |
| 01786 | 四 | |
| 01787 | 士 | V1 |
| 01788 | 市 | |
| 01789 | 師 | |
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| 01793 | 詩 | V1 |
| 01794 | 誌 | |
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| 01796 | 児 | |
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| 01798 | 磁 | |
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| 01800 | 仕上げる | V1 |
| 01801 | しあさって | |
| 01802 | しあわせ | V1 |
| 01803 | シーディー | V1 |
| 01804 | 塩 | |
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| 01807 | 市外 | |
| 01808 | 紫外線 | |
| 01809 | しかく | |
| 01810 | 四角 | |
| 01811 | 資格 | V1 |
| 01812 | 四角い | |
| 01813 | 四角な | |
| 01814 | しかし | |
| 01815 | 仕方 | |
| 01816 | じかに | |
| 01817 | 直に | V1 |
| 01818 | 直 | |
| 01819 | しかも | |
| 01820 | じかん | |
| 01821 | 時間 | |
| 01822 | しき | |
| 01823 | 四季 | V1 |
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| 01825 | 識 | V1 |
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| 01831 | 事業 | V1 |
| 01832 | 仕切り | V1 |
| 01833 | 資金 | V1 |
| 01834 | 敷く | V1 |
| 01835 | 仕組 | V1 |
| 01836 | 刺激 | V1 |
| 01837 | しげる | V1 |
| 01838 | 茂る | |
| 01839 | 試験 | V1 |
| 01840 | 資源 | |
| 01841 | 事件 | |
| 01842 | じこ | V1 |
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| 01844 | 自己 | V1 |
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| 01868 | しずく | |
| 01869 | 沈む | V1 |
| 01870 | しずめる | |
| 01871 | 姿勢 | |
| 01872 | 施設 | |
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| 01874 | 自然に | V1 |
| 01875 | 思想 | V1 |
| 01876 | 子孫 | |
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| 01878 | 舌 | |
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| 01881 | したがう | V1 |
| 01882 | 従 | |
| 01883 | 従う | V1 |
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| 01887 | したく | |
| 01888 | 仕度 | |
| 01889 | 支度 | V1 |
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| 01891 | 七 | |
| 01892 | 質 | |
| 01893 | しっかり | |
| 01894 | 失業 | V1 |
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| 01930 | しばらく | V1 |
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| 01934 | 自分 | V1 |
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| 01947 | 地味 | |
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| 01950 | 染みる | V1 |
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| 01953 | 事務所 | V1 |
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| 02253 | すえ | |
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| 02255 | スカート | |
| 02256 | スカーフ | |
| 02257 | 姿 | |
| 02258 | すき | |
| 02259 | 好 | |
| 02260 | 好き | |
| 02261 | スキー | |
| 02262 | すきま | V1 |
| 02263 | すきやき | |
| 02264 | すぎる | V1 |
| 02265 | 過 | V1 |
| 02266 | 過ぎる | |
| 02267 | 空く | |
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| 02315 | 統 | V1 |
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| 02321 | 隅 | |
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| 02336 | 鋭い | |
| 02337 | するめ | |
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| 02348 | 制 | V1 |
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| 02635 | 大陸 | |
| 02636 | 大量 | |
| 02637 | たえる | |
| 02638 | 絶 | |
| 02639 | 耐 | V1 |
| 02640 | 耐える | V1 |
| 02641 | 倒 | V1 |
| 02642 | 倒す | V1 |
| 02643 | タオル | |
| 02644 | 倒れる | |
| 02645 | たかい | |
| 02646 | 高 | V1 |
| 02647 | 高い | |
| 02648 | 互い | |
| 02649 | 互いに | V1 |
| 02650 | 耕 | |
| 02651 | 耕す | V1 |
| 02652 | 宝 | V1 |
| 02653 | だから | V1 |
| 02654 | 滝 | V1 |
| 02655 | 炊 | V1 |
| 02656 | 炊く | |
| 02657 | 宅 | |
| 02658 | 抱く | V1 |
| 02659 | 類 | |
| 02660 | たくさん | |
| 02661 | タクシー | V1 |
| 02662 | 宅配 | |
| 02663 | 巧み | V1 |
| 02664 | たぐる | V1 |
| 02665 | たくわえる | V1 |
| 02666 | 蓄える | V1 |
| 02667 | たけ | V1 |
| 02668 | 竹 | |
| 02669 | たけのこ | V1 |
| 02670 | たしか | V1 |

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| 02671 | 確か | V1 |
| 02672 | 確 | |
| 02673 | 確かめる | V1 |
| 02674 | たしかめる | |
| 02675 | 多少 | V1 |
| 02676 | たす | |
| 02677 | 出 | V1 |
| 02678 | 出す | V1 |
| 02679 | 助 | V1 |
| 02680 | 助かる | |
| 02681 | 助ける | V1 |
| 02682 | 携 | |
| 02683 | たずねる | V1 |
| 02684 | 尋ねる | |
| 02685 | 唯 | V1 |
| 02686 | ただいま | |
| 02687 | 戦 | V1 |
| 02688 | 戦う | V1 |
| 02689 | 闘 | |
| 02690 | 但し | V1 |
| 02691 | 正 | |
| 02692 | 正しい | V1 |
| 02693 | 畳 | V1 |
| 02694 | 畳む | V1 |
| 02695 | たち | |
| 02696 | 立入禁止 | V1 |
| 02697 | 立場 | |
| 02698 | たちまち | |
| 02699 | たつ | |
| 02700 | 裁 | |
| 02701 | 立つ | V1 |
| 02702 | 竜 | |
| 02703 | 宅急便 | V1 |
| 02704 | 達 | |
| 02705 | 達する | V1 |
| 02706 | 貴 | |
| 02707 | 尊 | |
| 02708 | たっぷり | V1 |
| 02709 | 縦 | V1 |
| 02710 | 建物 | |
| 02711 | たてる | |
| 02712 | 建てる | |
| 02713 | 建 | V1 |
| 02714 | 立てる | |
| 02715 | 妥当 | V1 |
| 02716 | たとえ | |
| 02717 | たとえば | V1 |
| 02718 | たとえる | V1 |
| 02719 | 棚 | |
| 02720 | たなばた | V1 |
| 02721 | 谷 | V1 |
| 02722 | 他人 | |
| 02723 | たぬき | |
| 02724 | たね | V1 |
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| 02727 | 楽しむ | |
| 02728 | 頼む | V1 |
| 02729 | 束 | V1 |
| 02730 | たばこ | |
| 02731 | タバコ | V1 |
| 02732 | 足袋 | V1 |
| 02733 | 度 | |
| 02734 | 旅 | V1 |
| 02735 | たびたび | |
| 02736 | 多分 | |
| 02737 | 食べ物 | |
| 02738 | 食べる | |
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| 02740 | 球 | V1 |
| 02741 | 玉 | |
| 02742 | 弾 | |
| 02743 | たまご | |
| 02744 | 卵 | |
| 02745 | だます | V1 |
| 02746 | たまたま | V1 |
| 02747 | たまに | |
| 02748 | たまる | |
| 02749 | だまる | |
| 02750 | 黙る | |
| 02751 | 民 | |
| 02752 | ため | V1 |
| 02753 | 為 | V1 |
| 02754 | だめ | V1 |

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| 02755 | 駄目 | V1 |
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| 02757 | 試す | V1 |
| 02758 | ためる | |
| 02759 | 保つ | V1 |
| 02760 | たやすい | |
| 02761 | たより | |
| 02762 | 便り | V1 |
| 02763 | たよる | V1 |
| 02764 | 頼る | V1 |
| 02765 | たらす | |
| 02766 | 多量 | |
| 02767 | 足りる | |
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| 02771 | 俵 | V1 |
| 02772 | 単 | |
| 02773 | 誕 | V1 |
| 02774 | 団 | |
| 02775 | 段 | |
| 02776 | 談 | |
| 02777 | 単位 | V1 |
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| 02779 | 単価 | V1 |
| 02780 | 担架 | |
| 02781 | 短歌 | V1 |
| 02782 | 段階 | V1 |
| 02783 | たんき | V1 |
| 02784 | 短期 | |
| 02785 | 短気 | V1 |
| 02786 | 単語 | |
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| 02792 | 誕生日 | |
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| 02794 | ダンス | V1 |
| 02795 | 男性 | V1 |
| 02796 | 団体 | V1 |
| 02797 | だんだん | |
| 02798 | 担当 | |
| 02799 | たんぼ | |
| 02800 | 暖房 | |
| 02801 | ち | |
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| 02803 | 地 | |
| 02804 | 小 | |
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| 02806 | 小さな | V1 |
| 02807 | チーズ | V1 |
| 02808 | 知恵 | |
| 02809 | 地下 | V1 |
| 02810 | 近 | |
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| 02813 | 違い | |
| 02814 | 違う | V1 |
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| 02817 | 近づく | |
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| 02820 | 近寄る | |
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| 02822 | 地球 | V1 |
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| 02824 | 遅刻 | |
| 02825 | 知識 | |
| 02826 | 地図 | V1 |
| 02827 | 乳 | |
| 02828 | 父 | |
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| 02830 | ちぢまる | |
| 02831 | 縮 | |
| 02832 | ちぢむ | V1 |
| 02833 | 縮む | |
| 02834 | ちぢめる | V1 |
| 02835 | 縮める | |
| 02836 | ちっとも | |
| 02837 | 地方 | |
| 02838 | ちゃ | |

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02843 ちゅう
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02849 中央 V1
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02886 ちょっと V1
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02889 散
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02891 賃
02892 賃金
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02894 ついたち V1
02895 一日
02896 ついて V1
02897 ついで
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02913 仕 V1
02914 つかまえる V1
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02916 つかむ V1
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02918 月 V1
02919 つぎ
02920 次 V1
02921 付き合う
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| 02926 | つく | |
| 02927 | 就 | |
| 02928 | 就く | |
| 02929 | 着く | |
| 02930 | 点く | |
| 02931 | 突く | V1 |
| 02932 | 付く | V1 |
| 02933 | つぐ | |
| 02934 | 接 | |
| 02935 | 机 | V1 |
| 02936 | 尽くす | |
| 02937 | 勇 | |
| 02938 | つくる | |
| 02939 | 作 | |
| 02940 | 作る | |
| 02941 | 造 | V1 |
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| 02943 | つけもの | |
| 02944 | 漬物 | |
| 02945 | つける | V1 |
| 02946 | 着ける | |
| 02947 | 付ける | |
| 02948 | 告 | |
| 02949 | つごう | |
| 02950 | 都合 | V1 |
| 02951 | 伝 | |
| 02952 | 伝える | V1 |
| 02953 | 伝わる | |
| 02954 | 土 | |
| 02955 | 筒 | V1 |
| 02956 | 続 | |
| 02957 | 続き | V1 |
| 02958 | つづく | V1 |
| 02959 | 続く | |
| 02960 | 続ける | V1 |
| 02961 | つつしむ | |
| 02962 | 謹む | V1 |
| 02963 | 包む | |
| 02964 | 勤 | V1 |
| 02965 | 勤め | V1 |
| 02966 | つとめる | |
| 02967 | 勤める | |
| 02968 | 努 | |
| 02969 | つな | V1 |
| 02970 | つなぐ | V1 |
| 02971 | 津波 | |
| 02972 | つね | V1 |
| 02973 | 常 | |
| 02974 | 常に | |
| 02975 | つばさ | |
| 02976 | 粒 | V1 |
| 02977 | つぶす | V1 |
| 02978 | つぶれる | V1 |
| 02979 | つぼみ | |
| 02980 | 妻 | |
| 02981 | つまずく | V1 |
| 02982 | つまみ | V1 |
| 02983 | つまむ | |
| 02984 | つまらない | V1 |
| 02985 | つまり | V1 |
| 02986 | つまる | V1 |
| 02987 | 詰まる | |
| 02988 | 罪 | |
| 02989 | つむ | |
| 02990 | 積 | |
| 02991 | 積む | |
| 02992 | つめ | |
| 02993 | 冷たい | |
| 02994 | 詰める | V1 |
| 02995 | つもり | V1 |
| 02996 | 積もる | |
| 02997 | つや | |
| 02998 | 梅雨 | |
| 02999 | 強 | V1 |
| 03000 | 強い | |
| 03001 | つらい | V1 |
| 03002 | 釣 | |
| 03003 | つり合い | V1 |
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| 03005 | 連れる | |
| 03006 | 手 | |

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| 03008 | 手当 | V1 |
| 03009 | 手洗い | V1 |
| 03010 | てい | |
| 03011 | 停 | V1 |
| 03012 | 訂 | |
| 03013 | ていか | |
| 03014 | 低下 | |
| 03015 | 定価 | |
| 03016 | 定期 | V1 |
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| 03019 | 停止 | |
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| 03024 | 停電 | |
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| 03032 | 出掛ける | |
| 03033 | 手紙 | |
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| 03035 | 適 | V1 |
| 03036 | 適当 | |
| 03037 | できる | |
| 03038 | 出来る | V1 |
| 03039 | 出口 | |
| 03040 | てこ | V1 |
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| 03042 | 手順 | |
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| 03044 | ですから | |
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| 03046 | 徹 | V1 |
| 03047 | 鉄 | |
| 03048 | 哲学 | |
| 03049 | 鉄橋 | |
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| 03052 | 徹底 | |
| 03053 | 鉄道 | |
| 03054 | 鉄砲 | |
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| 03056 | 手荷物 | V1 |
| 03057 | 手拭 | V1 |
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| 03059 | デパート | V1 |
| 03060 | 手配 | V1 |
| 03061 | 手袋 | V1 |
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| 03066 | でも | |
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| 03076 | 典 | V1 |
| 03077 | 天 | V1 |
| 03078 | 展 | V1 |
| 03079 | 点 | |
| 03080 | 電 | V1 |
| 03081 | 店員 | V1 |
| 03082 | 天気 | V1 |
| 03083 | 電気 | |
| 03084 | 点検 | V1 |
| 03085 | 電源 | |
| 03086 | 天国 | V1 |
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| 03088 | 天使 | |
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| 03092 | 点数 | |
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| 03094 | 電卓 | V1 |
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| 03099 | 伝統 | |
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| 03101 | 天然 | |
| 03102 | 天皇 | |
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| 03104 | てんぷら | |
| 03105 | 電報 | V1 |
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| 03108 | 電話 | V1 |
| 03109 | と | |
| 03110 | 戸 | |
| 03111 | 徒 | V1 |
| 03112 | ドア | |
| 03113 | 問い | |
| 03114 | トイレ | V1 |
| 03115 | とう | V1 |
| 03116 | 党 | V1 |
| 03117 | 塔 | |
| 03118 | 糖 | V1 |
| 03119 | 騰 | V1 |
| 03120 | 問う | |
| 03121 | どう | V1 |
| 03122 | 堂 | |
| 03123 | 銅 | V1 |
| 03124 | どういたしまして | |
| 03125 | 統一 | |
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| 03129 | 陶器 | V1 |
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| 03132 | 動作 | |
| 03133 | 東西 | V1 |
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| 03136 | どうして | |
| 03137 | どうしても | V1 |
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| 03168 | 通り | |
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| 03177 | とく | |
| 03178 | 解く | |
| 03179 | 解 | |
| 03180 | 説 | |
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| 03182 | 得 | |
| 03183 | 徳 | V1 |
| 03184 | 研 | |
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| 03187 | 読書 | |
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| 03196 | とげ | V1 |
| 03197 | 時計 | V1 |
| 03198 | とける | V1 |
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| 03200 | 退ける | V1 |
| 03201 | 退 | |
| 03202 | どこ | V1 |
| 03203 | どこか | V1 |
| 03204 | 床屋 | |
| 03205 | ところ | |
| 03206 | 所 | |
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| 03209 | ところどころ | V1 |
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| 03214 | 図書館 | V1 |
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| 03219 | とたんに | V1 |
| 03220 | とち | V1 |
| 03221 | 土地 | |
| 03222 | とちゅう | |
| 03223 | 途中 | |
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| 03225 | 読解 | V1 |
| 03226 | 特急 | V1 |
| 03227 | 特許 | |
| 03228 | とつぜん | V1 |
| 03229 | 突然 | |
| 03230 | どっち | |
| 03231 | とても | |
| 03232 | 届 | V1 |
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| 03234 | 届ける | |
| 03235 | ととのう | V1 |
| 03236 | 整 | V1 |
| 03237 | 整う | V1 |
| 03238 | ととのえる | |
| 03239 | 整える | |
| 03240 | 唱 | |
| 03241 | どなた | V1 |
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| 03259 | 止める | |
| 03260 | とも | |
| 03261 | 友 | V1 |
| 03262 | ともかく | |
| 03263 | 友達 | V1 |
| 03264 | 共 | V1 |
| 03265 | 共に | |
| 03266 | 共働き | V1 |
| 03267 | ドライブ | V1 |
| 03268 | とらえる | |
| 03269 | 捕らえる | |
| 03270 | トランジスター | |
| 03271 | トランプ | V1 |
| 03272 | 鳥 | V1 |
| 03273 | とりあげる | |
| 03274 | とりあつかい | |
| 03275 | 取り扱う | V1 |
| 03276 | 取り換える | |
| 03277 | 取り替える | V1 |
| 03278 | 取り消す | |
| 03279 | 取消 | |
| 03280 | 取り込む | |
| 03281 | とりつぎ | |
| 03282 | とりつぐ | |
| 03283 | 取引 | |
| 03284 | 塗料 | V1 |
| 03285 | 努力 | |
| 03286 | とる | V1 |
| 03287 | 取る | |
| 03288 | 採 | V1 |
| 03289 | 採る | |
| 03290 | 撮 | V1 |
| 03291 | 取 | V1 |
| 03292 | ドル | V1 |
| 03293 | どれ | |
| 03294 | とれる | V1 |
| 03295 | 取れる | |
| 03296 | 泥 | |
| 03297 | 泥棒 | |
| 03298 | トン | V1 |
| 03299 | とんでもない | V1 |
| 03300 | どんどん | |
| 03301 | どんな | V1 |
| 03302 | トンネル | |
| 03303 | 問屋 | V1 |
| 03304 | 菜 | V1 |
| 03305 | 名 | |
| 03306 | なあ | |
| 03307 | ない | V1 |
| 03308 | 内科 | |
| 03309 | 内閣 | V1 |
| 03310 | ナイフ | V1 |
| 03311 | 内容 | V1 |
| 03312 | ナイロン | V1 |
| 03313 | なお | V1 |
| 03314 | 尚 | |
| 03315 | なおす | |
| 03316 | 治 | |
| 03317 | 治す | V1 |
| 03318 | 直す | |
| 03319 | なおる | |
| 03320 | 治る | V1 |
| 03321 | 直る | |
| 03322 | なか | |
| 03323 | 中 | |
| 03324 | 仲 | |
| 03325 | 永 | V1 |
| 03326 | 長 | |
| 03327 | 長い | |
| 03328 | 長さ | V1 |
| 03329 | 流す | |
| 03330 | なかなか | |
| 03331 | 半 | |
| 03332 | 仲間 | V1 |
| 03333 | 眺める | V1 |
| 03334 | 流れ | |
| 03335 | 流れる | |
| 03336 | なく | |
| 03337 | 泣く | |
| 03338 | 泣 | |
| 03339 | 慰める | |
| 03340 | なくす | |
| 03341 | 無くす | V1 |
| 03342 | なくなる | V1 |

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| 03343 | 無くなる | |
| 03344 | 投 | |
| 03345 | 投げる | V1 |
| 03346 | 仲人 | |
| 03347 | 名残 | |
| 03348 | 情 | |
| 03349 | なさる | V1 |
| 03350 | 茄子 | |
| 03351 | なぜ | |
| 03352 | なぞ | V1 |
| 03353 | 名高い | V1 |
| 03354 | 雪崩 | |
| 03355 | 夏 | V1 |
| 03356 | 納豆 | |
| 03357 | 七つ | V1 |
| 03358 | ななめ | V1 |
| 03359 | 斜め | |
| 03360 | 何 | V1 |
| 03361 | なのか | V1 |
| 03363 | 七日 | |
| 03364 | なべ | V1 |
| 03365 | なま | |
| 03366 | 生 | |
| 03367 | 名前 | V1 |
| 03368 | 怠ける | V1 |
| 03369 | 鉛 | V1 |
| 03370 | 波 | |
| 03371 | 並木 | V1 |
| 03372 | 涙 | V1 |
| 03373 | なめらか | |
| 03374 | 習 | |
| 03375 | 習う | |
| 03376 | 並ぶ | V1 |
| 03377 | なる | V1 |
| 03378 | 成 | V1 |
| 03379 | 成る | V1 |
| 03380 | 鳴る | V1 |
| 03381 | なるべく | V1 |
| 03382 | なるほど | |
| 03383 | 慣れる | V1 |
| 03384 | なれる | |
| 03385 | 慣 | V1 |
| 03386 | なわ | V1 |
| 03387 | なわとび | |
| 03388 | 何でも | |
| 03389 | なんでも | |
| 03390 | 荷 | V1 |
| 03391 | 二 | |
| 03392 | 似合う | V1 |
| 03393 | にいさん | |
| 03394 | 兄さん | |
| 03395 | ニーズ | |
| 03396 | におい | V1 |
| 03397 | におう | V1 |
| 03398 | にがい | V1 |
| 03399 | 苦い | V1 |
| 03400 | 逃がす | |
| 03401 | 二月 | |
| 03402 | にぎやか | |
| 03403 | にぎり | |
| 03404 | 握 | |
| 03405 | 握る | |
| 03406 | 肉 | |
| 03407 | にくい | V1 |
| 03408 | 憎い | V1 |
| 03409 | 憎む | |
| 03410 | 逃げる | |
| 03411 | にこにこ | V1 |
| 03412 | 濁る | V1 |
| 03413 | 西 | |
| 03414 | 二乗 | |
| 03415 | ニス | V1 |
| 03416 | にせ | |
| 03417 | 日曜日 | |
| 03418 | 日用品 | |
| 03419 | 日記 | |
| 03420 | 荷造り | |
| 03421 | 日光 | |
| 03422 | 日本 | |
| 03423 | 荷札 | V1 |
| 03424 | 日本語 | |
| 03425 | にほんじん | |
| 03426 | 日本人 | |
| 03427 | 荷物 | |

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| 03428 | 入院 | |
| 03429 | 入学 | |
| 03430 | ニュース | V1 |
| 03431 | 似 | |
| 03432 | 似る | V1 |
| 03433 | 煮る | V1 |
| 03434 | にわ | |
| 03435 | 庭 | V1 |
| 03436 | にわとり | V1 |
| 03437 | 鶏 | |
| 03438 | 人気 | |
| 03439 | 人形 | V1 |
| 03440 | 人間 | |
| 03441 | 人情 | |
| 03442 | 人参 | |
| 03443 | 人数 | |
| 03444 | 縫う | V1 |
| 03445 | 抜く | V1 |
| 03446 | ぬぐ | V1 |
| 03447 | 脱 | |
| 03448 | 脱ぐ | |
| 03449 | 盗 | |
| 03450 | 盗む | V1 |
| 03451 | 布 | |
| 03452 | ぬらす | |
| 03453 | 塗る | V1 |
| 03454 | ぬるい | V1 |
| 03455 | 根 | |
| 03456 | ねえさん | V1 |
| 03457 | 姉さん | |
| 03458 | 願 | |
| 03459 | 願い | |
| 03460 | 願う | |
| 03461 | ねぎ | |
| 03462 | ネクタイ | |
| 03463 | 猫 | V1 |
| 03464 | ねじ | V1 |
| 03465 | ねじる | |
| 03466 | ねずみ | V1 |
| 03467 | ねだん | |
| 03468 | 値段 | |
| 03469 | ねつ | |
| 03470 | 熱 | V1 |
| 03471 | 熱心 | |
| 03472 | 熱する | |
| 03473 | 熱帯 | V1 |
| 03474 | 熱湯 | V1 |
| 03475 | 寝床 | V1 |
| 03476 | ねばり | V1 |
| 03477 | ねばる | V1 |
| 03478 | ねぼう | |
| 03479 | ねむい | |
| 03480 | 眠い | V1 |
| 03481 | ねむる | V1 |
| 03482 | 眠る | V1 |
| 03483 | ねらい | V1 |
| 03484 | ねる | |
| 03485 | 寝 | V1 |
| 03486 | 寝る | V1 |
| 03487 | 念 | |
| 03488 | 粘土 | |
| 03489 | 燃料 | V1 |
| 03490 | 年齢 | |
| 03491 | の | V1 |
| 03492 | 野 | V1 |
| 03493 | 能 | |
| 03494 | 脳 | |
| 03495 | 農 | |
| 03496 | 農家 | |
| 03497 | 農業 | |
| 03498 | 農民 | |
| 03499 | 能率 | V1 |
| 03500 | 能力 | |
| 03501 | ノート | V1 |
| 03502 | 軒 | |
| 03503 | のく | |
| 03504 | のこぎり | V1 |
| 03505 | 残 | |
| 03506 | 残す | V1 |
| 03507 | 残り | |
| 03508 | 残る | V1 |
| 03509 | 載 | V1 |
| 03510 | 乗 | V1 |
| 03511 | 乗せる | |

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| 03512 | 除 | |
| 03513 | 除く | |
| 03514 | 望む | |
| 03515 | のち | |
| 03516 | ノック | V1 |
| 03517 | のど | |
| 03518 | のばす | |
| 03519 | 延ばす | |
| 03520 | 延 | |
| 03521 | 野原 | |
| 03522 | 延びる | V1 |
| 03523 | のびる | |
| 03524 | 伸びる | |
| 03525 | 述 | |
| 03526 | のぼり | |
| 03527 | 上り | |
| 03528 | のぼる | |
| 03529 | 昇 | |
| 03530 | 上る | |
| 03531 | 登 | |
| 03532 | のみ | |
| 03533 | 飲み物 | V1 |
| 03534 | 飲む | |
| 03535 | 飲 | |
| 03536 | 海苔 | |
| 03537 | 乗り換え | |
| 03538 | 乗り換える | V1 |
| 03539 | 乗り物 | |
| 03540 | 乗物 | |
| 03541 | 乗る | |
| 03542 | のろい | V1 |
| 03543 | 鈍い | |
| 03544 | のんき | V1 |
| 03545 | は | |
| 03546 | 歯 | V1 |
| 03547 | 刃 | |
| 03548 | 派 | V1 |
| 03549 | 葉 | V1 |
| 03550 | 場 | V1 |
| 03551 | 場合 | V1 |
| 03552 | ばあさん | |
| 03553 | パーセント | V1 |
| 03554 | パーマ | V1 |
| 03555 | はい | V1 |
| 03556 | 灰 | |
| 03557 | 俳 | V1 |
| 03558 | 排 | |
| 03559 | 肺 | V1 |
| 03560 | 倍 | V1 |
| 03561 | ばいきん | |
| 03562 | 俳句 | V1 |
| 03563 | 灰皿 | V1 |
| 03564 | 廃止 | |
| 03565 | 配達 | |
| 03566 | 売買 | |
| 03567 | パイプ | V1 |
| 03568 | 敗北 | V1 |
| 03569 | 俳優 | |
| 03570 | はいる | V1 |
| 03571 | 入る | V1 |
| 03572 | はう | V1 |
| 03573 | はえる | |
| 03574 | 生える | |
| 03575 | 羽織 | |
| 03576 | 墓 | V1 |
| 03577 | ばか | V1 |
| 03578 | 馬鹿 | V1 |
| 03579 | 破壊 | V1 |
| 03580 | はがき | V1 |
| 03581 | 博士 | |
| 03582 | 鋼 | V1 |
| 03583 | はかり | V1 |
| 03584 | はかる | |
| 03585 | 計 | V1 |
| 03586 | 計る | |
| 03587 | 測 | |
| 03588 | 謀る | |
| 03589 | 量る | |
| 03590 | はく | |
| 03591 | 掃 | V1 |
| 03592 | 掃く | |
| 03593 | 吐 | V1 |
| 03594 | 吐く | V1 |
| 03595 | 博 | |

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| 03596 | 拍 | V1 |
| 03597 | 履く | |
| 03598 | 拍手 | V1 |
| 03599 | 爆発 | V1 |
| 03600 | 博物館 | |
| 03601 | はげしい | V1 |
| 03602 | 激しい | |
| 03603 | 激 | |
| 03604 | バケツ | |
| 03605 | 励ます | V1 |
| 03606 | 励む | V1 |
| 03607 | 化 | V1 |
| 03608 | 化ける | |
| 03609 | 箱 | V1 |
| 03610 | はこぶ | V1 |
| 03611 | 運ぶ | |
| 03612 | はさみ | V1 |
| 03613 | はさむ | V1 |
| 03614 | 橋 | V1 |
| 03615 | 端 | V1 |
| 03616 | 恥 | |
| 03617 | はしご | V1 |
| 03618 | 始 | V1 |
| 03619 | 始まる | |
| 03620 | はじめ | V1 |
| 03621 | 初め | |
| 03622 | 始め | |
| 03623 | 初 | V1 |
| 03624 | はじめて | |
| 03625 | 初めて | V1 |
| 03626 | 始めて | |
| 03627 | 始める | |
| 03628 | 場所 | V1 |
| 03629 | 柱 | |
| 03630 | はしる | |
| 03631 | 走 | |
| 03632 | 走る | |
| 03633 | 恥じる | V1 |
| 03634 | はず | |
| 03635 | バス | V1 |
| 03636 | 恥ずかしい | V1 |
| 03637 | バスケット | V1 |
| 03638 | はずす | |
| 03639 | 外す | |
| 03640 | バス停 | V1 |
| 03641 | パスポート | |
| 03642 | 外れる | |
| 03643 | パソコン | |
| 03644 | はた | |
| 03645 | 旗 | V1 |
| 03646 | 機 | |
| 03647 | はだ | V1 |
| 03648 | バター | V1 |
| 03649 | はだか | |
| 03650 | 裸 | |
| 03651 | はたけ | |
| 03652 | 畑 | |
| 03653 | はだし | V1 |
| 03654 | 果 | |
| 03655 | はたち | V1 |
| 03656 | 二十 | |
| 03657 | 働 | V1 |
| 03658 | 働き | |
| 03659 | 働く | |
| 03660 | 八 | V1 |
| 03661 | 鉢 | |
| 03662 | 八月 | |
| 03663 | 発 | V1 |
| 03664 | 伐 | V1 |
| 03665 | 罰 | |
| 03666 | 発音 | V1 |
| 03667 | 二十日 | |
| 03668 | はっきり | |
| 03669 | 発見 | V1 |
| 03670 | 発行 | V1 |
| 03671 | 発達 | V1 |
| 03672 | 発展 | |
| 03673 | 発表 | |
| 03674 | 発明 | V1 |
| 03675 | 派手 | V1 |
| 03676 | 波止場 | |
| 03677 | はな | |
| 03678 | 花 | |
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| 03680 | 話 | |
| 03681 | はなす | |
| 03682 | 放す | |
| 03683 | 離す | V1 |
| 03684 | 話す | V1 |
| 03685 | バナナ | V1 |
| 03686 | 花見 | V1 |
| 03687 | はなれる | |
| 03688 | 放れる | |
| 03689 | 離れる | |
| 03690 | はね | V1 |
| 03691 | 羽 | V1 |
| 03692 | ばね | |
| 03693 | はねる | |
| 03694 | 母 | V1 |
| 03695 | 幅 | |
| 03696 | 省 | V1 |
| 03697 | 省く | |
| 03698 | 浜 | V1 |
| 03699 | 浜辺 | V1 |
| 03700 | はめる | V1 |
| 03701 | はやい | |
| 03702 | 早 | |
| 03703 | 早い | |
| 03704 | 速 | |
| 03705 | 林 | V1 |
| 03706 | 早引き | V1 |
| 03707 | はやる | |
| 03708 | 流行る | V1 |
| 03709 | 原 | V1 |
| 03710 | 腹 | |
| 03711 | ばら | |
| 03712 | はらう | |
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| 03714 | 針 | |
| 03715 | 針金 | |
| 03716 | はる | |
| 03717 | 春 | V1 |
| 03718 | 張 | |
| 03719 | 張る | V1 |
| 03720 | はるか | V1 |
| 03721 | はるばる | |
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| 03723 | 晴れ | V1 |
| 03724 | バレエ | |
| 03725 | バレーボール | V1 |
| 03726 | 晴れる | |
| 03727 | 判 | V1 |
| 03728 | 版 | |
| 03729 | 班 | V1 |
| 03730 | 販 | |
| 03731 | 晩 | |
| 03732 | 番 | V1 |
| 03733 | パン | |
| 03734 | 範囲 | V1 |
| 03735 | 反映 | V1 |
| 03736 | ハンガー | V1 |
| 03737 | ハンカチ | |
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| 03739 | 番組 | |
| 03740 | ばんごう | |
| 03741 | 番号 | V1 |
| 03742 | 犯罪 | V1 |
| 03743 | 万歳 | |
| 03744 | ハンサム | V1 |
| 03745 | 反射 | V1 |
| 03746 | 反省 | V1 |
| 03747 | パンダ | V1 |
| 03748 | はんたい | V1 |
| 03749 | 反対 | |
| 03750 | 判断 | |
| 03751 | 番地 | |
| 03752 | 半年 | |
| 03753 | ハンドバッグ | |
| 03754 | ハンドブック | |
| 03755 | ハンドル | V1 |
| 03756 | 犯人 | V1 |
| 03757 | 反応 | |
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| 03760 | ひ | |
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| 03764 | 批 | V1 |
| 03765 | 罷 | |
| 03766 | 避 | |
| 03767 | 非 | V1 |
| 03768 | 飛 | |
| 03769 | 備 | |
| 03770 | 美 | |
| 03771 | ピアノ | V1 |
| 03772 | ビール | V1 |
| 03773 | 冷える | V1 |
| 03774 | 被害 | V1 |
| 03775 | 比較 | |
| 03776 | 東 | V1 |
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| 03778 | 光 | |
| 03779 | 光る | V1 |
| 03780 | 彼岸 | V1 |
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| 03782 | 引き受ける | |
| 03783 | ひきだし | V1 |
| 03784 | ひく | V1 |
| 03785 | 引 | V1 |
| 03786 | 引く | |
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| 03788 | 低 | |
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| 03791 | ひげ | |
| 03792 | 悲劇 | |
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| 03802 | 避暑 | |
| 03803 | 非常 | V1 |
| 03804 | ひたい | |
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| 03806 | ひたす | |
| 03807 | 浸 | V1 |
| 03808 | 左 | |
| 03809 | 必 | |
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| 03818 | ぴったり | |
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| 03822 | 必要 | V1 |
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| 03825 | 人 | |
| 03826 | ひどい | |
| 03827 | 人柄 | V1 |
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| 03829 | 等しい | V1 |
| 03830 | 一つ | V1 |
| 03831 | ひとり | |
| 03832 | 一人 | V1 |
| 03833 | 独 | |
| 03834 | ひなまつり | |
| 03835 | ビニール | |
| 03836 | ひねる | |
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| 03839 | ひびく | |
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| 03843 | 皮膚 | |
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| 04197 | ほん | |
| 04198 | 本 | |
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| 04201 | 本線 | |
| 04202 | 本棚 | |
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| 04478 | 目上 | |
| 04479 | メートル | V1 |
| 04480 | 目方 | |
| 04481 | めがね | V1 |
| 04482 | 眼鏡 | V1 |
| 04483 | 恵む | V1 |
| 04484 | めし | |
| 04485 | 飯 | |
| 04486 | 召し上がる | V1 |
| 04487 | 目下 | |
| 04488 | 雌 | |
| 04489 | 珍しい | |
| 04490 | 目立つ | V1 |
| 04491 | めちゃくちゃ | V1 |
| 04492 | 滅 | |
| 04493 | めった | V1 |
| 04494 | めでたい | |
| 04495 | 目盛り | V1 |
| 04496 | メリヤス | V1 |
| 04497 | メロン | |
| 04498 | 免 | |
| 04499 | 面 | |
| 04500 | 面会 | V1 |
| 04501 | 免税 | V1 |
| 04502 | 面積 | V1 |
| 04503 | 面倒 | |
| 04504 | 模 | |
| 04505 | もう | V1 |
| 04506 | もうけ | V1 |
| 04507 | もうける | |
| 04508 | 設 | |
| 04509 | 設ける | V1 |
| 04510 | 申し込む | |
| 04511 | 申 | |
| 04512 | 申す | V1 |
| 04513 | 毛布 | |
| 04514 | 燃 | |
| 04515 | 燃える | |
| 04516 | モーター | |
| 04517 | 目的 | V1 |
| 04518 | 目標 | V1 |
| 04519 | 木曜日 | |

| | | |
|---|---|---|
| 04520 | もぐる | V1 |
| 04521 | 潜 | |
| 04522 | 潜る | |
| 04523 | 目録 | |
| 04524 | 模型 | V1 |
| 04525 | もし | |
| 04526 | 文字 | |
| 04527 | もしもし | |
| 04528 | もたらす | |
| 04529 | もたれる | V1 |
| 04530 | 用いる | |
| 04531 | もちもの | |
| 04532 | 勿論 | |
| 04533 | もつ | |
| 04534 | 持 | |
| 04535 | 持つ | |
| 04536 | もったいない | V1 |
| 04537 | もっていく | |
| 04538 | もってくる | |
| 04539 | もっと | |
| 04540 | もっとも | |
| 04541 | 最も | |
| 04542 | 最 | V1 |
| 04543 | もっぱら | |
| 04544 | 専 | |
| 04545 | 専ら | V1 |
| 04546 | もつれる | V1 |
| 04547 | もてなす | V1 |
| 04548 | モデル | |
| 04549 | もと | |
| 04550 | 元 | |
| 04551 | 戻す | |
| 04552 | 基 | V1 |
| 04553 | 基づく | V1 |
| 04554 | もとめる | |
| 04555 | 求 | |
| 04556 | 求める | |
| 04557 | 戻る | |
| 04558 | もの | |
| 04559 | 者 | |
| 04560 | 物 | |
| 04561 | 物語 | V1 |
| 04562 | 物事 | |
| 04563 | 物差し | |
| 04564 | 物干し | |
| 04565 | 模範 | V1 |
| 04566 | もみじ | |
| 04567 | もむ | V1 |
| 04568 | もめる | |
| 04569 | 木綿 | |
| 04570 | 桃 | |
| 04571 | 桃色 | V1 |
| 04572 | もや | |
| 04573 | 燃やす | V1 |
| 04574 | 模様 | V1 |
| 04575 | 催し | V1 |
| 04576 | 催 | |
| 04577 | もらう | |
| 04578 | 森 | V1 |
| 04579 | 漏る | |
| 04580 | 盛る | |
| 04581 | もれる | |
| 04582 | 漏れる | |
| 04583 | もろい | V1 |
| 04584 | 問 | |
| 04585 | 門 | V1 |
| 04586 | 問題 | |
| 04587 | 問答 | V1 |
| 04588 | や | |
| 04589 | 屋 | |
| 04590 | 矢 | |
| 04591 | やあ | |
| 04592 | 八百屋 | |
| 04593 | やがて | |
| 04594 | やかましい | |
| 04595 | やかん | |
| 04596 | 野球 | |
| 04597 | 夜勤 | |
| 04598 | やく | V1 |
| 04599 | 焼 | |
| 04600 | 焼く | |
| 04601 | 役 | |
| 04602 | 約 | V1 |
| 04603 | やくざ | |

| | | |
|---|---|---|
| 04604 | 薬剤師 | V1 |
| 04605 | 役所 | |
| 04606 | 訳す | V1 |
| 04607 | 約束 | |
| 04608 | 役割 | |
| 04609 | 焼ける | V1 |
| 04610 | 野菜 | V1 |
| 04611 | 易しい | V1 |
| 04612 | 易 | |
| 04613 | 優しい | |
| 04614 | 養う | V1 |
| 04615 | 社 | V1 |
| 04616 | やすい | |
| 04617 | 安 | |
| 04618 | 安い | |
| 04619 | 休 | V1 |
| 04620 | 休み | |
| 04621 | やすむ | V1 |
| 04622 | 休む | |
| 04623 | 安物 | |
| 04624 | やすり | |
| 04625 | やせる | |
| 04626 | 家賃 | |
| 04627 | 厄介 | V1 |
| 04628 | 薬局 | V1 |
| 04629 | 八つ | |
| 04630 | やってくる | V1 |
| 04631 | やっと | V1 |
| 04632 | やっぱり | |
| 04633 | 宿 | |
| 04634 | やとう | |
| 04635 | 雇う | |
| 04636 | 宿屋 | V1 |
| 04637 | 家主 | |
| 04638 | 屋根 | |
| 04639 | やはり | |
| 04640 | 破 | |
| 04641 | 破る | |
| 04642 | 破れる | V1 |
| 04643 | 敗 | |
| 04644 | 山 | V1 |
| 04645 | 病 | V1 |
| 04646 | 止む | V1 |
| 04647 | やむをえず | |
| 04648 | やめる | V1 |
| 04649 | 辞 | |
| 04650 | やや | |
| 04651 | やりなおす | |
| 04652 | やる | V1 |
| 04653 | やわらかい | V1 |
| 04654 | 柔らかい | V1 |
| 04655 | 湯 | |
| 04656 | 輸 | V1 |
| 04657 | 豊 | V1 |
| 04658 | 優 | V1 |
| 04659 | 有 | V1 |
| 04660 | 由 | V1 |
| 04661 | 遊 | V1 |
| 04662 | 郵 | V1 |
| 04663 | 夕 | V1 |
| 04664 | ゆううつ | |
| 04665 | 有益 | V1 |
| 04666 | 有害 | |
| 04667 | 夕方 | V1 |
| 04668 | 勇敢 | V1 |
| 04669 | 勇気 | |
| 04670 | 友好 | |
| 04671 | 有効 | V1 |
| 04672 | 優秀 | V1 |
| 04673 | 優勝 | V1 |
| 04674 | 友情 | V1 |
| 04675 | 夕食 | V1 |
| 04676 | 友人 | V1 |
| 04677 | 夕立 | |
| 04678 | 郵便 | V1 |
| 04679 | 郵便局 | |
| 04680 | 裕福 | |
| 04681 | ゆうべ | |
| 04682 | 夕べ | V1 |
| 04683 | 有名 | V1 |
| 04684 | 夕焼け | |
| 04685 | 猶予 | |
| 04686 | 有利 | |
| 04687 | 有料 | V1 |

| | | |
|---|---|---|
| 04688 | 有力 | V1 |
| 04689 | 故 | V1 |
| 04690 | ゆか | |
| 04691 | 床 | |
| 04692 | 愉快 | |
| 04693 | ゆかた | V1 |
| 04694 | 雪 | V1 |
| 04695 | 湯気 | |
| 04696 | 輸血 | |
| 04697 | 輸出 | |
| 04698 | ゆすぐ | |
| 04699 | ゆずる | |
| 04700 | 譲 | V1 |
| 04701 | 譲る | |
| 04702 | 輸送 | V1 |
| 04703 | 豊か | V1 |
| 04704 | 油断 | |
| 04705 | ゆっくり | |
| 04706 | ゆとり | |
| 04707 | 輸入 | |
| 04708 | 指 | V1 |
| 04709 | 指輪 | |
| 04710 | 弓 | |
| 04711 | 夢 | |
| 04712 | ゆるい | |
| 04713 | 緩い | |
| 04714 | 許 | V1 |
| 04715 | 許す | V1 |
| 04716 | ゆるむ | V1 |
| 04717 | 緩む | |
| 04718 | ゆるめる | |
| 04719 | 緩める | |
| 04720 | ゆれる | V1 |
| 04721 | 揺れる | |
| 04722 | よ | V1 |
| 04723 | 予 | |
| 04724 | 誉 | V1 |
| 04725 | 預 | |
| 04726 | 夜明け | V1 |
| 04727 | よい | |
| 04728 | 善 | |
| 04729 | よう | V1 |
| 04730 | 酔う | V1 |
| 04731 | 幼 | |
| 04732 | 容 | |
| 04733 | 曜 | |
| 04734 | 様 | |
| 04735 | 洋 | |
| 04736 | 溶 | |
| 04737 | 用 | |
| 04738 | 要 | |
| 04739 | 陽 | V1 |
| 04740 | 養 | |
| 04741 | ようい | |
| 04742 | 容易 | V1 |
| 04743 | 用意 | V1 |
| 04744 | 八日 | |
| 04745 | ようき | V1 |
| 04746 | 容器 | V1 |
| 04747 | 陽気 | |
| 04748 | ようきゅう | V1 |
| 04749 | 要求 | V1 |
| 04750 | 用具 | |
| 04751 | 用語 | |
| 04752 | 洋裁 | |
| 04753 | 用事 | |
| 04754 | 用心 | |
| 04755 | 様子 | |
| 04756 | 要素 | V1 |
| 04757 | 幼稚 | |
| 04758 | 幼稚園 | |
| 04759 | 要点 | |
| 04760 | 用途 | |
| 04761 | 洋服 | |
| 04762 | 羊毛 | V1 |
| 04763 | ようやく | V1 |
| 04764 | 要領 | |
| 04765 | よく | |
| 04766 | 抑 | V1 |
| 04767 | 欲 | |
| 04768 | 浴 | V1 |
| 04769 | 翌 | |
| 04770 | 余計 | V1 |
| 04771 | よける | |

| | | |
|---|---|---|
| 04772 | よこ | |
| 04773 | 横 | V1 |
| 04774 | 横顔 | |
| 04775 | 横切る | |
| 04776 | 汚す | V1 |
| 04777 | 予算 | V1 |
| 04778 | 予習 | |
| 04779 | よじる | |
| 04780 | よじれる | V1 |
| 04781 | 寄 | |
| 04782 | 寄せる | |
| 04783 | よそ | V1 |
| 04784 | 予想 | |
| 04785 | 装 | V1 |
| 04786 | 四日 | |
| 04787 | 四つ | |
| 04788 | よって | V1 |
| 04789 | 予定 | V1 |
| 04790 | 夜中 | |
| 04791 | 世の中 | |
| 04792 | 予備 | |
| 04793 | 呼び出す | |
| 04794 | 呼ぶ | |
| 04795 | 呼 | V1 |
| 04796 | 余分 | |
| 04797 | 予防 | V1 |
| 04798 | よほど | V1 |
| 04799 | よむ | |
| 04800 | 読 | |
| 04801 | 読む | |
| 04802 | 嫁 | V1 |
| 04803 | 予約 | V1 |
| 04804 | 余裕 | |
| 04805 | よる | |
| 04806 | 因る | |
| 04807 | 寄る | |
| 04808 | 因 | |
| 04809 | 夜 | V1 |
| 04810 | 喜 | V1 |
| 04811 | 喜び | |
| 04812 | 喜ぶ | V1 |
| 04813 | よろしい | V1 |
| 04814 | よろしく | V1 |
| 04815 | 弱い | |
| 04816 | 弱 | V1 |
| 04817 | 弱める | |
| 04818 | 弱る | V1 |
| 04819 | ラーメン | V1 |
| 04820 | 来 | V1 |
| 04821 | ライオン | V1 |
| 04822 | 来月 | |
| 04823 | 来週 | |
| 04824 | ライター | V1 |
| 04825 | 来年 | |
| 04826 | 楽 | |
| 04827 | 落 | V1 |
| 04828 | 落語 | V1 |
| 04829 | 落第 | |
| 04830 | ラジオ | V1 |
| 04831 | 乱 | V1 |
| 04832 | 覧 | V1 |
| 04833 | ランプ | V1 |
| 04834 | 乱暴 | |
| 04835 | 利 | |
| 04836 | 理 | |
| 04837 | 里 | |
| 04838 | 離 | V1 |
| 04839 | 利益 | |
| 04840 | 理解 | V1 |
| 04841 | 陸 | |
| 04842 | 理屈 | V1 |
| 04843 | 利子 | V1 |
| 04844 | 理性 | |
| 04845 | 理想 | |
| 04846 | 利息 | |
| 04847 | 律 | |
| 04848 | 率 | |
| 04849 | 立 | V1 |
| 04850 | リットル | |
| 04851 | 立派 | |
| 04852 | 流 | V1 |
| 04853 | 留 | |
| 04854 | 理由 | V1 |
| 04855 | 留学 | |

04856 流行
04857 りょう V1
04858 両
04859 寮
04860 料
04861 良 V1
04862 量
04863 領
04864 利用 V1
04865 了解
04866 両替
04867 料金 V1
04868 良好 V1
04869 漁師 V1
04870 領事館 V1
04871 車両
04872 領収書
04873 りょうしん
04874 両親
04875 良心
04876 両方 V1
04877 料理
04878 旅館 V1
04879 旅券
04880 旅行
04881 旅費
04882 履歴書 V1
04883 理論
04884 臨 V1
04885 りんご V1
04886 臨時
04887 ルート V1
04888 ルール
04889 留守 V1
04890 令 V1
04891 例
04892 冷
04893 励 V1
04894 礼
04895 零
04896 例外 V1
04897 礼儀
04898 冷却
04899 冷静
04900 冷蔵庫 V1
04901 冷房 V1
04902 レース
04903 レール V1
04904 歴
04905 歴史 V1
04906 レコード
04907 レストラン
04908 レタス
04909 列 V1
04910 列車 V1
04911 レッテル
04912 レベル V1
04913 レポート
04914 練
04915 連
04916 恋愛
04917 煉瓦 V1
04918 レンジ V1
04919 練習 V1
04920 レンズ
04921 連続 V1
04922 レントゲン
04923 連絡
04924 路
04925 労 V1
04926 朗
04927 漏 V1
04928 老 V1
04929 廊下 V1
04930 老人
04931 ろうそく V1
04932 ろうどう
04933 労働
04934 浪人
04935 ローマ字 V1
04936 六
04937 録 V1
04938 録音
04939 ロッカー V1

| | | |
|---|---|---|
| 04940 | ロビー | V1 |
| 04941 | 論 | |
| 04942 | 論文 | |
| 04943 | 論理 | |
| 04944 | 輪 | V1 |
| 04945 | 和 | |
| 04946 | ワープロ | V1 |
| 04947 | ワイシャツ | |
| 04948 | ワイン | |
| 04949 | 和歌 | |
| 04950 | 我 | |
| 04951 | 若 | |
| 04952 | 若い | |
| 04953 | 沸かす | V1 |
| 04954 | わがまま | V1 |
| 04955 | 若者 | |
| 04956 | わかる | |
| 04957 | 分かる | |
| 04958 | 別れ | V1 |
| 04959 | わかれる | |
| 04960 | 別れる | V1 |
| 04961 | わく | V1 |
| 04962 | 沸く | V1 |
| 04963 | 枠 | |
| 04964 | わけ | V1 |
| 04965 | 訳 | V1 |
| 04966 | 分ける | |
| 04967 | 技 | V1 |
| 04968 | 業 | V1 |
| 04969 | わざと | V1 |
| 04970 | わさび | |
| 04971 | 災 | |
| 04972 | わざわざ | |
| 04973 | わずか | V1 |
| 04974 | 忘れ物 | V1 |
| 04975 | 忘れる | V1 |
| 04976 | 綿 | |
| 04977 | 話題 | V1 |
| 04978 | わたし | |
| 04979 | 私 | V1 |
| 04980 | わたしたち | |
| 04981 | 私達 | |
| 04982 | 渡 | |
| 04983 | 渡す | |
| 04984 | 渡る | V1 |
| 04985 | 詫びる | V1 |
| 04986 | 和服 | |
| 04987 | 笑い | V1 |
| 04988 | 笑 | V1 |
| 04989 | 笑う | |
| 04990 | 童 | |
| 04991 | 割合 | |
| 04992 | 割合に | V1 |
| 04993 | 割引 | V1 |
| 04994 | 割 | |
| 04995 | 割る | |
| 04996 | 悪い | |
| 04997 | 悪 | V1 |
| 04998 | 悪口 | |
| 04999 | 割れる | |
| 05000 | 我々 | |

# Appendix 2

## Abbreviated examples of the word association sets for the initial 100 items in Version 1 of the Japanese Word Association Database (JWAD-V1)

This appendix presents in an abbrievated format the word association data for the initial 100 items in Version 1 of the Japanese Word Association Database (JWAD-V1). The entries consist of the item identification number, the stimulus item itself, the total number of respondents, the total number of word association response types (i.e., number of different word associations), and the number of word association responses with frequencies of 2 or more. The entries also present the set of core associations which have frequencies of 2 or more, as well as the complete set of word association responses with frequencies of 1.

**00001 ああ 50 35 7**

ああ無情 (7); 感嘆 (4); なめる (3); しんどい (2); 同意 (2); 溜息・ためいき (2); 嗚呼 (2)

ああ言えばこう言う; アルコール; おお; ひらめき; めんどくさい; もう駄目だ; よかった; 感動詞; 感銘; 気持ちいい; 共感; 叫び; 苦しい; 言葉; 肯定; 残念; 人生はつまらん; 声; 青春; 赤; 川の流れのように; 大変; 嘆願する; 悲しい; 美しい; 美味; 友よ; blank

**00004 合図 49 34 7**

笛・ふえ (8); サイン (3); 送る・おくる (3); 手 (2); スタート・start (2); ピストル (2); 信号 (2)

手を振る; GO サイン; ウィンク; ごうれい; コミュニケーション; スポーツ; ドカン; ほしい; よーいどん; 気がつく; 見る; 元気; 口笛; 合言葉; 合図する; 山川; 始まり; 出る; 出発; 人; 図る; 仲間; 伝える; 聞く; 無視; 目くばせ; 予定

**00005 愛する 48 26 8**

人 (12); 恋人 (5); 家族 (3); 女 (2); 女性 (2); 赤 (2); 男女 (2); 彼女 (2)

愛する人; love; あなた; なでる; ハート; ヨン様; 愛人; 丸; 熊さん; 嫌; 嫌う; 妻; 心; 大人; 大切; 平和; 恋; 恋する

**00008 あいにく 48 29 4**

残念・ざんねん (14); 雨 (5); あいにくさま (2); 不在 (2)

あいにくの雨; あいていない; あいびきにく; アイロニー; ことわる; ダメ; どんまい; ない; 悪天候; 雨が降っています; 雨模様; 気まずさ; 拒絶; 故障; 高飛車; 今日は留守; 出かけています; 切らす; 否定; 品切れです; 不可能; 不都合; 満席; 留守; blank

**00009 アイロン 49 18 7**

かける (13); 熱い・あつい (13); スチーム (3); 鉄 (3); 母 (2); お

母さん (2); アイロンがけ (2)

Y シャツ; アイロンする; アイロン台; シーツ; しわ; ナイロン; パーマ; 衣装; 乾かす; 蒸気; 服

**00010 あう 51 31 9**

会う (8); 出会い (4); 人 (4); 合わない・あわない (3); 偶然・ぐうぜん (2); ぴったり・ピッタリ (2); まちあわせ (2); 気 (2); 友達 (2)

偶然に; あうんの呼吸; ノリ; フランス語; 愛情; 逢瀬; 懐; 効果音; 合う; 合性; 再会; 事故; 真夜中; 正解; 舌足らず; 知人; 動作; 馬が合う; 彼氏彼女; 鳴き声; 面会; 友人

**00014 合 49 29 10**

合体 (5); 合コン (4); 会合 (3); 合う (3); 合カギ (3); 合わせる (3); 合格 (3); 合戦 (2); 合同 (2); 合併 (2)

パズル; ブロック; 意見; 一合; 強調; 合羽; 合宿; 合唱; 合掌; 合図; 合成; 合致; 合板; 心; 人; 炊飯; 性格; 雪合戦; 馬が合う

**00015 遭 49 15 4**

遭難・そうなん (21); 遭偶・そうぐう (12); (3); 事故 (2)

あり; クマ; であい; めぐり会い; 逢う; 海; 水; 雪山; 被害; 友達; blank

**00016 青 50 27 7**

空 (13); 赤 (6); 海 (3); 青空 (2); いれずみ (2); ブルー (2); 群青 (2)

青色; 色; LED; かっこいい; さびしい; のり; わたれ; 安全; 寒い; 顔色; 鬼; 水; 青春; 青信号; 青二才; 青年; 白; 発光ダイオード; 碧; 落書き

**00018 仰 50 21 9**

空 (8); 仰天 (7); 信仰 (6); 仰ぐ (5); 仰げば尊し (3); 宗教 (3); 仰々しい (2); 上 (2); blank (2)

あお; うちわ; 教え; 仰木; 仰木監督; 上手; 神; 尊敬; 大仰; 天皇; 別れ; ; blank

**00019 赤 50 27 5**

血 (9); 青 (7); 信号 (6); トマト (4); 色 (2)

赤信号; くちびる; バラ; びろうど; フェラーリ; べこ; ほほ; りんご; 牛; 共産; 情熱; 信号機; 赤ちゃん; 赤とんぼ; 赤ワイン; 赤軍; 赤十字; 赤川; 赤痢菌; 鮮やか; 日の丸; 目立つ

**00023 上がる 50 24 5**

下がる (12); エレベーター (7); 成績 (6); 階段 (4); 株価 (2)

エスカレーター; たこ; テンション; のぼる; ふうせん; 何かが上がる; 火; 階; 株; 気温; 血圧; 原稿; 高い; 上がると下が〜る; 大学; 調子; 熱; 年代; 陽

**00025 秋 50 31 8**

紅葉 (10); 落葉・落ち葉 (4); 秋刀魚・さんま (3); 食欲の秋 (3); 栗 (2); 四季 (2); 赤 (2); 千秋楽 (2)

いちょう;　うれしい;　オレンジ色;　さつまいも;　さびしい;　しんみり;　なす;　ほおずき;　わびしい;　果物;　季節;　郷愁;　芸術;　月見;　枯れ葉;　収穫の秋;　秋休み;　秋分の日;　春;　松たけ;　千;　涼しい

**00027　明らか　　50　30　7**

明白 (7);　明確 (6);　事実 (4);　真実 (3);　(3);　よくわかる (2);　証拠 (2)

うそ;　はっきり;　ぼんやり;　暗;　意図;　確実;　簡単;　間違い;　結論;　事件;　自明;　詳細;　正しい;　正義は勝つ;　説明;　単純;　二股;　白;　不明;　分かる;　明解;　明快;　論文

**00031　開く　　49　22　7**

ドア (11);　本 (8);　扉・とびら (6);　戸 (3);　閉じる (3);　箱 (2);　閉める (2)

ふた;　ホームページ;　また;　花;　開設;　開閉;　口;　耳;　心;　人の話;　窓;　道;　目;　門

**00034　アクセント　　49　20　9**

英語 (14);　発音 (9);　強調 (3);　強く (2);　つける (2);　なまり (2);　英単語 (2);　難しい (2);　方言 (2)

ことば;　ニュアンス;　はねる;　わるい;　音楽;　音符;　記号;　強弱;　粋;　発音問題

**00035　あくび　　50　22　5**

眠い・ねむい (20);　出る・でる (4);　眠気 (4);　睡眠 (3);　口 (2)

あぁ〜あ;　あくびをする;　いねむり;　おおあくび;　おくび;　かく;　のど;　は〜;　ひま;　欠;　授業;　出す;　寝る;　退屈;　大口;　長い;　連鎖

**00036　悪魔　　50　25　3**

天使 (22);　黒 (3);　ささやき (3)

黒い;　サタン;　しっぽ;　デーモン小暮;　デビル;　とりつく;　ばいきんまん;　ビダルサスーン;　悪い;　悪女;　悪人;　羽;　可哀想な子供の名前;　恐しい;　小悪魔したくなる髪;　大魔人;　怖い;　魔女;　魔法;　夢;　妖艶;　blank

**00037　あげどうふ　　50　31　7**

美味しい・おいしい (8);　食べる・たべる (6);　うまい (3);　豆腐・とうふ (3);　だし (2);　食物 (2);　大豆 (2)

美味;　480 円;　あっさり;　いらない;　おでん;　おふくろ;　かつお節;　たんぱく質;　フライパン;　ゆどうふ;　わりと好き;　居酒屋;　厚あげ;　好きじゃない;　好物;　汁;　出汁;　湯;　豆腐屋;　熱い;　油;　揚げる;　揚げ豆腐;　和食

**00043　あこがれる　　50　34　3**

人 (7);　夢 (7);　先輩・せんぱい (5)

アイドル;　あの人;　かっこいい;　スター;　ダイエット;　ドキドキ;　バレンタイン;　まと;　歌手;　器;　筋肉質;　金;　見下す;　賢人;　光;　師;　私;　失望;　将来;　人物;　成功者;　前園;　尊敬;　大人の女性;　憧憬;　彼;　片想い;　目標;　有名人;　理想;　両手

**00044　朝　　51　32　10**

眠い・ねむい (5);　夜 (5);　太陽

(4); 昼・ひる (3); 朝ごはん (2); ごはん (2); さわやか (2); 気持ちいい (2); 起きる (2); 朝日 (2)

あくび; こない; にわとり; パン; 音楽; 空; 光; 弱い; 食パン; 新聞; 早朝; 遅い; 朝刊; 朝食; 朝練; 鳥; 日の出; 日光; 晩; 眠たい; 明るい; 目覚し時計

**00045　浅い　50　17　7**

深い・ふかい (14); 海 (9); 川 (8); 考え (3); 湖 (2); 水 (2); 眠り (2)

河; 経験; 皿; 傷; 水たまり; 浅橋; 浅瀬; 池; 低い; 有明海

**00047　あさって　51　27　10**

明日 (11); しあさって (4); 今日 (4); あさっての方向 (3); 未来 (3); おととい (2); 土曜日 (2); 二日後・2 日後 (2); 明後日 (2); 予定 (2)

きのう; すぐ来る; たいくつ; バイト; 一昨日; 近い; 金曜日; 向く; 昨日; 秋葉原; 適当; 都合; 盗み; 日にち; 入試; 遊び

**00049　足　50　32　6**

手 (8); 走る (5); 靴・くつ (3); 速い (3); 歩く (3); サッカー (2)

2 本; あし; くつ下; スニーカー; つめ; つる; ふみ入れる; 遠足; 脚; 細い; 臭い; 出る; 俊足; 素足; 足す; 足る; 足袋; 足浴; 太い; 大きい; 短足; 中国人; 豚足; 本数; 毛; 両足

**00051　アジア　51　35　7**

日本 (6); 東南アジア (4); 中国 (4); 広い (3); 東南 (2); 東 (2); 民族 (2)

アフリカ; アメリカ; サッカー; タイ; ヨーロッパ; 亜細亜大学; 杏仁豆腐; 黄色人; 海; 近い; 近隣国; 経済; 原付自転車; 純真; 蒸; 植民地; 世界; 太陽; 台湾; 地域; 中東; 東側; 東洋; 東洋人; 文化; 米国; 北京; 料理

**00052　足跡　50　30　9**

残す (6); 靴・くつ (4); 追跡 (4); 痕跡・こんせき (3); たどる (3); 軌跡 (3); 19 (2); 遺跡 (2); 犯人 (2)

クマ; ゲソ; つける; のこる; もぐら; ロードオブメジャー; 雨; 化石; 過去; 恐竜; 残さない; 残すな; 思い出; 証拠; 雪; 追う; 敵地; 土; 歩く; 北京原人; 連続

**00058　預ける　50　12　5**

金・お金 (21); 預金 (9); 銀行 (8); 子供 (3); 貯金 (3)

かぎ; 荷物; 金庫; 傾ける; 託児所; 友人

**00060　あせる　50　30　6**

汗 (7); 急ぐ (6); テスト (4); 時間 (4); 失敗 (3); 冷や汗 (2)

あせらない; いつも; おちつかない; テンパる; ピンチ; よくある; ラストスパート; 汗が出る; 汗だく; 間違う; 急がないと; 急遽; 緊張; 嫌い; 事件;

授業; 初心者; 焦る; 寝坊; 人生; 走る; 締め切り; 普通; 冷汗

**00065 価 50 15 7**

価値 (24); 価格 (9); 金・お金 (3); 株価 (2); 高い (2); 値段 (2); 物価 (2); 変動 (2)

0 以下; 代価; 評価; 廉価

**00075 あたりまえ 50 28 4**

当然 (16); 常識 (6); もちろん (2); 普通・ふつう (2)

あたりまえだの缶コーヒー; クラッカー; ごはん; できて当然; できない; できる; でしょう; どうして？; ルール; 一般的; 完璧; 基本; 出来事; 勝; 尋常; 生活; 青; 絶対; 前田; 盗めて; 当たり前; 日本人; 予感; blank

**00077 あたる 50 32 11**

ボール (5); 痛い・いたい (4); 事故 (3); 宝くじ・宝クジ (3); くじ (2); ぶつかる (2); 車 (2); 当たる (2); 日 (2); 罰・ばち (2); 風 (2)

あたってるよ; うれしい; はずれる; ひじ; フグ; やつあたり; ラムちゃん; 勘; 光; 仕事; 諸星あたる; 食; 食べ物; 食中毒; 石; 的; 電柱; 頭を打つ; 日光; 壁; 棒

**00078 当たる 50 15 6**

宝くじ・宝クジ (22); くじ・クジ (10); ボール (3); はずれる (2); 当選 (2); 壁・かべ (2)

1 等賞; ダーツ; ばち; バット; ぶつかる; 合格; 車; 的; 予想

**00080 あちら 50 21 7**

こちら (24); こっち (2); どちら (2); 遠く (2); 向こう・むこう (2); 行く (2); 方向 (2)

あちらこちら; ある; ちょっと遠く; バスガイド; 遠い; 驚き; 近隣; 向こう側; 参る; 指示; 自転車; 人; 矢印; blank

**00081 圧 50 17 5**

圧力 (28); 気圧 (4); 圧力鍋・圧力なべ (3); 重圧 (2); 水 (2)

ストレス; つぶす; 圧殺; 圧縮; 圧政; 圧内; 応カテンソル; 空圧; 高気圧; 上からの力; 油圧

**00088 扱う 48 31 8**

物・モノ (7); 危険物 (4); 手 (4); 丁寧・ていねい (2); 子供 (2); 商品 (2); 人 (2); 道具 (2)

丁寧に; ハンドル; ペット; 扱いにくい; 火; 壊れ物; 慣れ; 機械; 支配; 捨てる; 車; 取り扱い表示; 商店; 慎重; 説明書; 大切に; 注意; 天地無用; 伝票; 毒物; 猫; 物事; 問題

**00093 集める 50 23 11**

金・お金 (7); 収集 (5); 切手 (5); 人 (4); ごみ・ゴミ (3); コレクター (3); 集合 (3); コレクション (2); フィギュア (2); 捨てる (2); 趣味 (2)

ガラクタ; カン; コレクト; ポケモン; ユニホーム; 集まる; 集会; 集金; 大人買い; 標本; 密集; 落ち葉

**00096　後　　50　31　6**

前 (15);　影 (2);　後日 (2);　祭・祭り (2);　先 (2);　未来 (2)

back;　あとで;　うしろ;　ストーカー;　バックステップ;　ふりむく;　暗闇;　気後れ;　後ずさり;　後ほど;　後れる;　後悔;　後退;　後半;　後方宙返り;　始;　事後;　終わる;　戦後;　遅い;　注意;　直後;　背中;　放課後;　blank

**00097　跡　　51　22　5**

足跡 (18);　遺跡・いせき (9);　城跡 (4);　足 (2);　跡地 (2)

くつ;　のこる;　もういない;　軌跡;　恐竜;　古跡;　痕跡;　山;　傷跡;　消す;　人間;　昔;　追う;　道の跡;　爆弾;　歴史

**00098　穴　　50　31　8**

入る (7);　落とし穴 (4);　もぐら (3);　掘る (3);　洞くつ・どうくつ (3);　洞穴 (3);　マンホール (2);　入れる (2)

あける;　アナゴ;　くま;　プレーリードッグ;　ぼけつ;　もぐる;　暗い;　穴があったら入りたい;　穴ぐら;　穴子;　穴子握り;　縦穴式住居;　深い;　性器;　巣;　大穴;　地;　土;　墓穴;　防空壕;　落ちる;　罠;　blank

**00103　姉　　49　20　3**

妹 (22);　姉妹 (8);　兄 (2)

2 人;　いない;　わからない;　家;　家族;　叶姉妹;　恐い;　姑;　姉さん;　姉貴;　女;　身内;　大人;　仲良し;　弟;　髪;　欲しい

**00104　あの　　50　19　7**

この (12);　その (9);　あの人 (7);　あの日 (3);　どの (3);　あの～ (2);　blank (2)

あのすばらしい愛を・・・♪;　あのね;　あの絵;　あの頃;　あの時;　あの店;　あれ;　こそあど言葉;　阿野先生;　指す;　指示;　疎遠

**00106　あひる　　51　31　12**

鳥 (9);　あひるの子 (3);　ひよこ (3);　白 (2);　あびる優 (2);　黄色 (2);　鴨・カモ (2);　醜いあひるの子・みにくいあひるの子 (2);　親子 (2);　池 (2);　白鳥 (2);　風呂・お風呂 (2)

白い;　アヒル;　アフラック;　うかぶ;　がちょう;　くちばし;　だちょう;　泳ぐ;　灰色;　雁;　口;　子供;　水;　川;　筑波山;　飛べない;　歩く;　扁平足

**00107　浴びる　　50　13　7**

シャワー (19);　水 (9);　日光 (5);　風呂 (5);　酒 (2);　太陽 (2);　湯・お湯 (2)

雨;　光;　水浴び;　注目;　日の光;　噴水

**00108　危ない　　48　32　5**

危険 (9);　事故 (5);　車 (3);　よける (2);　火 (2)

危険だ;　がけ;　けが;　スピード;　トラック;　トラップ;　黄色;　海外;　橋;　刑事;　原チャリ;　交通事故;　工事;　工事現場;　仕事;　死;　助ける;　場所;　人;　石油;　渡るな;　踏切;　逃げる;　道;　道路;　怖い;　落下

**00109　危　　49　19　4**

危険 (25);　危ない (3);　崖・がけ (3);　車 (3)

あぶない;　ボール;　安全;　黄色; 危ない場所;　危ねえ;　危機;　危険物;　危篤;　険しい;　死;　事; 事故;　毒;　爆弾

**00110　油　　50　25　6**

水 (15);　火 (5);　はねる (4);　油田 (3);　石油 (2);　揚げ物 (2)

あつい;　オイル;　がま;　ぎとぎと;　しょうゆ;　タンカー;　ぬるぬる;　フライパン;　べたべた; ラーメン;　炎;　機械;　脂肪; 臭い;　重油;　天ぷら;　灯油; 油っこい;　油を売る

**00111　あま　　51　20　9**

海女 (8);　尼 (8);　女 (6);　甘い・あまい (4);　アマチュア (3);　天久保 (3);　尼さん (3);　尼寺 (3);　天 (2)

あまから;　あまくだり;　お寺; ぼうず;　下等;　甘;　辛;　僧; 天の川;　天久保 4 丁目;　blank

**00117　余る　　50　35　7**

余分 (7);　お菓子 (3);　残す (3); 時間 (3);　金 (2);　食べ物 (2); 物・もの (2);　目に余る (2)

1 人;　いらない;　おやつ;　お釣り;　ごはん;　じゃんけん;　すそ; プリント;　わける;　過剰;　割り算;　残りもの;　残る;　脂肪; 手;　食べる;　人;　切る;　幅; 米;　予備;　余り;　余り物;　余剰;　余裕;　料理

**00119　編む　　51　10　4**

毛糸 (17);　セーター (14);　マフラー (12);　ニット (2)

こたつ;　ほどく;　糸;　手袋; 手編み;　編集

**00120　雨　　49　29　4**

傘・かさ・カサ (12);　降る・ふる (7);　濡れる・ぬれる (3);　冷たい (2)

6 月;　いや;　う;　じめじめ;　すそ;　だるい;　どしゃぶり;　もっとふれ;　レイン;　雨のしずく; 雨ふり;　雨後;　雨天;　奇妙; 嫌い;　寂;　水;　水色;　川;　長崎;　天気;　霧雨;　夜;　憂うつ; 鬱

**00121　謝る　　50　25　7**

謝罪 (12);　ごめんなさい (8);　ごめん (3);　悪い (3);　けんか (2); 失礼 (2);　土下座 (2)

sorry;　ごめんね;　慰謝料;　下げる;　会見;　客;　後悔;　残念; 謝礼;　手紙;　申し訳ない;　遅刻; 中国語;　頭;　平謝り;　涙;　侘びる;　blank

**00123　謝　　51　23　6**

謝罪 (13);　謝る (7);　感謝 (6); ごめんなさい (4);　あやまる (2); 謝謝 (2)

ありがとう;　おわび;　ごめん; 悪い;　弓;　許す;　強い;　金; 月謝;　赦す;　謝罪会見;　謝礼; 手紙;　陳謝;　土下座;　頭を下げる;　病院

**00124　荒い　　50　35　8**

海 (5);　息 (5);　荒野 (3);　ざつ・ザツ (2);　性格 (2);　川 (2);　地面 (2);　波 (2)

きめ細か;　でこぼこ;　なめらか;　やさしい;　やすり;　運転;　塩;　画像;　気;　気性;　強い;　言葉;　荒木;　荒矢;　細い;　仕事;　辛い;　粗い;　大荒れ;　適当;　度;　肌;　鼻息;　筆跡;　布;　木目;　blank

**00125　粗い　　50　31　6**

細かい (11);　雑・ざつ (4);　目・め (4);　粗末 (2);　摩擦・まさつ (2);　blank (2)

あみ;　いいかげん;　きめ細かい;　けずれる;　こしょう;　サンドペーパー;　ジャリ道;　たわし;　めが粗い;　やすり;　やな感じ;　よくない;　運転;　画素;　欠陥住宅;　結晶;　絹;　作業;　性格;　清い;　粗雑;　粗相;　肌;　米;　麻

**00127　洗　　50　22　8**

洗濯 (17);　洗う (4);　洗顔 (4);　洗濯機 (3);　顔 (2);　洗剤 (2);　体 (2);　服 (2)

きれい;　シャンプー;　すっきり;　熊;　皿;　手洗;　水;　石けん;　洗浄;　洗濯物;　洗面所;　掃除;　美;　洋服

**00130　改まる　　48　29　6**

改正 (8);　改善 (6);　態度 (4);　礼儀 (3);　改心 (2);　反省 (2)

あいさつ;　かしこまる;　ぼうず;　駅;　改めて;　改行;　改札口;　改定;　改名;　改名する;　機会;　姿勢;　心;　心を改める;　制度;　生活;　暖まる;　丁重;　丁寧;　日;　変わる;　目上の人;　話

**00132　あらっ　　50　31　6**

驚き・おどろき (10);　まあ (5);　うっかり (3);　失敗 (3);　おばさん (2);　困った (2)

あらっぽい;　ええっ！？;　おかま;　おくさん;　おっちょこちょい;　おやっ;　お金が;　お母さん;　サザエさん;　どうしましょう;　びっくり;　ふりむく;　ポテト;　ヤバ・・・;　よっと;　気づく;　疑問;　驚く;　大変;　地震;　突然;　発見;　凡ミス;　落ちた;　blank

**00133　あらゆる　　48　30　8**

全て・すべて (11);　手段 (3);　場面 (2);　色々 (2);　世界 (2);　全部 (2);　物 (2);　物事 (2)

あらゆる人;　ありとあらゆる;　いろんなもの;　こと;　たくさん;　花;　局面;　決まった;　事象;　失敗;　手口;　種類;　出来事;　色;　制覇;　生物;　多くの;　努力;　方向;　方法;　万物;　様々な

**00135　現わす　　50　25　3**

姿 (17);　出現 (7);　表現 (4)

ウルトラマン;　ご来光;　すがた;　映画;　怪人;　具現;　具現化;　見える;　現象;　光;　消える;　消えろ;　消す;　神;　身振り;　正体;　想像;　変身;　本性;　明るい;　兔;　blank

**00137　現　　49　19　8**

現実 (9);　現在 (7);　現代 (6);　現れる (5);　今 (5);　うつつ (2);　出現 (2);　幽霊 (2)

おばけ;　けんげん;　学園祭実行委員会;　現国;　現出;　現代人;　現役;　直面;　物質;　未来;　友達

**00139　ありがたい　　50　25　7**

感謝 (20);　ありがとう (2);　うれしい (2);　お辞儀・おじぎ (2);　プレゼント (2);　助け (2);　親 (2)

おせっかい;　お金;　お歳暮;　ことば;　どういたしまして;　とても;　めずらしい;　やさしさ;　やめてほしい;　愛;　喜ぶ;　札;　助かる;　食事;　親切;　大切;　仏;　blank

**00140　ありがとう　　49　17　4**

感謝・かんしゃ (22);　どういたしまして (7);　礼・お礼 (4);　さようなら (3)

あいさつ;　うれしい;　おじぎ;　おめでとう;　ございます;　こちらこそ;　ごめんなさい;　どうも;　温かさ;　感謝する;　幸せ;　謝意;　贈り物

**00141　有様　　51　24　8**

様子・ようす (10);　ひどい (9);　この有様 (4);　状態 (3);　blank (3);　このような (2);　見た目 (2);　殿様 (2);　無様 (2)

ありさま;　かたち;　ごらんの;　その様子;　何様;　蟻;　現状;　今;　自分;　失態;　真実;　悲惨;　風貌;　無惨

**00149　慌てる　　51　36　7**

急ぐ・いそぐ (9);　焦る (3);　あたふた (2);　ふためく (2);　混乱 (2);　遅刻 (2);　落ち着く・おちつく (2)

あぶなっかしい;　ころぶ;　テスト;　テスト前;　テンパる;　とり乱す;　バタバタ;　パニック;　わすれる;　火事;　汗;　挙動不審;　恐慌;　驚く;　困惑;　仕事;　時間;　焦り;　地震;　朝;　朝寝坊;　土けむり;　動揺;　飛びだす;　落ち着け;　落とす;　冷や汗;　冷静;　blank

**00151　案　　50　25　8**

案内 (11);　提案 (6);　会議 (4);　計画 (3);　考え (3);　予算案 (3);　案の定 (2);　考える (2)

アイディア;　ひらめく;　プラン;　案ずるより産むが易し;　案件;　案内人;　企画;　議長;　紙;　図案;　代替案;　通る;　発案;　不信任案;　法;　良い

**00153　暗記　　50　31　10**

単語 (8);　テスト (4);　記憶 (3);　暗記する (2);　英単語 (2);　覚える (2);　空 (2);　社会 (2);　数学 (2);　大変 (2)

カード;　がんばる;　そろばん;　つめこむ;　つらい;　暗唱;　一夜漬け;　英文;　憶える;　学校;　技術;　苦;　嫌い;　試験;　数式;　世界史;　得意;　年号;　筆記;　勉強;　歴史

**00154　安心　　50　31　8**

安全 (6);　不安 (6);　セコム (3);　家 (3);　保険 (3);　ベッド (2);　ほっとする (2);　安心感 (2)

おちつく; サービス; セーフ; セコムしてますか？; ふとん; やすらぎ; ゆとり; レイク; 安心する; 一人; 温かい; 価格; 家族; 感心; 実家; 心; 心配; 人; 大丈夫; 第一; 平和; 満足; 老後

**00155 安全 50 26 8**

安全第一 (12); 危険 (7); 運転 (3); 交通 (3); 交通安全 (3); 家 (2); 守る (2)

ねる; 安全運転; 安全圏; 安全地帯; 黄色; 確保; 確保する; 基準; 祈る; 疑惑; 工事; 策; 善; 装置; 対策; 大切; 日本; 不安

**00156 あんな 50 33 6**

こんな (9); 物・もの (4); あんなこと (3); 案内・あんない (3); 梅宮アンナ (3); 人 (2)

あんず; あんなことやこんなこと; おれな; とても; ドラえもん; どんな; バラ; ふう; マンガ; やつ; 安心; 遠い; 関西弁; 山; 女; 女子; 人の名前; 人名; 体操着; 抽象的; 土屋アンナ; 怒り; 悲しい; 方言; 本; 話し始め

**00164 医 51 16 3**

医者 (31); 医学 (4); 薬 (3)

ブラックジャック; メディセン; 医師; 医術; 医専; 学類; 女医; 仁; 注射; 白; 白衣; 病院; 病気

**00165 良い 50 18 2**

悪い (32); 行い・おこない (2)

OK; スタイル; すばらしい; よかった; よろし; 子; 事柄; 自由; 成績; 正解; 天気; 無印良品; 友達; 良い人; 良心; blank

**00167 いいえ 50 17 5**

はい (25); 拒否・きょひ (4); 否定 (4); 違う (3); 返事 (2)

No; いいえ違います; いただきません; いやです; くびふる; けっこうです; そうではありません; 嫌; 手; 断る; 答える; 悲しい

**00169 いいん 50 17 7**

委員会 (14); 委員 (12); 医院 (4); 学級委員 (4); 委員長 (3); 病院 (2); blank (2)

いんげん; まじめ; メガネ; ヤドカリ; 仕事; 七国山病院; 図書委員; 代表; 無理

**00173 言 50 19 5**

言葉・ことば (21); 言語 (6); 口 (4); 言う (3); 独り言 (2)

いう; うるさい; ゲーム; しゃべる; つる; 一言; 言うなよ; 言の葉; 言及; 言語学; 言霊; 告白; 発言; 予言

**00175 家 50 30 9**

家族 (7); 実家・じっか (5); 屋根 (3); 家庭 (3); 帰る・かえる (3); 安心 (2); 建てる (2); 住む (2); 庭 (2)

あったか; くつろぐ; リビング; 家屋; 家計簿; 家出; 火事; 我が家; 帰りたい; 帰宅; 在宅; 三井のリハウス; 自宅; 宿舎;

全壊;　大きい;　暖かい;　二階建て;　入る;　眠る;　木

**00177　いか　　50　26　7**

たこ・タコ (16);　するめ・スルメ (4);　いかすみ (3);　くさい (2);　海 (2);　刺身・サシミ (2);　白い (2)

10 本;　いかさし;　いかそうめん;　いかにも;　いかリング;　いるか;　おいしい;　すみ;　パスタ;　フライ;　ヤリイカ;　以下;　貝;　食べたい;　食べる;　精子;　長い;　白;　函館

**00178　以下　　49　19　6**

以上 (14);　以下同文 (10);　以下省略 (6);　下 (2);　文章 (2);　未満 (2)

20 歳;　そこから下;　もって;　以下の通り;　下のこと;　項目;　参照;　終わり;　少ない;　数値;　切り捨て;　読み物;　略

**00179　烏賊　　51　17　10**

blank (16);　蛸・鮹・たこ・タコ (7);　海賊 (6);　するめ・スルメ (3);　海 (3);　山賊 (3);　さしみ (2);　黒 (2);　白い (2)

イカ;　いかすみ;　恐い;　青;　石;　足;　盗賊

**00180　いがい　　50　25　7**

意外 (14);　以外 (8);　以内 (2);　意外な (2);　意外性 (2);　驚き (2);　驚く (2)

いがいたい;　かのうせい;　その他;　ダークホース;　びっくり;　案外;　魚介類;　差;　思いとは別に;　自分以外;　心外;　人格;　人生;　大変;　的外れ;　優しい;　予想外;　blank

**00182　意外　　50　29　9**

驚き・おどろき (7);　案外 (5);　驚く・おどろく (5);　blank (3);　びっくりする (2);　意外性 (2);　心外 (2);　性格 (2);　予想外 (2)

うそお;　かわいい;　ギャップ;　スキャンダル;　意外とすき;　驚;　結果;　言葉;　事実;　自分;　信じられない;　存外;　当然;　頭;　発現;　友人;　予想;　予想通り;　例外;　話

**00183　いかが　　49　39　5**

いかがですか (5);　いかがお過ごし・いかがおすごし (3);　いかがでしょうか (3);　食事 (2);　茶・お茶 (2)

いか;　いかがおすごしですか;　いかがかね;　いかがしますか;　いかがなさいます;　いかがなさいますか？;　いかがなものか;　いたしましょうか？;　いただきます;　ご機嫌;　たずねる;　ていねい;　どう？;　どうも;　ファミレス;　レストラン;　奥様;　何が;　過ごす;　勧誘;　気分;　疑問;　敬語;　結構です;　思う;　手;　手紙;　丁寧語;　調子;　批判;　品物;　味;　迷惑;　夕食

**00186　息　　50　27　9**

ため息 (5);　吸う (5);　呼吸 (5);　白い (5);　吐く・はく (3);　吐息 (3);　マラソン (2);　荒い・あらい (2);　生きる (2)

ガム;　さわやか;　喘息;　ひそめる;　口;　酸素;　子供;　止める;　自然にするもの;　出す;　生;　切

れる; 絶える; 息する; 息づかい; 息をのむ; 息子; 白

**00192 行 50 20 9**

行列 (9); 列 (7); 行間 (5); 旅行 (5); 行く (3); 行事 (3); 修行 (3); 一行 (2); 帰 (2)

レポート; 改行; 行為; 行水; 着; 文; 文字; 文章; 遊び; 来; 来る

**00194 幾ら 50 22 8**

金・お金・おかね (19); 少し (4); 数 (3); いくら何でも・いくらなんでも (2); おつり (2); 数学 (2); 値段 (2); 払う (2)

1.2; イクラ; いくらか; いくらでも; どれほど; もらったの？; 何個; 金額; 合計; 四角; 少数; 多い; 八百屋; blank

**00196 いけない 50 26 11**

禁止 (8); 駄目・ダメ (5); 悪い・わるい (5); いけないこと (3); いい・よい (2); 危険 (2); 禁 (2); 殺人 (2); 情事 (2); 犯罪 (2); 浮気・うわき (2)

いいよ; する; なまける; ふみ込む; 悪; 関係; 気にしない; 規則; 行けない; 罪; 場所; 逮捕; 不倫; 遊び; blank

**00197 生け花 48 32 8**

華道 (5); きれい (4); 和 (4); 着物・きもの (3); 芸術 (2); 剣山・けんざん (2); 女 (2); 生ける・いける (2)

うつわ; おばあさん; オレンジレンジ; お嬢様; お茶; かざり; かたい; かびん; さす; さみしい; ババア; 仮屋崎; 花; 華; 華道の先生; 教室; 興味ない; 枯; 女性; 上品; 植える; 日本; 盆栽; 流派

**00200 潔 50 15 8**

清潔 (26); 潔白 (6); きれい (3); いさぎよい (2); 簡潔 (2); 潔い (2); 潔癖 (2)

さわやか; 漢; 高潔; 粋; 切腹; 男; 目標

**00201 勇ましい 50 20 8**

勇者 (13); 男 (8); 強い・つよい (5); 姿 (3); 勇気 (3); かっこいい (2); 戦士 (2); 勇敢 (2)

王; 王子; 騎士; 強がり; 筋肉; 女性; 筑波生; 蛮勇; 武士; 兵士; 無謀; 勇士

**00202 意志 49 34 7**

強い (7); 固い・かたい (4); blank (3); 弱い (2); 信念 (2); 心 (2); 大切 (2)

コア; 意志疎通; 意志力; 意思疎通; 意思薄弱; 貫く; 貫徹; 希望; 虚無; 強さ; 決める; 決意; 決定; 考え; 志; 志す; 持つ; 自由; 自由意志; 進路; 尊重; 通じる; 鉄; 脳; 必要; 未来; 勇気

**00203 いし 49 25 8**

石 (13); 意志 (4); 石ころ (4); かたい (3); 岩 (2); 固い (2); 硬い (2); 水切り・水きり (2)

グー; ひろう; 意見; 意志疎通; 岩石; 固し; 砂; 砂利; 三年; 初志貫徹; 小さい; 川原; 土; 投げる; 頭; 竜安寺; blank

**00206　意識　　　50　38　5**

無意識 (6);　意識調査 (4);　朦朧・もうろう (4);　意識不明 (2);　覚醒 (2);　脳 (2)

ある;　ない;　なくなる;　はっきりする;　フロイト;　ぼんやり;　意識する;　意識する心;　意識的;　医療;　遠のく;　回復;　空;　高い;　差別;　思考;　自意識;　自意識過剰;　自覚;　手当て;　心;　人間;　青;　知識;　低い;　頭;　頭痛;　白い;　薄い;　浮かぶ

**00208　医者　　　49　28　9**

白衣 (7);　病院 (6);　治す (3);　病気 (3);　藪医者・やぶ医者 (3);　えらい・エラい (2);　患者 (2);　金持ち (2);　薬 (2)

MRI;　ジョーブ博士;　すごい;　なる;　めがね;　看護士;　看護婦;　兄;　財前;　歯;　診る;　診察する;　清潔;　注射;　聴診器;　白;　麻酔;　無用;　名医

**00211　異常　　　50　35　7**

異常気象 (6);　異常事態 (6);　正常 (5);　異常者 (2);　危ない・あぶない (2);　変 (2)

アブノーマル;　エラー;　おかしい;　きちがい;　プリオン;　やばい;　恐い;　狂気;　宿舎;　暑さ;　常識;　神経;　尋常;　精神;　精神異常;　体;　通常;　頭;　日常;　肌荒れ;　発見;　犯罪;　病気;　変質者;　変態;　良い;　良くない

**00212　椅子　　　50　19　5**

座る・すわる (16);　机 (11);　木 (4);　テーブル (3);　座椅子 (2)

イームズ;　イストリゲーム;　かたい;　すわるもの;　パイプ椅子;　恐怖;　教室;　江戸川乱歩;　死刑;　車椅子;　人間;　投げる;　勉強;　崩壊

**00214　イスラム教　　　50　36　6**

キリスト教 (5);　宗教 (5);　シーア派 (3);　メッカ (3);　コーラン (2);　モスク (2)

アーレフ;　アッラー;　アブドラー;　アラブ;　インド;　お祈り;　カレー;　キリスト;　スンニー;　ヒンドゥー教;　ムハンマド;　ラマダーン;　温和;　回;　外国人;　危険;　原理主義;　巡礼;　信者;　西アジア;　戦争;　大変;　断食;　茶色;　中東;　豚;　豚肉;　熱心;　怖い;　礼拝

**00216　忙しい　　　50　33　5**

仕事 (8);　毎日 (7);　日々 (3);　サラリーマン (2);　汗 (2)

あくせく;　いやな事;　イライラする;　きらい;　ストレス;　つかれる;　テスト;　バイト;　ビジネス;　ゆとり;　リーマン;　過労死;　楽;　最近;　私の毎日;　週末;　人;　睡眠不足;　生活;　走る;　多忙;　大変;　日;　年末;　煩雑;　勉強;　母;　眠い

**00217　急ぐ　　　49　27　7**

走る (11);　急行 (5);　電車 (4);　車 (3);　緊急 (2);　遅刻 (2);　特急 (2)

あせり;　あせる;　あわてる;　ギリギリ;　タクシー;　ダッシュ;　でも冷静に;　ヘイ！タクシィー。;　ゆっくり;　回れ;　汗;　時間;

先を急ぐ;　早歩き;　遅く;　朝;
登校;　病院;　用事;　blank

**00218　急　　　　50　34　6**

急行 (8);　急用 (4);　あわてる (3);
急ぐ (3);　あせる (2);　急カーブ
(2);　速い・はやい (2)

あせり;　たっきゅうびん;　まわ
れ;　回る;　急な用事;　急行列車;
急降;　急遽;　救急;　救急車;
緊急;　慌ただしい;　行く;　坂;
車;　取り急ぐ;　性急;　操作;
大変;　朝;　特急;　病;　用事;
要する;　来る;　落ち着く

**00221　痛い　　　　49　30　7**

怪我・けが・ケガ (9);　傷・キズ
(6);　血 (3);　つらい (2);　苦痛
(2);　心 (2);　注射 (2)

アバラ;　ころぶ;　ダメージ;　ね
んざ;　ばんそうこう;　ひざが痛
い;　プロスタグランジン;　胃;
蚊;　回復;　楽しい;　金玉;　刺
す;　歯;　治る;　出血;　針;　足;
虫歯;　痛覚;　病院;　腹痛;　別
れ

**00223　いたずら　　　　49　25　7**

子供・子ども (16);　いたずら小僧
(3);　叱る・しかる (3);　落書・落
書き (3);　いたずらする (2);　悪が
き (2);　電話 (2)

いたずらっこ;　だます;　ちかん;
ちびっこ;　ムカツク;　悪;　悪さ;
悪知恵;　悪童;　楽しい;　甘えん
ぼう;　失敗;　大惨事;　注意;
怒る;　遊び;　幼児;　浪費