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Two Distance Computation Models for TDMT Using Narrow and Broad Concepts on a Thesaurus

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This paper discusses two distance computing models for TDMT : a distance model and a similarity model. These models use a semantic dictionary (or thesaurus) with a Directed Acyclic Graph (DAG) structure concept classification system, named the Concept Classification Graph (CCG). The distance model computes the distance between two expressions using the narrow concept set on a CCG. The similarity model computes the similarity between two expressions using the broad concept set on a CCG. These models are divided into 3 phase calculations, for expressions, for words and for concepts. The calculations for the concepts use concept sets on a CCG, and the other phases use the results of the next phase. In addition, a heuristic method for searching for the shortest path between two concepts is provided with the distance model.

The experimental results have shown that the proposed models have few ambiguities, but are slow. And, a comparison of the two models shows that the similarity model can compute about 13 times as fast as the distance model, although it is a little more ambiguous than the distance model.

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Symbols and Terms

1. Symbols

<i>Symbol</i>	<i>Meaning</i>
$\forall \chi$	For all χ .
$\exists \gamma$	There exists a γ .
$\langle X \rangle$	X is a concept.
$\chi \in A$	χ is a member of A.
$A \subseteq B$	A is a subset of B.
$\chi \mapsto \gamma$	The edge from χ to γ .
$\chi \Leftrightarrow \gamma$	The edge from χ to γ , or from γ to χ .
$ A $	The cardinality of a set A.
$A \oplus B$	The union of disjoint sets A and B.
$P(A)$	The power set of a set A.
$\min X$	The minimum value of the variable X
$\max X$	The maximum value of the variable X
$\text{abs}(X)$	The absolute value of X

2. Terms

Path : A node sequence $[v_0, v_1, \dots, v_n]$ is a path in a graph, if the graph has an edge $v_{i-1} \mapsto v_i$, for $i = 1, \dots, n$.

Chain : A node sequence $[v_0, v_1, \dots, v_n]$ is a chain in a graph, if the graph has an edge $v_{i-1} \Leftrightarrow v_i$, for $i = 1, \dots, n$.

Descendent : A node α is a descendent of a node β on a graph, if a path $[\beta, \dots, \alpha]$ is in the graph.

Ancestor : A node α is an ancestor of a node β on a graph, if a path $[\alpha, \dots, \beta]$ is in the graph.

Chapter 1.

Introduction

TDMT (Transfer-Driven Machine Translation) makes the most of the example-based framework, which produces an output sentence using the closest translation example to an input sentence. In TDMT, the semantic distance¹ between an input and a translation example is measured in terms of a thesaurus hierarchy [TDMT]. Accordingly, the performance of TDMT heavily depends on the choice of thesaurus. It is, therefore, necessary to find an effective thesaurus and semantic distance computation method using it.

Currently, TDMT uses the [Kadokawa] thesaurus² and [Sumita 92]'s method to compute the distance using that thesaurus for Japanese-to-English and Japanese-to-Korean translations. By the way, this method was developed considering only thesauri as [Kadokawa] which have a balanced tree structure such as [Kadokawa], so it can not be used in the many other thesauri such as [EDR 90], which have an unbalanced structure [Fig. 1.1 (a)] and multiple-inheritance concepts [Fig. 1.1 (b)] in a graph.

Therefore, other methods based on a graph structure, which is an alternative to [Sumita 92], should be investigated.

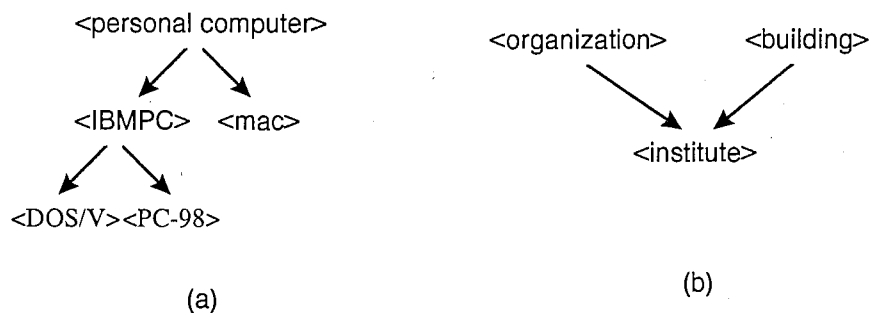


Fig. 1.1 Some concept classifications

¹ Some researchers call this 'linguistic or conceptual' in order to distinguish it from statistical or factual relations.

² There are only two kinds of relationships in a thesaurus : hyponymy and synonymy.

For this purpose, we have studied the development of a new method to compute the distance between linguistic expressions using a general classification structure of semantic concepts. As a result, two distance computation methods, the distance model and the similarity model, using a directed graph structure thesaurus were developed and used to experiment on the concept dictionary of [EDR 90].

This paper introduces the two models and reports their preliminary experimental results. In chapter 2, we define a concept dictionary model and introduce some definitions to be used in our computations. In chapter 3, we describe the distance model and a heuristic algorithm to search for the shortest chain. In chapter 4, we introduce the similarity model. Lastly, in chapters 5 and 6, we report the experimental results of our models and conclude this paper.

Chapter 2.

A Concept Dictionary

In this chapter, we define a concept dictionary model and some terms related to it. Then, we introduce some sets to be used in our computations.

2.1 A concept dictionary

In order to develop distance computation models which can be applied to many kinds of concept dictionaries, we introduce a virtual dictionary model defined in [Definition 2.1], which classifies concepts using a general structure, Directed Acyclic Graph (DAG) concept classification.

Definition 2.1.

A *concept dictionary* consists of a Concept Classification Graph *CCG*, a word set *W* and a function *Word_Concept* ;

- $CCG \langle V, E, R \rangle$ is a source Directed Acyclic Graph, where ;
 - V** : The set of nodes or concepts
 - E** : The set of edges on V. An edge $x \mapsto y$ represents that *y is a kind of x*.
 - R** : The root node of the CCG.
- **Word_Concept** : $W \rightarrow P(V)$
 $\forall \omega \in W, \text{Word_Concept}(\omega) = \{\alpha \mid \alpha \in V, \alpha \text{ can be named } \omega\}$

Example 2.1. The concept dictionary used in this paper as a example.

- CCG

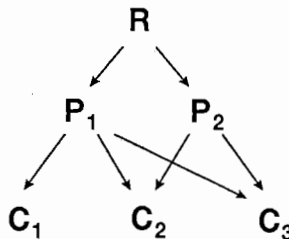


Fig. 2.1 An example of a CCG

- Word set : $W = \{ \omega_1, \omega_2, \omega_3 \}$
- Function **Word_Concept** :
 $Word_Concept(w_1) = \{P_1, C_3\}$
 $Word_Concept(w_2) = \{C_1\}$
 $Word_Concept(w_3) = \{P_2\}$

The following definitions are terms related to a CCG. LCA [*Definition 2.2*] is used in the concept distance computation of chapter 3 and the similarity computation of chapter 4. And, GCD [*Definition 2.3*] is used in the shortest chain searching algorithm of chapter 3.

Definition 2.2.

A *Lowest Common Ancestor concept (LCA)* of two concepts α and β , is an upper concept which does not have any descendent concept which is a common ancestor of α and β on a given CCG.

Definition 2.3.

A *Highest Common Descendent concept (HCD)* of two concepts α and β , is a lower concept which does not have any ancestor concept which is a common descendent of α and β on a given CCG.

Example 2.2 .

LCAs and HCDs: In [*Example 2.1*], the following are true.

1. LCA of C_1 and C_2 , is P_1
2. LCA of C_2 and C_3 , is P_1 and P_2
3. LCA of P_1 and P_2 , is R
4. HCD of P_1 and P_2 , is C_2 and C_3

2.2 The quantification of a concept

Certainly, a concept can be grasped from the viewpoint of quality ; however, it should be represented in terms of quantity for computation. For this, we use two kinds of set : a set of narrow concepts and a set of broad concepts. These sets can be explicitly defined with a given CCG.

The narrow (or sub) concepts of a concept are itself and the concepts with a narrow

meaning to specify the concept more concretely. For example, in [Fig. 2.1], the narrow concepts of **R** are all concepts, and the narrow concepts of **P₁** are **P₁**, **C₁**, **C₂**, and **C₃**. We can consider the narrow concept set of a concept as the partition (or domain) of the concept on the total concept.

We used narrow concepts to compute the distance between two concepts. On a CCG, these are represented by the descendants, so the set of narrow concepts is defined as [Definition 2.4]

Definition 2.4.

The set of narrow concepts of a concept α given a CCG :

$$NCS(\alpha) = \{\chi | \forall \chi, \chi \text{ is a descendant of } \alpha \text{ in the CCG}\}$$

The broad (or super) concepts of a concept, reversely, are itself and the concepts with a wide scope of meaning to cover all concepts exhaustively. For example, in [Fig. 2.1], the broad concepts of **C₁** are **C₁**, **P₁** and **R**, and the broad concepts of **C₂** are **C₂**, **P₁**, **P₂**, and **R**. We can consider the broad concept set as the constituent (or feature) set of that concept, because the meaning features of that concept are inherited from these broad concepts.

We use the broad concepts to compute the conceptual similarity between two concepts. On a CCG, these are represented by the ancestors, so the set of broad concepts is defined as [Definition 2.5]

Definition 2.5.

The set of broad concepts of a concept α given a CCG :

$$BCS(\alpha) = \{\chi | \forall \chi, \chi \text{ is an ancestor of } \alpha \text{ in the CCG}\}$$

Example 2.3 .

NCSs and BCSs of all concepts in [Example 2.1]

- | | |
|---|---|
| 1. NCS(R) = { R , P₁ , P₂ , C₁ , C₂ , C₃ }, | BCS(R) = { R } |
| 2. NCS(P₁) = { P₁ , C₁ , C₂ , C₃ }, | BCS(P₁) = { P₁ , R } |
| 3. NCS(P₂) = { P₂ , C₂ , C₃ }, | NCS(P₂) = { P₂ , R } |
| 4. NCS(C₁) = { C₁ }, | BCS(C₁) = { C₁ , P₁ , R } |
| 5. NCS(C₂) = { C₂ }, | BCS(C₂) = { C₂ , P₁ , P₂ , R } |
| 6. NCS(C₃) = { C₃ }, | BCS(C₃) = { C₃ , P₁ , P₂ , R } |

Chapter 3.

Distance Computation

In this chapter, we introduce a distance measure using the NCS of concepts to compute the concept distance between linguistic expressions.

3.1 The distance between two expressions

It is desirable to compute the linguistic (or semantic) distance of two expressions with the whole meaning of two expressions, but it is not easy to understand an expression and describe its semantic structure. Assuming that the distance of each word pair in the expressions is known (see 3.2), we defined the distance between the two expressions as the average of the word distances like [*Definition 3.1*].

Definition 3.1.

The distance between two expressions I_n and E_n which have n words, and $\text{Word_DisT}()$ is defined in section 3.2. :

Let $I_n = [i_1, i_2, \dots, i_n]$, $E_n = [e_1, e_2, \dots, e_n]$

$$\text{Exp_DisT}(I_n, E_n) = \frac{\sum_i \text{Word_DisT}(i_i, e_i)}{n}$$

It is necessary to pursue other methods which offer greater validation and efficiency, since this computation is simple but has weak validation.

3.2 The distance between two words

The concepts of a word may be various, so the concept distance computation of words must be able to disambiguate this. The best solution, naturally, is to select the concept of a word according to the context of the expressions, but it is also necessary to understand the expressions. Assuming that the context is unknown, a human being probably selects the minimum distance of all of the concept pairs of two words as the distance of the two words. So, we define it as [*Definition 3.2*], like a human.

Definition 3.2.

The distance between two words :

$$\text{Word_DisT}(\omega_1, \omega_2) = \min_{\alpha_1, \alpha_2} \text{Concept_DisT}(\alpha_1, \alpha_2),$$
$$; \alpha_1 \in \text{Concept}(\omega_1), \alpha_2 \in \text{Concept}(\omega_2)$$

Example 3.1.

The word distance between ω_1 and ω_2 in [Example 2.1] : The (C_1, C_3) and (P_1, C_1) are the possible concept pairs. If the concept distance between P_1 and C_1 is 3, and the distance between C_1 and C_3 is 5 then :

$$\text{Word_Concept}(\omega_1) = \{P_1, C_3\}$$
$$\text{Word_Concept}(\omega_2) = \{C_1\}$$

$$\text{Word_DisT}(\omega_1, \omega_2) = \min (\text{Con_DisT}(P_1, C_1), \text{Con_DisT}(C_3, C_1))$$
$$= \min (3, 5) = 3$$

When the words are the heads of expressions, the word distance is defined by the sum of the word distance of the head words and the expression distance of these expressions in [Definition 3.3]

Definition 3.3. The word distance between two expressions ε_1 and ε_2

Let ω_1 be the head of ε_1 and ω_2 be the head of ε_2 .

$$\text{Word_DisT}(\varepsilon_1, \varepsilon_2) = \text{Word_DisT}(\omega_1, \omega_2) + \text{EXP_DisT}(\varepsilon_1, \varepsilon_2)$$

3.3 The distance between two concepts in a CCG

Intuitively, the relation of two concepts in a CCG is described by the concepts that link the two concepts, and the distance between the two concepts is reflected by the sum of each link length. In [Kim 93], the length of the shortest chain which has two concepts as the end points, is the distance between the two concepts¹. By introducing this idea to our study in [Definition 3.4], we defined the distance between two concepts as the length of the shortest chain, as shown in [Definition 3.5].

¹ However, this paper only defines the length of the chain by the summation of the length, and does not define the weight of the length explicitly.

Definition 3.4.

The length of a chain $[\alpha_0, \alpha_1, \dots, \alpha_n]$ is the summation of all the lengths of the edges [Definition 3.6] in the chain, as follow :

$$\text{Chain_Length}([\alpha_0, \alpha_1, \dots, \alpha_n]) = \sum_i \text{Edge_Length}(\alpha_{i-1} \leftrightarrow \alpha_i)$$

Definition 3.5.

The distance between two concepts is the minimum length of all chains which have the two concepts as end-points.

$$\text{Concept_DisT}(\alpha, \beta) = \min_{[\alpha, \dots, \beta]} \text{Chain_Length}([\alpha, \dots, \beta]);$$

Example 3.2.

The concept distance between C_1 and C_3 : When the numbers in [Fig. 3.1] are the edge lengths, then we know that the shortest chain is $[C_1, P_1, C_3]$.

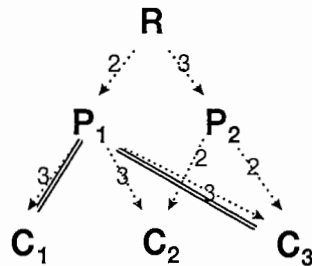


Fig. 3.1 An example CCG

Therefore the distance is the sum of the two edge lengths in the following.

$$\begin{aligned} \text{Concept_DisT}(C_1, C_3) &= \text{Chain_Length}([C_1, P_1, C_3]) \\ &= \text{Edge_Length}(P_1, C_1) + \text{Edge_Length}(P_1, C_3) = 3 + 3 = 6 \end{aligned}$$

In [Definition 3.5], the length of the edge is the very distance between two adjacent concepts such that one is a parent and the other is its child. The distance between a parent P and a child C_1 may be evaluated by the difference in these concepts, the black section in (a) of [Fig. 3.2]. For example, C_2 has less difference or larger intersection with P than C_1 , so we can think that C_2 is conceptually closer to P than C_1 .

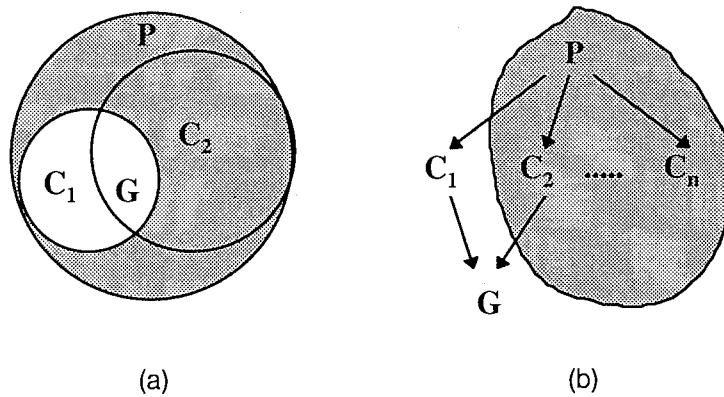


Fig. 3.2. A Concept Distance

A concept difference can be described by the difference of NCS [Definition 2.4] of the concepts, i.e., the black section in (b) of [Fig. 3.2]. As a result, the edge length is defined as the cardinality of the difference set of the parent's NCS and the child's NCS like [Definition 3.6].

Definition 3.6. The length of the edges

$$\text{Edge_Length}(\rho \mapsto \chi) = |\text{NCS}(\rho) \ominus \text{NCS}(\chi)| = |\text{NCS}(\rho) - \text{NCS}(\chi)|$$

Example 3.3.

All of the edge lengths in a CCG of [Example 2.1] are represented in [Fig. 3.1]. The length of $R \mapsto P_1$ is computed like this :

$$\text{NCS}(R) = \{ R, P_1, P_2, C_1, C_2, C_3 \}, \quad \text{NCS}(P_1) = \{ P_1, C_1, C_2, C_3 \}$$

$$\text{Difference}(R, P_1) = \text{NCS}(R) - \text{NCS}(P_1) = \{ R, P_2 \}$$

$$\text{Edge_Length}(R \mapsto P_1) = |\text{NCS}(R) - \text{NCS}(P_1)| = 2$$

3.4 Searching for the shortest chain

The distance computation, or the search for the shortest chain between two concepts in a CCG, is the most time consuming part of this method and directly affects the system's performance. In this section, we describe an attempt to find an effective search algorithm for use in this model.

To solve this problem of computation time, we first tried a "greedy" technique, well known as Dijkstra's algorithm [AHO 82]. This algorithm searches for the shortest paths

from a single source to all destinations and has time bounded by $O(e \log n)$: e is the edge number and n is the node number. But, this technique turned out to be so inefficient for our system that we could not obtain any desirable results and switched to another algorithm.

Next, we developed a heuristic algorithm considering some of the properties of a CCG. To identify about all chains between α and β , if α is an ancestor of β , then the shortest path length is simply $|\text{INCS}(\beta)| - |\text{INCS}(\alpha)|$. But, if not :

1. The paths which have an LCA of α and β are longer than the paths which do not have it.
2. Among two paths having an HCD, the path which has the bigger HCD is shorter.

We define the term **GCD** as [Definition 3.7] and describe our algorithm as follows.

Definition 3.7.

A concept's *Greatest Common Descendent concept (GCD)* between two children is the common descendant of the children which has the biggest NCS.

Example 3.4.

In Fig. 2.1, the **GCD** of **R** between P_1 and P_2 is C_1 , if $|\text{INCS}(C_1)|$ is greater than $|\text{INCS}(C_2)|$.

Algorithm 3.1 Concept_Distance(α, β)

```

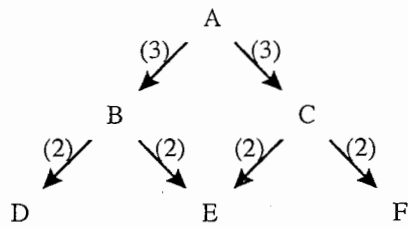
Begin
Find the least LCA of  $\alpha$  and  $\beta$  [1]
if LCA is  $\alpha$  or  $\beta$  itself then Concept_Distance =  $|\text{INCS}(\alpha)| - |\text{INCS}(\beta)|$  [2.1]
else if GCD of LCA on the branches of  $\alpha$  and  $\beta$  exist [2.2]
    then Concept_Distance =  $\text{Concept\_Distance}(\alpha, \text{GCD}) + \text{Concept\_Distance}(\beta, \text{GCD})$  [2.2.1]
    else Concept_Distance =  $2 * |\text{NCS}(\text{LCA})| - (|\text{INCS}(\alpha)| + |\text{INCS}(\beta)|)$  [2.2.2]
End

```

In **Algorithm 3.1**, the lines [1] and [2.2] clearly take $O(n)$ time, and [2.1] and [2.2.2] take $O(1)$. But, [2.2.1] takes $O(n^2)$ in the worst case when the CCG is skewed. As a result, the total time spent in this algorithm is bounded by $O(n^2)$.

Example 3.5.

A distance computation between **D** and **F** with **Algorithm 3.1**



Concept_Distance(D,F)

1. [1] : LCA of D and F is A
2. [2.2] : GCD of A is E
3. [2.2.1] : Concept_Distance(D,E)
 4. [1] : LCA of D and E is B
 5. [2.2.2] : $\text{Concept_Distance}(D,E) = 2 * |\text{NCS}(B)| - (|\text{NCS}(D)| + |\text{NCS}(E)|) = 2*3 - (1+1) = 4$
 6. RETURN
7. [2.2.1] : Concept_Distance(E,F)
 8. [1] : LCA of D and E is C
 9. [2.2.2] : $\text{Concept_Distance}(E,F) = 2 * |\text{NCS}(C)| - (|\text{NCS}(E)| + |\text{NCS}(F)|) = 2*3 - (1+1) = 4$
 10. RETURN
11. [2.2.1] : $\text{Concept_Distance}(D,F) = \text{Concept_Distance}(D,E) + \text{Concept_Distance}(E,F) = 4 + 4 = 8$
12. RETURN

Chapter 4.

Similarity Computation

In this chapter, we introduce a linguistic similarity measure, which is regarded as the size of common concepts.

The similarity of concepts is the relative size of the common concepts compared to the union of the two concepts, as shown in [Fig. 4.1]. Then, when the two concepts are the same, the similarity is 1, and when they are completely different case, the similarity is 0.

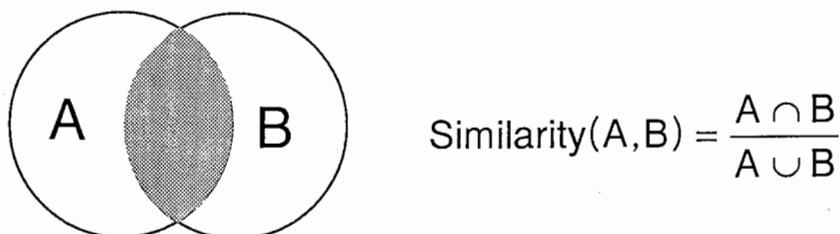


Fig. 4.1 The similarity of A and B

4.1 The similarity between two expressions

To compute the similarity between two expressions, first it is necessary to get the concept of each expression. By the way, the concept of an expression is combined with the concepts of words, but it is also very difficult to know the exact combining method and to discern the common concept from the complex concepts of an expression. Without any linguistic or statistic knowledge, this model computes the similarity of expressions by the similarities of each word pair and the following assumption.

Assumption 4.1.

The similarity of each word pair (A,B) of two expressions is the probability gained by statistical observation, and the only thing which affects the probability is its word pair, which is statistically independent on each other.

With this assumption, we can imagine that the similarity between two expressions can

be described by the multiple of all similarities of each word pair in expressions like [Definition 4.1].

Definition 4.1 .

The similarity between two expressions I_n and E_n which have n segments :

Let $I_n = [i_1, i_2, \dots, i_n]$, $E_n = [e_1, e_2, \dots, e_n]$.

$$\text{Exp_SimT}(I_n, E_n) = \prod_i \text{Word_SimT}(i_i, e_i)$$

4.2 The similarity between two words

The concepts of a word may be various, so the concept similarity computations of words also must have the solution to this ambiguity. Like [Definition 3.2], with the assumption that the context is unknown and according as the behavior of a human being, we define the maximum similarity of each concept pair in words, [Definition 4.2], as the similarity of the words.

Definition 4.2.

The word similarity between two words ω_1 and ω_2

$$\text{Word_SimT}(\omega_1, \omega_2) = \max_{\alpha_1, \alpha_2} \text{Con_SimT}(\alpha_1, \alpha_2)$$

When, $\alpha_1 \in \text{Concept}(\omega_1)$, $\alpha_2 \in \text{Concept}(\omega_2)$

Example 4.1.

The word similarity between ω_1 and ω_2 in [Example 2.1] : (C_1, C_3) and (P_1, C_1) are the possible concept pairs. As in Example 4.2, the concept similarity between P_1 and C_1 is 0.67, and the similarity between C_1 and C_3 is 0.4 then :

$$\text{Word_Concept}(\omega_1) = \{P_1, C_3\}$$

$$\text{Word_Concept}(\omega_2) = \{C_1\}$$

$$\begin{aligned} \text{Word_SimT}(\omega_1, \omega_2) &= \mathbf{max} (\text{Con_SimT}(P_1, C_1), \text{Con_SimT}(C_3, C_1)) \\ &= \mathbf{max} (0.67, 0.4) = 0.67 \end{aligned}$$

In the case where words may be expressions in [Definition 4.2], the word similarity of these expressions is defined by the multiple of the word distance of the head words and the ratio of the similarity of the expressions, [Definition 4.3].

Definition 4.3.

The word similarity between two expressions ε_1 and ε_2

Let ω_1 be the head of ε_1 and ω_2 be the head of ε_2 , then

$$\text{Word_SimT}(\varepsilon_1, \varepsilon_2) = \text{Word_SimT}(\omega_1, \omega_2) \times \text{EXP_SimT}(\varepsilon_1, \varepsilon_2)$$

4.3 The similarity between two concepts in a CCG

In this research, the more general concepts including two concepts are considered to be the common concepts of the two concepts. For example, <color> and <non physical object> may be some common concepts of <green> and <red>. And, <bird>, <animal> and <physical object> may be common concepts of <bird> and <hawk>. In a CCG, these common concepts are the intersection of the BCS [Definition 2.5] of the two concept.

Therefore, we define the similarity as the relative size of the intersection of the BCS of the two concepts compared to the union of the BCS of the two concepts, [Definition 4.4].

Definition 4.4.

The similarity between two concepts in the given CCG

$$\text{Con_SimT}(\alpha, \beta) = \frac{|\text{BCS}(\alpha) \cap \text{BCS}(\beta)|}{|\text{BCS}(\alpha) \cup \text{BCS}(\beta)|}$$

Example 4.2.

The similarity between C_1 and C_3 , and between C_1 and P_1 in [Example 2.1].

$$\text{BCS}(P_1) = \{P_1, R\}, \text{BCS}(C_1) = \{C_1, P_1, R\}, \text{BCS}(C_3) = \{C_3, P_1, P_2, R\}$$

$$\text{Con_SimT}(C_1, C_3) = \frac{|\{R, P_1\}|}{|\{R, P_1, P_2, C_1, C_3\}|} = \frac{2}{5} = 0.4$$

$$\text{Con_SimT}(P_1, C_1) = \frac{|\{R, P_1\}|}{|\{R, P_1, C_1\}|} = \frac{2}{3} = 0.67$$

In this example, C_1 and C_2 have $\{P_1, R\}$ as a common concept set and $\{R, P_1, P_2, C_1, C_3\}$ as a union, so the similarity between C_1 and C_3 is 0.4. On the other hand, the similarity between P_1 and C_1 is 0.67, so we think that C_1 is more similar to P_1 than C_3 .

Chapter 5.

Experimentation

We have experimented on the performance of our computation models by replacing our models with the distance calculation mechanism of the present TDMT system. Using Japanese-to-English translation for 158 untrained sentences about hotel room reservations, we compared the two models proposed here, which use the EDR thesaurus, the model proposed by [OI 95], which also uses the EDR thesaurus, and the present system's model proposed by [Sumita 92], which uses the [Kadokawa] thesaurus.

The translation results of the four methods are presented with their distance (or similarity) values in the [Appendix].

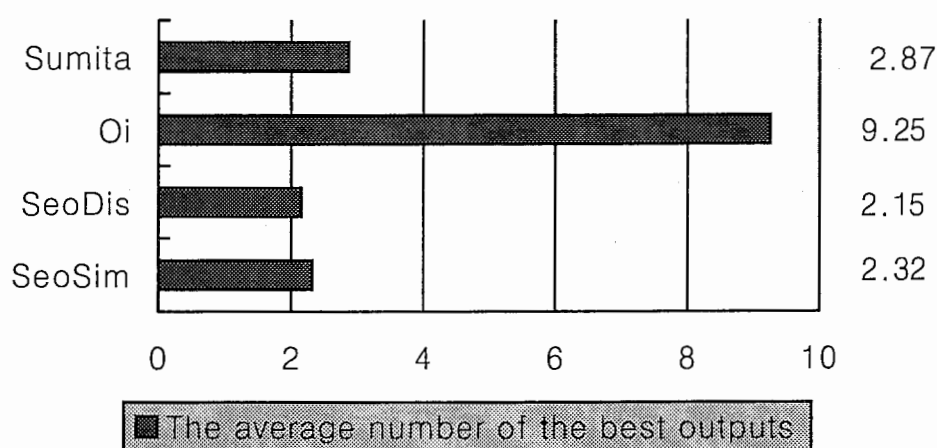
[Oi], [SeoDis], [SeoSim], and [Sumita] represent the distance computing methods of [OI 95], our distance computing method explained in Chapter 3, our similarity computing method explained in Chapter 4, and the distance computing method of [Sumita 92], respectively.

For all four methods, the same number of sentences, 114 of 158, resulted in output sentences.

As for translation quality, we could not conclude the superiority of our methods because the amount of the system's example training can be considered insufficient.

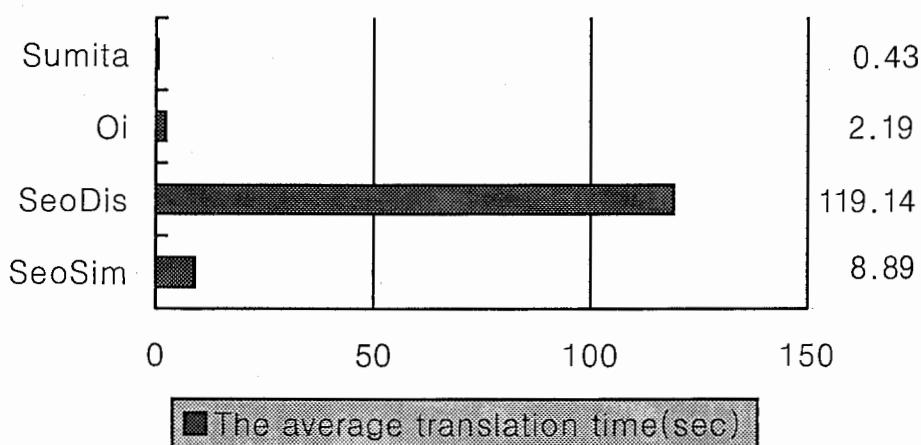
There were no conspicuous differences in output quality between the four methods. Although the present system's method, [Sumita 92] seemed to present slightly inferior results, this might have been caused not by the computation mechanism, but by the utilization of the different thesauri.

[Graph 5.1] shows the average number of best outputs for the 114 sentences, which were counted excluding the cases with no output.



Graph 5.1

[Graph 5.2] shows the average translation time for the 158 sentences.



Graph 5.2

From [Graph 5.1] and [Graph 5.2], for the methods which used the EDR thesaurus, it is evident that the determination technique of the best-one output in [Oi], and the efficient computation technique in [SeoDis] are necessary.

However, these four methods can be considered to be more applicative and promising for translation quality, since they can be used with the general and complicated thesauri.

Chapter 6

Conclusion

In this research, we have studied the development of a new method to compute the distance between linguistic expressions using a general semantic concept classification structure for TDMT. As a result, we proposed two distance computation models : the distance model and the similarity model, using a semantic dictionary with a DAG structure concept classification, defined as the CCG.

The distance model computes the distance between two expressions using the narrow concept sets of each concept on the CCG, regarding the narrow concept set of a concept as the partition (or domain) of that concept on the total concept. And, the similarity model computes the similarity between two expressions using the broad concept sets of each concept on the CCG, regarding the broad concept set of a concept as constituent (or feature) set of that concept.

The proposed models can also be profitably applied to other systems which use a DAG structure thesaurus as the linguistic knowledge for the semantic distance computation of linguistic objects. Especially, document retrieval systems can use the word distance computations of the proposed models to obtain matching documents and queries.

The similarity model may be used effectively for Context Sensitive Grammar parsing, providing that it can use A* algorithm to search for the optimal parsing tree. The tree weight, by similarity, is always smaller than its subtrees.

The distance model takes a lot of time, because it has to search for the shortest path on the CCG, known as a NP-hard problem. We proposed a heuristic algorithm of $O(n^2)$ using some of the properties of the CCG, but the proposed algorithm does not ensure the optimal results for all cases.

Ignoring accuracy, we know by the experimental results that the proposed models have few ambiguities, but take a lot of time to compute. And, comparing the two proposed models, The processing of the similarity model is about 13 times as fast as that of the distance model, although the similarity model is a little more ambiguous than the

distance model.

As future study, we need to develop other, efficient algorithms that ensure the optimal solution for the distance model and to experiment on the accuracy of these models with a large amount of data. Also, the expression computation phase in the distance model, whose validation is weak, should be studied more.

Acknowledgment

The authors would like to thank Mr. Kozo Oi, Mr. Eiichiro Sumita, Mr. Jun Kawai, and Mr. Hideo Kurihara for their continuous technical support.

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Appendix

1 (J "日本から来ました")

[Oi] (("It came from japan" . 0.7222222))
[SeoDis] (("It came from japan" . 14.116209))
[SeoSim] (("It came from japan" . 0.092436984))
[Sumita] (("Came from japan" . 0.500005))

2 (J "会社名は別に書かなくてもよろしいですよ")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

3 (J "今調べておりますので少々お待ちください")

[Oi] (("I am checking now . please wait a moment" . 0.33333835))
[SeoDis] (("I am checking now . please wait a moment" . 4.6464334))
[SeoSim] (("I am checking now . please wait a moment" . 0.30738464))
[Sumita] (("I am checking now . please wait a moment" . 0.57143646))

4 (J "申し訳ございませんどうやらご予約を承っていないようですがどちらでご予約されましたか")

[Oi] (("I'm afraid it seems to be arrange not a reservation .
where did you reserve ?" . 7.30557)
("I'm afraid it seems to be arrange not a reservation .
where did you reserve ?" . 7.30557)
("I'm afraid it seems to be arrange not a reservation .
where i reserved" . 7.30557)
("I'm afraid it seems to be arrange not a reservation .
where i reserved" . 7.30557))
[SeoDis] (("I'm afraid it seems to be arrange not a reservation .
where did you reserve ?" . 27579.895)
("I'm afraid it seems to be arrange not a reservation .
where did you reserve ?" . 27579.895))
[SeoSim] (("I'm afraid it seems that a reservation i don't arrange .
where did you reserve ?" . 2.3662508e-17)
("I'm afraid it seems that a reservation i don't arrange .
where did you reserve ?" . 2.3662508e-17))
[Sumita] (("I'm afraid it seems that a reservation i don't arrange .
where did you reserve ?" . 6.075413))

5 (J "その名前ではご予約がありません")

[Oi] (("There isn't a reservation at the name" . 1.0555656)
("There aren't a reservation they at the name" . 1.0555656)
("There isn't a reservation in the name" . 1.0555656)
("There isn't a reservation in the name" . 1.0555656))
[SeoDis] (("There isn't a reservation the name" . 353.06976))

[SeoSim] (("There isn't a reservation the name" . 0.0098568015))
[Sumita] (("There isn't a reservation on the name" . 0.9889023))

6 (J "東京の旅行会社で予約しました")

[Oi] (("I reserved in the travel agency from tokyo" . 0.7222222))
[SeoDis] (("I reserved in the travel agency from tokyo" . 230.0079))
[SeoSim] (("I reserved in the travel agency from tokyo" . 0.016968329))
[Sumita] (("I reserved in the travel agency from tokyo" . 0.44444945))

7 (J "もう一度調べてください")

[Oi] (("Please check once more" . 0.8888896))
[SeoDis] (("Please check once more" . 57.2136))
[SeoSim] (("Please check once more" . 0.07826087))
[Sumita] (("Please check me once more" . 1.0238096))

8 (J "確認書はお持ちですか")

[Oi] (("Do i have the confirmation slip ?" . 5.0e-6)
("Has the confirmation slip ?" . 5.0e-6))
[SeoDis] (("Does have the confirmation slip ?" . 50000.395)
("Does have the confirmation slip ?" . 50000.395))
[SeoSim] (("Do i have the confirmation slip ?" . 0.10703572)
("Has the confirmation slip ?" . 0.10703572))
[Sumita] (("I have the confirmation slip" . 0.35898745))

9 (J "はいもっています")

[Oi] (("Yes, i have" . 5.0e-6)
("Yes, it has" . 5.0e-6)
("Yes, has" . 5.0e-6))
[SeoDis] (("Yes, i have" . 5.0e-6)
("Yes, it has" . 5.0e-6)
("Yes, has" . 5.0e-6))
[SeoSim] (("Yes, i have" . 0.999))
[Sumita] (("Yes, i have" . 5.0e-6))

10 (J "これがそうです")

[Oi] (("That's right this" . 6.0)
("This is that's right" . 6.0))
[SeoDis] (("That's right this" . 50000.0)
("This is that's right" . 50000.0))
[SeoSim] (("That's right this" . 4.6709952e-11)
("This is that's right" . 4.6709952e-11))
[Sumita] (("That's right this" . 6.083336))

11 (J "いいえあいにく日本に忘れてきてしまったのですが")

[Oi] (("No, i'm afraid forgot on japan" . 3.1111262)
("No, i'm afraid forgot to japan" . 3.1111262))

("No, i'm afraid i forgot on japan" . 3.1111262)
("No, i'm afraid i forgot to japan" . 3.1111262))
[SeoDis] (("No, i'm afraid forgot on japan" . 668.5977))
[SeoSim] (("No, i'm afraid i forgot to japan" . 3.047762e-4))
[Sumita] (("No, i'm afraid i forgot to japan" . 3.0833535)
("No, i'm afraid i forgot to japan" . 3.0833535))

12 (J "旅行会社はわかりますか")

[Oi] (("Do you know the travel agency ?" . 0.3888889)
("I know the travel agency" . 0.3888889))
[SeoDis] (("Do you know the travel agency ?" . 125.614136)
("I know the travel agency" . 125.614136))
[SeoSim] (("As for the travel agency , do you know ?" . 0.1)
("As for the travel agency , i know" . 0.1))
[Sumita] (("Do you know the travel agency ?" . 0.375005)
("I know the travel agency" . 0.375005))

13 (J "旅行会社はわかります")

[Oi] (("I know the travel agency" . 0.3888889))
[SeoDis] (("I know the travel agency" . 125.614136))
[SeoSim] (("As for the travel agency , i know" . 0.1))
[Sumita] (("I know the travel agency" . 0.375005))

14 (J "では旅行会社の名前を教えてください")

[Oi] (("Well, please tell the name of the travel agency" . 0.44444945)
("Well, please tell the name of the travel agency" . 0.44444945)
("Well, please tell the travel agency name" . 0.44444945)
("Well, please tell me the name of the travel agency" . 0.44444945)
("Well, please tell me the name of the travel agency" . 0.44444945)
("Well, please tell me the travel agency name" . 0.44444945))
[SeoDis] (("Well, please tell the name of the travel agency" . 223.65483)
("Well, please tell me the name of the travel agency" . 223.65483))
[SeoSim] (("Well, please tell the travel agency name" . 0.0998001)
("Well, please tell me the travel agency name" . 0.0998001))
[Sumita] (("Well, please tell the name of the travel agency" . 0.33333835)
("Well, please tell me the name of the travel agency" . 0.33333835))

15 (J "こちらで確認いたします")

[Oi] (("I will check here" . 0.2222222))
[SeoDis] (("I will check here" . 7.099375))
[SeoSim] (("I will check here" . 0.30769232))
[Sumita] (("I will check here" . 0.023813816))

16 (J "上のほうの階の部屋をお願いしたいのですがとってもらえますか")

[Oi] (("You would arrange a room on an upper floor . would you take ?" . 7.1111164)
("I would like to room on an upper floor . would you take ?" . 7.1111164))

("I would like to have a room on an upper floor . would you take ?" . 7.1111164))
[SeoDis] (("I would like to have a room on an upper floor . would you take ?" . 50189.543))
[SeoSim] (("I would like to have a room on an upper floor . would you take ?" . 2.413616e-12))
[Sumita] (("You would arrange a room on an upper floor . would you take ?" . 7.3333383)
 ("I would like to have a room on an upper floor . would you take ?" . 7.3333383))

17 (J "残念ですが下の階のお部屋しか空いておりません")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

18 (J "三階になりますがよろしいですか")

[Oi] ("Third floor , but is that all right ?" . 1.75)
 ("Third floor , but that is good" . 1.75))
[SeoDis] (("Third floor , but is that all right ?" . 1706.9265)
 ("Third floor , but that is good" . 1706.9265))
[SeoSim] (("Third floor , but is that all right ?" . 5.6012803e-4)
 ("Third floor , but that is good" . 5.6012803e-4))
[Sumita] (("It is third floor , but is that all right ?" . 1.8333334)
 ("It is third floor , but that is good" . 1.8333334))

19 (J "なるべく眺めのいいお部屋をお願いします")

[Oi] ("I would like to have a room with the fine view , if possible" . 1.0e-5)
 ("I would like to have a room with the fine view , if possible" . 1.0e-5))
[SeoDis] ("I would like to have a room with the fine view , if possible" . 1.0e-5)
 ("I would like to have a room with the fine view , if possible" . 1.0e-5))
[SeoSim] ("I would like to have a room with the fine view , if possible" . 0.99800104)
 ("I would like to have a room with the fine view , if possible" . 0.99800104))
[Sumita] ("I would like to have a room with the fine view , if possible" . 1.0e-5)
 ("I would like to have a room with the fine view , if possible" . 1.0e-5))

20 (J "部屋にテレビはついていますか")

[Oi] ("Is there the television in a room ?" . 0.33333334)
 ("Is there the television in a room ?" . 0.33333334)
 ("Is included in the television in a room ?" . 0.33333334)
 ("There is the television in a room" . 0.33333334)
 ("There is the television in a room" . 0.33333334)
 ("It is included in the television in a room" . 0.33333334)
 ("There is the television in a room" . 0.33333334))
[SeoDis] ("Is there the television in a room ?" . 108.68672)
 ("There is the television in a room" . 108.68672)
 ("There is the television in a room" . 108.68672))
[SeoSim] ("Is there the television in a room ?" . 0.23076923))
[Sumita] ("Is there the television in a room ?" . 0.16666667))

21 (J "有料になりますがついております")

[Oi] (("It will be pay , but is included" . 1.8611112)
("It is pay , but is included" . 1.8611112)
("It pay , but is included" . 1.8611112)
("Pay , but is included" . 1.8611112))
[SeoDis] (("It is pay , but is included" . 711.36646))
[SeoSim] (("It is pay , but is included" . 0.0012531328)
("It pay , but is included" . 0.0012531328)
("Pay , but is included" . 0.0012531328))
[Sumita] (("It is pay , but is included" . 1.0394837)
("It pay , but is included" . 1.0394837)
("Pay , but is included" . 1.0394837))

22 (J "お湯はいつでも使えますか")

[Oi] (("Can i use the hot water at any time ?" . 1.3333384))
[SeoDis] (("Can use at any time the hot water ?" . 721.1647))
[SeoSim] (("Can i use the hot water at any time ?" . 0.02883117))
[Sumita] (("Can i use the hot water at any time ?" . 1.0555656))

23 (J "いつでも使うことが出来ます")

[Oi] (("I can use at any time" . 1.888889))
[SeoDis] (("I can use at any time" . 530.25793))
[SeoSim] (("I can use at any time" . 0.014545455))
[Sumita] (("It will use at any time" . 1.7777778)
("I will use at any time" . 1.7777778))

24 (J "もし使えないようでしたらすぐにご連絡ください")

[Oi] (("If it not can uses , please contact me right away" . 2.3333435)
("If can't use , please contact me right away" . 2.3333435))
[SeoDis] (("If can't use , please contact me right away" . 166.9317))
[SeoSim] (("If can't use , please contact me right away" . 0.005811341))
[Sumita] (("Please do not contact me in the case of it seems that can use right away" . 2.000019)
("Please do not contact me in the case of it seems that can use right away" . 2.000019))

25 (J "もしよかったら部屋を見せてもらえますか")

[Oi] (("When i good , do i found you would show a room ?" . 4.8055606)
("If good , would you show a room ?" . 4.8055606))
[SeoDis] (("If good , would you show a room ?" . 25343.38))
[SeoSim] (("Would you show a room to good ?" . 5.573278e-13))
[Sumita] (("If good , would you show a room ?" . 4.5416718))

26 (J "もっと大きな部屋はありませんか")

[Oi] (("Is there a larger room ?" . 1.1111112)
("Isn't there a larger room ?" . 1.1111112))
[SeoDis] (("Is there a larger room ?" . 446.08853)
("Isn't there a larger room ?" . 446.08853))

[SeoSim] (("Is there a larger room ?" . 0.06976744))
[Sumita] (("Is there a larger room ?" . 0.9166667))

27 (J "前金はいりますか")

[Oi] (("Is the deposit necessary ?" . 0.0)
("Will the deposit be necessary ?" . 0.0)
("Is the deposit necessary ?" . 0.0)
("Is the deposit necessary ?" . 0.0)
("Is the deposit necessary ?" . 0.0))
[SeoDis] (("Is the deposit necessary ?" . 0.0)
("Will the deposit be necessary ?" . 0.0)
("Is the deposit necessary ?" . 0.0)
("Is the deposit necessary ?" . 0.0)
("Is the deposit necessary ?" . 0.0))
[SeoSim] (("Is the deposit necessary ?" . 1.0))
[Sumita] (("Is the deposit necessary ?" . 0.0))

28 (J "いりません")

[Oi] (("I amn't" . 0.0))
[SeoDis] (("I amn't" . 0.0))
[SeoSim] (("I amn't" . 1.0))
[Sumita] (("I amn't" . 0.0))

29 (J "クレジットカードは使えますか")

[Oi] (("Can i use the credit card ?" . 0.44444445))
[SeoDis] (("Can use the credit card ?" . 111.451355))
[SeoSim] (("Can i use the credit card ?" . 0.16216215))
[Sumita] (("Can i use the credit card ?" . 5.0e-6))

30 (J "カードはブイアイエスエーしか使えません")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

31 (J "カード現金ドルでしたらどれでも結構です")

[Oi] (("Which is the card good on cash dollar" . 2.7222223)
("Which is good on the card cash dollar" . 2.7222223)
("Which is good on cash dollar the card" . 2.7222223))
[SeoDis] (("Which is good on cash dollar" . 2741.2227))
[SeoSim] (("Which is the card good on cash dollar" . 3.6221394e-6))
[Sumita] (("Which is cash the card a good dollar" . 8.222227)
("Which is cash the card a good dollar" . 8.222227)
("Which is cash the card good on the dollar" . 8.222227)
("Which is cash the card good in the dollar" . 8.222227)
("Which is cash the card good in the case of the dollar" . 8.222227))

32 (J "両替もできますのでお申しつけ下さい")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

33 (J "何泊おとりしましょうか")

[Oi] (("How many days could i take ?" . 0.7222272))
[SeoDis] (("How many days could i take ?" . 222.98877))
[SeoSim] (("How many days could i take ?" . 0.035678573))
[Sumita] (("How many days could i take ?" . 0.77273226))

34 (J "今晚から三泊お願いします")

[Oi] (("For three nights from this evening , please" . 0.33333334))
[SeoDis] (("For three nights from this evening , please" . 158.45134))
[SeoSim] (("For three nights from this evening , please" . 0.2))
[Sumita] (("For three nights from this evening , please" . 0.33333334))

35 (J "空き部屋はありますか")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

36 (J "今日の宿泊分ですか")

[Oi] (("The stay for today ?" . 0.0)
("The stay for today ?" . 0.0))
[SeoDis] (("The stay for today ?" . 0.0)
("The stay for today ?" . 0.0))
[SeoSim] (("The stay for today ?" . 1.0))
[Sumita] (("The stay for today ?" . 0.0))

37 (J "今日の宿泊でバス付きのシングルを一部屋お願いします")

[Oi] (("I the stay for today the room a single with a bath , please" . 6.9444447)
("The room a single with a bath the stay for today , please" . 6.9444447)
("The stay for today the room a single with a bath , please" . 6.9444447)
("For the stay for today the room a single with a bath , please" . 6.9444447)
("The room a single with a bath stay for today , please" . 6.9444447))
[SeoDis] (("The room a single with a bath stay for today , please" . 50683.164))
[SeoSim] (("I the stay for today the room a single with a bath , please" . 3.5032463e-12))
[Sumita] (("For the stay for today the room a single with a bath , please" . 6.66667)
("For the stay for today the room single with a bath , please" . 6.66667))

38 (J "バスなしのお部屋でしたらご用意できます")

[Oi] (("We can prepare without the bus room" . 1.4444546))

[SeoDis] (("We can prepare without the bus room" . 498.5255))
[SeoSim] (("We can prepare without the bus room" . 0.021446666))
[Sumita] (("We can prepare a room on without the bus" . 6.7777925)
("We can prepare a room for without the bus" . 6.7777925)
("We can prepare a room without the bus" . 6.7777925)
("We can prepare a room without the bus" . 6.7777925)
("We can prepare a room of without the bus" . 6.7777925)
("We can prepare without the bus room" . 6.7777925)
("We can prepare without bus room" . 6.7777925))

39 (J "共同のバスはそちらにありますか")

[Oi] (("Is there the bus there at the cooperation ?" . 0.5)
("Is there there the bus leaving ?" . 0.5)
("Is there there the cooperation bus ?" . 0.5)
("Is there the bus there at the cooperation ?" . 0.5)
("Is there there the bus leaving ?" . 0.5)
("Is there there the cooperation bus ?" . 0.5)
("Is there the bus there at the cooperation ?" . 0.5)
("Is there there the bus leaving ?" . 0.5))
[SeoDis] (("Is there the bus the cooperation there ?" . 212.31721)
("Is there the bus the cooperation there ?" . 212.31721)
("Is there the bus the cooperation there ?" . 212.31721))
[SeoSim] (("Is there there the cooperation bus ?" . 0.11111111))
[Sumita] (("Is there the bus there at the cooperation ?" . 0.5)
("Is there there the bus leaving ?" . 0.5)
("Is there there the cooperation bus ?" . 0.5))

40 (J "ありませんが近くに銭湯がございまして宿泊のお客様にご利用いただいています")

[Oi] (("There isn't and there is the public bath nearby
and it is use to the guest who stays" . 15.861116))
[SeoDis] (("There isn't and there is the public bath nearby
and uses to the guest who stays" . 125466.8))
[SeoSim] (("There isn't and there is the public bath nearby
and i am using to the guest who stays" . 5.6856096e-33)
("There isn't and there is the public bath nearby
and i used to the guest who stays" . 5.6856096e-33)
("There isn't and there is the public bath nearby
and i use to the guest who stays" . 5.6856096e-33))
[Sumita] (("There isn't and there is the public bath nearby
and it is use at the guest who stays" . 15.611135))

41 (J "今晚泊まりたいのですがベッドは空いていますか")

[Oi] (("I would like to stay this evening . is a bed available ?" . 0.7222222))
[SeoDis] (("I would like to stay this evening , but is it a bed available ?" . 18.583956))
[SeoSim] (("I would like to stay this evening . is a bed available ?" . 0.040404044))
[Sumita] (("I would like to stay this evening , but is a bed available ?" . 0.6666667))

("I would like to stay this evening . is a bed available ?" . 0.6666667))

42 (J "六から八人の大部屋でしたら空いています")

[Oi] nil

[SeoDis] nil

[SeoSim] nil

[Sumita] nil

43 (J "会員なのですが割引はありますか")

[Oi] (("Is there the discount as for the member ?" . 1.2777778)

("Is the discount as for the member ?" . 1.2777778)

("Is there the discount as for the member ?" . 1.2777778)

("Is the discount as for the member ?" . 1.2777778)

("Is there the discount as for the member ?" . 1.2777778)

("Is the discount as for the member ?" . 1.2777778))

[SeoDis] (("I the member and is the discount ?" . 166.43417)

("I the member and is the discount ?" . 166.43417)

("I the member and is the discount ?" . 166.43417))

[SeoSim] (("Is there the discount as for the member ?" . 0.0045519206))

[Sumita] (("Is there the discount as for the member ?" . 1.4166666))

44 (J "会員証はお持ちですか")

[Oi] (("Do i have the membership card ?" . 0.33333835)

("Has the membership card ?" . 0.33333835))

[SeoDis] (("Does have the membership card ?" . 50000.395)

("Does have the membership card ?" . 50000.395))

[SeoSim] (("Do i have the membership card ?" . 0.07284375)

("Has the membership card ?" . 0.07284375))

[Sumita] (("I have the membership card" . 0.35898745))

45 (J "会員証を持っていないのですが")

[Oi] (("I don't have the membership card" . 0.7777828)

("I don't have the membership card" . 0.7777828))

[SeoDis] (("I don't have the membership card" . 50023.53))

[SeoSim] (("I don't have the membership card" . 0.05853516))

[Sumita] (("I don't have the membership card" . 0.6923208))

46 (J "会員証を忘れてきたのですが会員料金で宿泊できませんか")

[Oi] (("Forgot the membership card ,
but could you stay at the charge for the member ?" . 5.2222223)

("Forgot the membership card ,

but can you stay at the charge for the member ?" . 5.2222223)

("I forgot the membership card ,

but could you stay at the charge for the member ?" . 5.2222223)

("I forgot the membership card ,

but can you stay at the charge for the member ?" . 5.2222223))

[SeoDis] (("Forgot the membership card ,
but the member can you stay at the charge ?" . 50485.562))
[SeoSim] (("I forgot the membership card ,
but the member you the charge ?" . 5.720677e-8))
[Sumita] (("I forgot the membership card ,
but can you stay in the fare for the member ?" . 4.9166765)
("I forgot the membership card ,
but can you stay in the charge for the member ?" . 4.9166765)
("I forgot the membership card ,
but can you stay in the fare for the member ?" . 4.9166765)
("I forgot the membership card ,
but can you stay in the charge for the member ?" . 4.9166765))

47 (J "そうですかそれでは会員外の宿泊料金になります")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

48 (J "わかりました本当は会員証を提示していただかないといけません但今回は会員料金で用意します")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

49 (J "少し高すぎませんか")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

50 (J "まけてもらえないですか")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

51 (J "割引料金はありますか")

[Oi] (("Is there the charge for the discount ?" . 1.1666667)
("Is there the charge in the discount ?" . 1.1666667)
("Is there the charge of the discount ?" . 1.1666667)
("Is there the discount ?" . 1.1666667)
("Is the charge for the discount ?" . 1.1666667)
("Is the charge in the discount ?" . 1.1666667)
("Is the charge of the discount ?" . 1.1666667))

("Is the discount ?" . 1.1666667))
[SeoDis] (("Is the charge the discount ?" . 275.64822)
("Is the charge the discount ?" . 275.64822)
("Is the charge the discount ?" . 275.64822))
[SeoSim] (("Is ?" . 0.008003201)
("Is the discount ?" . 0.008003201))
[Sumita] (("Is there the charge for the discount ?" . 0.8333417))

52 (J "この券を持っていると十パーセント宿泊料割引になると聞きましたが")

[Oi] (("Ten percent i asked discounts the room charge has had this ticket" . 2.333346)
("Ten percent i asked discounts the room charge has this ticket" . 2.333346)
("Ten percent i asked discounts the room charge you have had this ticket" . 2.333346)
("Ten percent i asked discounts the room charge you have this ticket" . 2.333346))
[SeoDis] (("Ten percent i would discount you have had this ticket the room charge" . 50308.664)
("Ten percent i would discount you have this ticket the room charge" . 50308.664))
[SeoSim] (("Ten percent i asked discounts the room charge has this ticket" . 1.2661654e-5))
[Sumita] (("I heard discounts ten percent the room charge has this ticket" . 2.1111479))

53 (J "大変申し訳ありませんがこの券は期限切れになっています")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

54 (J "ここでホテルを予約できますか")

[Oi] (("Can i reserve the hotel in here ?" . 0.3888889))
[SeoDis] (("Can i reserve the hotel on here ?" . 211.27527))
[SeoSim] (("Can i reserve the hotel on here ?" . 0.13793103))
[Sumita] (("Can i reserve the hotel here ?" . 0.27778113))

55 (J "はいできます")

[Oi] (("Yes, i can do" . 5.0e-6))
[SeoDis] (("Yes, i can do" . 5.0e-6))
[SeoSim] (("Yes, i can do" . 0.999))
[Sumita] (("Yes, i can do" . 5.0e-6))

56 (J "いつの宿泊を予約されますか")

[Oi] (("Do you reserve at when be the stay ?" . 0.75)
("Do you reserve from when be the stay ?" . 0.75)
("Do you reserve when be the stay ?" . 0.75)
("Is when is the stay reserve ?" . 0.75))
[SeoDis] (("Do you reserve at when be the stay ?" . 3192.0486))
[SeoSim] (("Do you reserve when be the stay ?" . 0.0052083335))
[Sumita] (("Do you reserve when be the stay ?" . 0.6944444))

57 (J "三月二十一日木曜日に一泊お願いできますか")

[Oi] ("Could i ask for one night on thursday march twenty first ?" . 0.5555606)
 ("Can i ask for one night on thursday march twenty first ?" . 0.5555606))
 [SeoDis] ("Could i ask for one night on thursday march twenty first ?" . 255.21524)
 ("Can i ask for one night on thursday march twenty first ?" . 255.21524))
 [SeoSim] ("Could i ask for one night on thursday march twenty first ?" . 0.07302632)
 ("Can i ask for one night on thursday march twenty first ?" . 0.07302632))
 [Sumita] ("Could i ask for one night on thursday march twenty first ?" . 0.27778614)
 ("Can i ask for one night on thursday march twenty first ?" . 0.27778614))

58 (J "何名さまですか")

[Oi] ("How many people are you ?" . 0.0))
 [SeoDis] ("How many people are you ?" . 0.0))
 [SeoSim] ("How many people are you ?" . 1.0))
 [Sumita] ("How many people are you ?" . 0.0))

59 (J "今晚で二名お願いできますか")

[Oi] ("Could i ask for this evening and two people ?" . 1.000005)
 ("Can i ask for this evening and two people ?" . 1.000005)
 ("Could i have this evening and two people ?" . 1.000005)
 ("Can i have this evening and two people ?" . 1.000005)
 ("Could i ask for two people at this evening ?" . 1.000005)
 ("Can i ask for two people at this evening ?" . 1.000005))
 [SeoDis] ("Could i have two people this evening ?" . 352.74362)
 ("Can i have two people this evening ?" . 352.74362))
 [SeoSim] ("Could i have this evening and two people ?" . 0.005662349)
 ("Can i have this evening and two people ?" . 0.005662349))
 [Sumita] ("Could i ask for this evening and two people ?" . 0.7500075)
 ("Can i ask for this evening and two people ?" . 0.7500075)
 ("Could i ask for two people at this evening ?" . 0.7500075)
 ("Can i ask for two people at this evening ?" . 0.7500075))

60 (J "どのようなホテルでもよろしいですか")

[Oi] ("What kind of hotel is all right ?" . 0.3888889)
 ("What kind of hotel is good" . 0.3888889))
 [SeoDis] ("What kind of hotel is all right ?" . 413.52005)
 ("What kind of hotel is good" . 413.52005))
 [SeoSim] ("What kind of hotel is all right ?" . 0.14814815)
 ("What kind of hotel is good" . 0.14814815))
 [Sumita] ("What kind of hotel is all right ?" . 0.5)
 ("What kind of hotel is good" . 0.5))

61 (J "市内のホテルがいいです")

[Oi] ("The hotel within the city is good" . 0.3888889)
 ("The hotel of within the city is good" . 0.3888889)
 ("Within the city hotel is good" . 0.3888889)
 ("The hotel within the city is good" . 0.3888889))

("The hotel of within the city is good" . 0.3888889)
 ("Within the city hotel is good" . 0.3888889))
 [SeoDis] (("Within the city hotel is good" . 100.34514
 ("Within the city hotel is good" . 100.34514))
 [SeoSim] (("Within the city hotel is good" . 0.14285715)
 ("Within the city hotel is good" . 0.14285715))
 [Sumita] (("Within the city hotel is good" . 0.16667369)
 ("Within the city hotel is good" . 0.16667369))

62 (J "ええ清潔であればどこでもいいです")

[Oi] (("If you yes, clean , where is good" . 1.000005)
 ("If you yes, clean , where is good" . 1.000005))
 [SeoDis] (("If you yes, clean , where is good" . 712.87555)
 ("If you yes, clean , where is good" . 712.87555))
 [SeoSim] (("If you yes, clean , where is good" . 0.0044712275)
 ("If you yes, clean , where is good" . 0.0044712275))
 [Sumita] (("If you yes, clean , where is good" . 0.8333459)
 ("If you yes, clean , where is good" . 0.8333459))

63 (J "安全な場所がいいのですが")

[Oi] (("The security one is good" . 0.6666767)
 ("The security one is good" . 0.6666767)
 ("The security one is good" . 0.6666767)
 ("That is the security one" . 0.6666767)
 ("The security one" . 0.6666767)
 ("The security one is a good thing" . 0.6666767)
 ("The security one is a good thing" . 0.6666767)
 ("The security one is a good thing" . 0.6666767)
 ("The security one is a good thing" . 0.6666767))
 [SeoDis] (("The place is the security a good thing" . 166.59451)
 ("The place is the security a good thing" . 166.59451))
 [SeoSim] (("The security place is good" . 0.07841437)
 ("The security place is good" . 0.07841437)
 ("The security place is good" . 0.07841437)
 ("The security place is a good thing" . 0.07841437)
 ("The security place is a good thing" . 0.07841437)
 ("The security place is a good thing" . 0.07841437)
 ("The security place is a good thing" . 0.07841437))
 [Sumita] (("The security one is good" . 0.62501)
 ("The security one is good" . 0.62501)
 ("The security one is good" . 0.62501)
 ("The security one is a good thing" . 0.62501)
 ("The security one is a good thing" . 0.62501)
 ("The security one is a good thing" . 0.62501)
 ("The security one is a good thing" . 0.62501))

64 (J "以前ニューヨークのホテルでひどい目にあったことがあるんですが")

[Oi] nil

[SeoDis] nil

[SeoSim] nil

[Sumita] nil

65 (J "どんな目にあわれましたか")

[Oi] (("Did you meet how be the eye ?" . 2.0))

[SeoDis] (("What kind of eye did you meet ?" . 209.59256))

[SeoSim] (("Did you meet how be the eye ?" . 0.0013176044))

[Sumita] (("To which eye could you meet ?" . 2.282053))

66 (J "ホテルを出た途端ひったくりにあいました")

[Oi] nil

[SeoDis] nil

[SeoSim] nil

[Sumita] nil

67 (J "あまりそうじなどが行き届いていませんでした")

[Oi] nil

[SeoDis] nil

[SeoSim] nil

[Sumita] nil

68 (J "ホテルマンの愛想がわるかったんです")

[Oi] nil

[SeoDis] nil

[SeoSim] nil

[Sumita] nil

69 (J "怖くない安全なところに泊まりたいんです")

[Oi] (("I would like to not stay in the security to a scary place" . 2.2222273))

[SeoDis] (("I not the security to scary" . 2198.7192))

[SeoSim] (("I would like to not stay in the security to a scary place" . 3.255663e-4))

[Sumita] (("I would like to not stay at the security to a scary place" . 2.522227))

70 (J "安全であればいいんです")

[Oi] nil

[SeoDis] nil

[SeoSim] nil

[Sumita] nil

71 (J "こじんまりしたホテルはありますか")

[Oi] nil

[SeoDis] nil

[SeoSim] nil

[Sumita] nil

72 (J "小ざれいな感じのホテルだったらいいです")

[Oi] nil

[SeoDis] nil

[SeoSim] nil

[Sumita] nil

73 (J "ご予算はどのくらいを考えていらっしゃいますか")

[Oi] (("Do you think the price range how ?" . 15.037042)

("How do you think apart from the price range ?" . 15.037042))

[SeoDis] (("How do you think apart from the price range ?" . 117122.086))

[SeoSim] (("Will it think how is the price range ?" . 6.544978e-31)

("Will it think how being the price range ?" . 6.544978e-31)

("Is it think how is the price range ?" . 6.544978e-31)

("Is it think how being the price range ?" . 6.544978e-31)

("Does it think how is the price range ?" . 6.544978e-31)

("Does it think how being the price range ?" . 6.544978e-31))

[Sumita] (("How do you think by the price range ?" . 11.58334))

74 (J "中級ホテルぐらいがいいです")

[Oi] (("A standard hotel is good" . 0.8888914)

("A standard hotel is good" . 0.8888914))

[SeoDis] (("The hotel is good" . 501.54108)

("The hotel is good" . 501.54108)

("The hotel is good" . 501.54108)

("The hotel is good" . 501.54108))

[SeoSim] (("A standard hotel is good" . 0.060729485)

("A standard hotel is good" . 0.060729485))

[Sumita] (("A standard hotel is good" . 0.16667917)

("A standard hotel is good" . 0.16667917))

75 (J "お部屋空いているようですがシングル二つかツインのお部屋どちらになさいますか")

[Oi] (("It seems that i an available room

and do you do two single or a twin room , either ?" . 3.2222323)

("It seems that i an available room

and are you doing two single or a twin room , where ?" . 3.2222323)

("It seems that i an available room

and do you do two single or a twin room , where ?" . 3.2222323)

("It seems that a room i available

and do you do two single or a twin room , either ?" . 3.222323))

[SeoDis] (("It seems that a room i available and a single ,

two or a twin a room would like to you have either ?" . 1023.5547))

[SeoSim] (("It seems that a room i available

and where are you doing two single or a twin a room , ?" . 1.05693564e-6)

("It seems that a room i available

and where are you doing two single or a twin room , ?" . 1.05693564e-6))
[Sumita] (("It seems that i an available room .
would like to you have two single or a twin room , either ?" . 3.3796504)
("It seems to be an available room .
would like to you have two single or a twin room , either ?" . 3.3796504)
("It seems that a room i available .
would like to you have two single or a twin room , either ?" . 3.3796504))

76 (J "料金は違うのですか")

[Oi] (("Is the charge different ?" . 0.0)
("Is the charge different ?" . 0.0)
("Is the charge different ?" . 0.0))
[SeoDis] (("Is the charge different ?" . 0.0)
("Is the charge different ?" . 0.0)
("Is the charge different ?" . 0.0))
[SeoSim] (("Is the charge different ?" . 1.0)
("Is the charge different ?" . 1.0)
("Is the charge different ?" . 1.0))
[Sumita] (("Is the charge different ?" . 0.0)
("Is the charge different ?" . 0.0)
("Is the charge different ?" . 0.0))

77 (J "ツインの方がシングルより二万ウォン高いようですよ")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

78 (J "じゃあ安い方をお願いいたします")

[Oi] (("Well, i would like to have a cheaper one" . 0.33333835))
[SeoDis] (("Well, i would like to have a cheaper one" . 80.375984))
[SeoSim] (("Well, i would like to have a cheaper one" . 0.19028573))
[Sumita] (("Well, a cheaper one thank you very much" . 0.22223057))

79 (J "どちらかいい方を予約してください")

[Oi] (("Please reserve either a good one" . 0.6666667)
("Please reserve either a better one" . 0.6666667))
[SeoDis] (("Please reserve either a good one" . 8.554353))
[SeoSim] (("Please reserve either a better one" . 0.0020908003))
[Sumita] (("Please reserve either a better one" . 1.1627094))

80 (J "スイートしか空いてないようですがどうされますか")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

81 (J "スイートでもよろしいですか")

[Oi] (("Is the suite room all right ?" . 0.44444445)
("The suite room is good" . 0.44444445))
[SeoDis] (("Is that suite room all right ?" . 219.09169)
("That is the suite room good" . 219.09169))
[SeoSim] (("Is the suite room all right ?" . 0.16)
("The suite room is good" . 0.16))
[Sumita] (("Is the suite room all right ?" . 0.5)
("The suite room is good" . 0.5))

82 (J "料金はかなり高いのしょうね")

[Oi] (("Is the charge very expensive ?" . 1.2222273)
("Is the charge very expensive thing ?" . 1.2222273)
("Is the charge very expensive thing ?" . 1.2222273)
("Is the charge very expensive thing ?" . 1.2222273))
[SeoDis] (("Is the charge very expensive ?" . 121.21453)
("Is the charge very expensive thing ?" . 121.21453)
("Is the charge very expensive thing ?" . 121.21453)
("Is the charge very expensive thing ?" . 121.21453))
[SeoSim] (("Is the charge very expensive ?" . 0.028065553))
[Sumita] (("Is the charge very expensive ?" . 0.8444557))

83 (J "ええシングルの一点五倍ぐらいです")

[Oi] (("Yes, that is one of single . five about the time" . 2.4444494)
("Yes, that is one of single . five about the time" . 2.4444494)
("Yes, it is one of single . five about the time" . 2.4444494)
("Yes, it is one of single . five about the time" . 2.4444494)
("Yes, one of single . five about the time" . 2.4444494)
("Yes, one of single . five about the time" . 2.4444494))
[SeoDis] (("Yes, it is one of a single . five" . 1214.2164)
("Yes, it is one . five of a single" . 1214.2164))
[SeoSim] (("Yes, it is a single one . five" . 1.1021534e-4)
("Yes, it is a single one . five" . 1.1021534e-4))
[Sumita] (("Yes, single one . five" . 1.655579)
("Yes, single one . five" . 1.655579))

84 (J "とりあえず予約しておいてください")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

85 (J "キャンセルできるか聞いて下さい")

[Oi] (("Please hear can cancel" . 2.1111114)
("Please hear can cancel" . 2.1111114))

[SeoDis] (("Please hear can cancel" . 381.77167)
("Please hear can cancel" . 381.77167))
[SeoSim] (("Please hear can cancel" . 0.0015556552)
("Please hear can cancel" . 0.0015556552))
[Sumita] (("Please hear can cancel" . 1.7000175))

86 (J "キャンセルはできません")

[Oi] (("We can't cancel" . 1.2222223)
("There can't cancel" . 1.2222223)
("I can't cancel" . 1.2222223)
("Can't cancel" . 1.2222223))

[SeoDis] (("I can't cancel" . 44.716774)
[SeoSim] (("I can't cancel" . 0.0771605)
[Sumita] (("I can't cancel" . 0.6666767))

87 (J "キャンセルは前日までだそうですがどうしますか")

[Oi] (("It is hear it is them by the day before the cancellation ,
but how do i do ?" . 4.666667)
("It is hear it is them bying the day before the cancellation ,
but how do i do ?" . 4.666667)
("It is hear he-she is them by the day before the cancellation ,
but how do i do ?" . 4.666667)
("It is hear them by the day before the cancellation ,
but how do i do ?" . 4.666667))

[SeoDis] (("It is hear them by the day before the cancellation . how does ?" . 18365.666))

[SeoSim] (("It is hear them by the day before the cancellation . how do i do ?" . 5.883949e-7)
("It is hear them by the day before the cancellation . how i will do" . 5.883949e-7))

[Sumita] (("It is hear it is them bying the day before the cancellation .
how do you do ?" . 4.083356)
("It is hear it is them bying the day before the cancellation .
how do i do ?" . 4.083356)
("It will be cancelling by the day before . how do you do ?" . 4.083356)
("It will be cancelling by the day before . how do i do ?" . 4.083356))

88 (J "予約しないでください")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

89 (J "他をあたってもらえますか")

[Oi] (("Would you hit other ?" . 1.2222222))
[SeoDis] (("Would you hit other ?" . 68.14629))
[SeoSim] (("Would you hit other ?" . 0.0052180625))
[Sumita] (("Would you hit other ?" . 1.6305555))

90 (J "送迎バスがあるかどうかきいていただけますか")

[Oi] nil

[SeoDis] nil

[SeoSim] nil

[Sumita] nil

91 (J "あるそうです")

[Oi] (("I hear is them" . 0.44444445))

[SeoDis] (("I hear is them" . 4.229762))

[SeoSim] (("I hear is them" . 0.3))

[Sumita] (("Will be" . 0.8333333))

92 (J "迎えにきてもらうよう頼みましょうか")

[Oi] nil

[SeoDis] nil

[SeoSim] nil

[Sumita] nil

93 (J "送迎バスがあるか聞いてみましょうか")

[Oi] nil

[SeoDis] nil

[SeoSim] nil

[Sumita] nil

94 (J "お願いします")

[Oi] (("Thank you very much" . 0))

[SeoDis] (("Thank you very much" . 0))

[SeoSim] (("Thank you very much" . 1))

[Sumita] (("Thank you very much" . 0))

95 (J "わたしの名前は山田です")

[Oi] (("My name is yamada" . 0.5)

("My name is yamada" . 0.5))

[SeoDis] (("My name is yamada" . 240.4363))

[SeoSim] (("My name is yamada" . 0.125))

[Sumita] (("My name is yamada" . 0.5)

("My name is yamada" . 0.5))

96 (J "何時頃きてもらえますか")

[Oi] (("Would you come ?" . 1.69444445)

("Would you come it ?" . 1.69444445))

[SeoDis] (("Would you come ?" . 4915.8677))

[SeoSim] (("Would you come ?" . 9.8931557e-4))

[Sumita] (("Would you come ?" . 1.5722222))

97 (J "今から三十分後に空港に着くそうです")

[Oi] (("I hear arrives them at the airport thirty minutes later from now" . 1.2777778)
("I will arrive at the airport thirty minutes later from now" . 1.2777778))
[SeoDis] (("I hear arrives them at the airport to thirty minutes later from now" . 127.49166))
[SeoSim] (("I hear arrives them at the airport at thirty minutes later from now" . 0.03939394))
[Sumita] (("I hear arrives them at the airport at thirty minutes later from now" . 0.93650794))

98 (J "今から一時間後に迎えに来てもらえますか")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

99 (J "時間の指定はできないそうですが")

[Oi] (("I hear the time can't reserve them" . 2.6666718)
("I hear can't reserve them the time" . 2.6666718))
[SeoDis] (("I hear can't reserve them the time" . 300.53406))
[SeoSim] (("I hear can't reserve them the time" . 3.5796964e-4))
[Sumita] (("I can't reserve the time" . 3.129637)
("I can't reserve the time" . 3.129637))

100 (J "どこで待ってればいいですか")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

101 (J "空港を出てシャトルバス乗り場あたりで待っていて下さい")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

102 (J "どのようなバスですか")

[Oi] (("What kind of bus ?" . 1.0))
[SeoDis] (("What kind of bus ?" . 26.448795))
[SeoSim] (("What kind of bus is it ?" . 0.0989418))
[Sumita] (("What kind of bus is it ?" . 0.6666767))

103 (J "赤いバスです")

[Oi] (("A red bus" . 1.0))
[SeoDis] (("It is a red bus" . 41.718742))
[SeoSim] (("A red bus" . 0.028441302))
[Sumita] (("It is a red bus" . 0.33334836))

104 (J "ホテルの看板を持ってるそうなので見つけて下さい")

[Oi] (("It seems that the sign in the hotel has had , so please find" . 2.2222223))

("It seems that the sign of the hotel has had , so please find" . 2.2222223)
 ("It seems that the sign in the hotel has , so please find" . 2.2222223)
 ("It seems that the sign of the hotel has , so please find" . 2.2222223)
 ("It seems that the sign in the hotel has had , so please find" . 2.2222223))
 [SeoDis] (("It seems that the sign of the hotel has had . please find" . 223.06296)
 ("It seems that the sign of the hotel has . please find" . 223.06296))
 [SeoSim] (("It seems that the sign in the hotel has , so please find" . 1.566416e-4)
 ("It seems that the sign of the hotel has , so please find" . 1.566416e-4))
 [Sumita] (("It seems that the sign of the hotel has . please find" . 2.1740036)
 ("It seems that the sign of the hotel has . please find it" . 2.1740036))

105 (J "声をかけてください")

[Oi] (("Please give the voice" . 0.3888889)
 ("Please give the voice" . 0.3888889))
 [SeoDis] (("Please give the voice" . 0.6880953))
 [SeoSim] (("Please dial the voice" . 0.16666667)
 ("Please make the voice" . 0.16666667)
 ("Please give the voice" . 0.16666667))
 [Sumita] (("Please dial the voice" . 0.5)
 ("Please make the voice" . 0.5)
 ("Please give the voice" . 0.5))

106 (J "ロッテホテルとあるのですぐわかると思いますよ")

[Oi] (("Is lotte hotel , so i will think you will find soon" . 0.3888939)
 ("Is lotte hotel , so i will think you will find soon" . 0.3888939)
 ("Is lotte hotel , so i think you will find soon" . 0.3888939)
 ("Is lotte hotel , so i think you will find soon" . 0.3888939))
 [SeoDis] (("Is lotte hotel , so i will think you will find soon" . 310.34573)
 ("Is lotte hotel , so i will think you will find soon" . 310.34573)
 ("Is lotte hotel , so i think you will find soon" . 310.34573)
 ("Is lotte hotel , so i think you will find soon" . 310.34573))
 [SeoSim] (("Is lotte hotel , so i think you will find soon" . 0.041625)
 ("Is lotte hotel , so i think you will find soon" . 0.041625))
 [Sumita] (("There is one lotte hotel , so i think you will find soon" . 0.500005)
 ("There is one lotte hotel , so i think you will find soon" . 0.500005))

107 (J "ありがとうございました")

[Oi] (("Thank you very much" . 0))
 [SeoDis] (("Thank you very much" . 0))
 [SeoSim] (("Thank you very much" . 1))
 [Sumita] (("Thank you very much" . 0))

108 (J "ホテルで名前を言えばわかりますか")

[Oi] (("If tells the name at the hotel , do you know ?" . 0.94444454)
 ("If tells the name at the hotel , i know" . 0.94444454))
 [SeoDis] (("If tells the name at the hotel , do you know ?" . 75.230965)

("If tells the name at the hotel , i know" . 75.230965))
 [SeoSim] (("If tells the name at the hotel , do you know ?" . 0.005982907)
 ("If tells the name at the hotel , i know" . 0.005982907))
 [Sumita] (("If tells the name at the hotel , do you know ?" . 1.4055605)
 ("If you tell the name at the hotel , do you know ?" . 1.4055605)
 ("If tells the name at the hotel , i know" . 1.4055605)
 ("If you tell the name at the hotel , i know" . 1.4055605))

109 (J "わかりますと思います")
 [Oi] (("I will think you will know" . 0.0)
 ("I will think you know" . 0.0)
 ("I think you will know" . 0.0)
 ("I think you know" . 0.0))
 [SeoDis] (("I will think you will know" . 0.0)
 ("I will think you know" . 0.0)
 ("I think you will know" . 0.0)
 ("I think you know" . 0.0))
 [SeoSim] (("I think you will know" . 1.0)
 ("I think you know" . 1.0))
 [Sumita] (("I think you will know" . 0.0)
 ("I think you know" . 0.0))

110 (J "こちらは空港案内所のチョでした")
 [Oi] (("You are the airport cho of the information center" . 2.055558)
 ("You are the airport the information center cho" . 2.055558)
 ("The airport this is cho of the information center" . 2.055558)
 ("The airport this is the information center cho" . 2.055558))
 [SeoDis] (("You are cho of the information center the airport" . 50611.406)
 ("This is cho of the information center the airport" . 50611.406))
 [SeoSim] (("The airport this is cho of the information center" . 3.155039e-4))
 [Sumita] (("This is cho of the airport , the information center" . 1.4444544)
 ("This is cho of the information center from the airport" . 1.4444544)
 ("This is cho of the information center in the airport" . 1.4444544))

111 (J "お気をつけて")
 [Oi] (("Have a nice trip" . 0))
 [SeoDis] (("Have a nice trip" . 0))
 [SeoSim] (("Have a nice trip" . 1))
 [Sumita] (("Have a nice trip" . 0))

112 (J "伊藤様で予約しておきました")
 [Oi] (("I reserved for mr-ms. ito" . 1.5)
 ("I reserved for mr. ito" . 1.5)
 ("I reserved for ms. ito" . 1.5)
 ("I reserved in mr-ms. ito" . 1.5)
 ("I reserved in mr. ito" . 1.5))

("I reserved in ms. ito" . 1.5)
 ("I reserved on mr-ms. ito" . 1.5)
 ("I reserved on mr. ito" . 1.5)
 ("I reserved on ms. ito" . 1.5)
 ("I reserved mr-ms. ito" . 1.5)
 ("I reserved mr. ito" . 1.5)
 ("I reserved ms. ito" . 1.5))
 [SeoDis] (("Mr-ms. ito was reserve" . 3916.354)
 ("Mr. ito was reserve" . 3916.354)
 ("Ms. ito was reserve" . 3916.354))
 [SeoSim] (("I reserved on mr-ms. ito" . 0.0014619884)
 ("I reserved on mr. ito" . 0.0014619884)
 ("I reserved on ms. ito" . 0.0014619884))
 [Sumita] (("Mr-ms. ito was reserve" . 0.16669168)
 ("Mr. ito was reserve" . 0.16669168)
 ("Ms. ito was reserve" . 0.16669168))

113 (J "どうぞ良い旅を")

[Oi] nil
 [SeoDis] nil
 [SeoSim] nil
 [Sumita] nil

114 (J "そのホテルでは割引はしてもらえるのですか")

[Oi] (("Will you have someone discount in the hotel ?" . 10.500006))
 [SeoDis] (("Will you have someone discount in the hotel ?" . 77744.78))
 [SeoSim] (("Will they have someone discount at the hotel ?" . 2.5587052e-21)
 ("Will the hotel have someone discount ?" . 2.5587052e-21)
 ("Will i have someone discount at the hotel ?" . 2.5587052e-21)
 ("Will the hotel have someone discount ?" . 2.5587052e-21)
 ("Will you have someone discount at the hotel ?" . 2.5587052e-21)
 ("Will the hotel have someone discount ?" . 2.5587052e-21))
 [Sumita] (("Will you have someone discount in the hotel ?" . 10.416672))

115 (J "割引はしないと思います")

[Oi] (("I will think doesn't discount" . 1.0)
 ("I will think you won't discount" . 1.0)
 ("I will think you don't discount" . 1.0)
 ("I won't discount" . 1.0)
 ("I will think it doesn't discount" . 1.0)
 ("I think doesn't discount" . 1.0)
 ("I think you won't discount" . 1.0)
 ("I think you don't discount" . 1.0)
 ("I won't discount" . 1.0)
 ("I think it doesn't discount" . 1.0))
 [SeoDis] (("I won't discount" . 103.25053)

("I won't discount" . 103.25053))
[SeoSim] (("I think doesn't discount" . 0.09)
("I think you won't discount" . 0.09)
("I think you don't discount" . 0.09)
("I won't discount" . 0.09)
("I think it doesn't discount" . 0.09))
[Sumita] (("I think doesn't discount" . 0.70000005))

116 (J "交渉次第では宿泊料を割引してくれるかもしれませんが交渉してみてください")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

117 (J "割引券はありますか")

[Oi] (("Is there the discount ticket ?" . 0.44444445)
("Is the discount ticket ?" . 0.44444445)
("Is there the discount ticket ?" . 0.44444445)
("Is the discount ticket ?" . 0.44444445)
("Is there the discount ticket ?" . 0.44444445)
("Is the discount ticket ?" . 0.44444445))
[SeoDis] (("Is there the discount ticket ?" . 46.326923)
("Is there the discount ticket ?" . 46.326923)
("Is there the discount ticket ?" . 46.326923))
[SeoSim] (("Is there the discount ticket ?" . 0.24))
[Sumita] (("Is the discount tickets ?" . 0.2777828))

118 (J "このホテルの割引券は利用できますか")

[Oi] (("Can i use this discount ticket in the hotel ?" . 0.8888939)
("Can i use this discount ticket of the hotel ?" . 0.8888939)
("Can i use this discount ticket of the hotel ?" . 0.8888939)
("Can i use the discount ticket in this hotel ?" . 0.8888939)
("Can i use the discount ticket of this hotel ?" . 0.8888939)
("Can i use the discount ticket of this hotel ?" . 0.8888939))
[SeoDis] (("Can i use this discount ticket of the hotel ?" . 185.48193)
("Can i use the discount ticket of this hotel ?" . 185.48193))
[SeoSim] (("Can i use this discount ticket of the hotel ?" . 0.035028048)
("Can i use the discount ticket of this hotel ?" . 0.035028048))
[Sumita] (("Can i use this discount ticket in the hotel ?" . 0.33335337)
("Can i use the discount ticket in this hotel ?" . 0.33335337))

119 (J "利用できます")

[Oi] (("I can use" . 0.33333334))
[SeoDis] (("I can use" . 6.1002164))
[SeoSim] (("I can use" . 0.3181818))
[Sumita] (("I can use" . 0.33333334))

120 (J "日付がないので聞いてみないとわかりません")

[Oi] (("A missing date , so i don't know you don't hear" . 1.1111112))
[SeoDis] (("A missing date , so i don't know you don't hear" . 199.0773))
[SeoSim] (("The date is missing , so i don't know you don't hear" . 8.797655e-4))
[Sumita] (("Don't have the date , so i won't hear" . 1.3428657))

121 (J "どうぞホテルで提示なさってください")

[Oi] (("Please present me at the hotel" . 14.361111))
[SeoDis] (("Please present me at the hotel" . 116322.01))
[SeoSim] (("Please present me at the hotel" . 1.5526854e-15))
[Sumita] (("Please present me at the hotel" . 16.666668))

122 (J "特別なことがない限りたぶん割り引いてもらえます")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

123 (J "特別なことというかどうか")

[Oi] (("If you are a special thing , what sort of a thing it ?" . 1.3888938)
("If you are a special thing , what sort of a thing is it ?" . 1.3888938)
("If i am a special thing , what sort of a thing ?" . 1.3888938)
("If i am a special thing , what sort of a thing is it ?" . 1.3888938)
("If you are a special thing , what sort of a thing it is" . 1.3888938))
[SeoDis] (("If you are a special thing , what sort of a thing it ?" . 401.15173)
("If you are a special thing , what sort of a thing is it ?" . 401.15173)
("If you are a special thing , what sort of a thing it is" . 401.15173)
("If you are a special thing , what sort of a thing it" . 401.15173))
[SeoSim] (("If you are special , what sort of a thing it ?" . 1.9766524e-4)
("If you are special , what sort of a thing is it ?" . 1.9766524e-4)
("If you are special , what sort of a thing it is" . 1.9766524e-4)
("If you are special , what sort of a thing it" . 1.9766524e-4))
[Sumita] (("If i special , which a thing i ?" . 36.875004)
("If i special , what sort of a thing i ?" . 36.875004)
("If i special , which a thing will you ?" . 36.875004)
("If i special , what sort of a thing will you ?" . 36.875004)
("If i special , which a thing you ?" . 36.875004)
("If i special , what sort of a thing you ?" . 36.875004)
("If i special , which a thing at ?" . 36.875004))

124 (J "週末は割引しないところもあります")

[Oi] (("There is also the place where i don't discount the weekend" . 1.7777779)
("There is also the weekend the place where i don't discount" . 1.7777779)
("There is also the place where i don't discount the weekend" . 1.7777779)
("There is also the weekend the place where i don't discount" . 1.7777779))

[SeoDis] (("There is also the place which i don't discount the weekend" . 444.9778)
("There is also the place which i don't discount the weekend" . 444.9778))
[SeoSim] (("There is the place where i don't discount the weekend" . 7.231406e-4))
[Sumita] (("There is also the place where doesn't discount at the weekend" . 1.7000049))

125 (J "混んでいると割引はしません")

[Oi] (("I not discount crowded" . 2.0))
[SeoDis] (("I not discount crowded" . 1175.3185))
[SeoSim] (("I not discount crowded" . 0.012857145))
[Sumita] (("Not discounts crowded" . 1.7222223))

126 (J "そのホテルはこの地図ではどこらへんになりますか")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

127 (J "この辺りです")

[Oi] (("It is this around" . 5.0e-6))
[SeoDis] (("It is this around" . 5.0e-6))
[SeoSim] (("It is this around" . 0.333))
[Sumita] (("It is this around" . 1.4999999e-5))

128 (J "もう少し拡大した地図をおもちいたしましょうか")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

129 (J "もう少し見やすい地図はありませんか")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

130 (J "この地図持って帰っていいですか")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

131 (J "どうぞさし上げます")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

132 (J "ホテルを紹介していただきたいのですが")

[Oi] (("I would like you to recommend me the hotel" . 0.33333835))
[SeoDis] (("I would like you to recommend me the hotel" . 137.44586))
[SeoSim] (("I would like you to recommend me the hotel" . 0.29486394))
[Sumita] (("I would like you to recommend me the hotel" . 1.0e-5))

133 (J "どんなホテルをお探しですか")

[Oi] (("What kind of hotel do i look for ?" . 1.2222272)
("Which hotel do i look for ?" . 1.2222272)
("What kind of hotel i look for" . 1.2222272)
("Which hotel i look for" . 1.2222272))
[SeoDis] (("Which hotel do i look for ?" . 627.5436)
("Which hotel i look for" . 627.5436))
[SeoSim] (("Which hotel do i look for ?" . 0.04985935)
("Which hotel i look for" . 0.04985935))
[Sumita] (("What kind of hotel will you look for ?" . 1.3333384)
("What kind of hotel do you look for ?" . 1.3333384)
("What kind of hotel looks for ?" . 1.3333384)
("What kind of hotel i look for" . 1.3333384))

134 (J "ソウル駅からなるべく近いホテルを探しています")

[Oi] (("I am looking for close , if possible from the seoul station the hotel" . 0.6666717)
("I am looking for close , if possible from the seoul station the hotel" . 0.6666717))
[SeoDis] (("I am looking for close , if possible from the seoul station the hotel" . 147.78514))
[SeoSim] (("I am looking for close , if possible from the seoul station the hotel" . 0.029662777))
[Sumita] (("I am looking for close , if possible from the seoul station the hotel" . 0.350015))

135 (J "市の中心部にあるホテルを紹介してください")

[Oi] (("Please arrange the hotel which is located in the central city" . 1.5)
("Please arrange the hotel which is located in the central city" . 1.5)
("Please arrange me the hotel which is located in the central city" . 1.5))
[SeoDis] (("Please arrange the hotel which is located in the central of the city" . 573.9109))
[SeoSim] (("Please arrange the hotel which is located in the central city" . 0.012311481)
("Please arrange the hotel which is located in the central city" . 0.012311481))
[Sumita] (("Please arrange me the hotel which is located in the central city" . 0.8333384))

136 (J "安いホテルがいいです")

[Oi] (("A cheap hotel is good" . 0.33333334)
("A cheap hotel is good" . 0.33333334))
[SeoDis] (("A cheap hotel is good" . 137.2792)
("A cheap hotel is good" . 137.2792))
[SeoSim] (("A cheap hotel is good" . 0.29545453)
("A cheap hotel is good" . 0.29545453))
[Sumita] (("A cheap hotel is good" . 0.250005)
("A cheap hotel is good" . 0.250005))

137 (J "あまりマンハッタンから離れていなくて安いホテルがいいです")

[Oi] nil

[SeoDis] nil

[SeoSim] nil

[Sumita] nil

138 (J "それではロッテホテルがいいと思います")

[Oi] (("Well, i will think lotte hotel is good" . 5.0e-6)

("Well, i think lotte hotel is good" . 5.0e-6))

[SeoDis] (("Well, i will think lotte hotel is good" . 5.0e-6)

("Well, i think lotte hotel is good" . 5.0e-6))

[SeoSim] (("Well, i think lotte hotel is good" . 0.333))

[Sumita] (("Well, i think lotte hotel is good" . 1.0e-5))

139 (J "ロッテホテルしかないですね")

[Oi] nil

[SeoDis] nil

[SeoSim] nil

[Sumita] nil

140 (J "ロッテホテルしか空いていません")

[Oi] nil

[SeoDis] nil

[SeoSim] nil

[Sumita] nil

141 (J "そのホテルの電話番号を教えてください")

[Oi] (("Please tell the telephone number of the hotel" . 5.0e-6)

("Please tell me the telephone number of the hotel" . 5.0e-6)

("Please tell the telephone number of the hotel" . 5.0e-6)

("Please tell me the telephone number of the hotel" . 5.0e-6))

[SeoDis] (("Please tell the telephone number of the hotel" . 5.0e-6)

("Please tell me the telephone number of the hotel" . 5.0e-6)

("Please tell the telephone number of the hotel" . 5.0e-6)

("Please tell me the telephone number of the hotel" . 5.0e-6))

[SeoSim] (("Please tell the telephone number of the hotel" . 0.999)

("Please tell me the telephone number of the hotel" . 0.999)

("Please tell the telephone number of the hotel" . 0.999)

("Please tell me the telephone number of the hotel" . 0.999))

[Sumita] (("Please tell the telephone number of the hotel" . 5.0e-6)

("Please tell me the telephone number of the hotel" . 5.0e-6)

("Please tell the telephone number of the hotel" . 5.0e-6)

("Please tell me the telephone number of the hotel" . 5.0e-6))

142 (J "そのホテルのパンフレットがちょうどありますのでどうぞ")

[Oi] (("There is the pamphlet at the hotel , so please" . 1.7777828)
("There is the pamphlet at the hotel , so please" . 1.7777828)
("There is a pamphlet at the hotel , so please" . 1.7777828)
("There is a pamphlet at the hotel , so please" . 1.7777828))
[SeoDis] (("There is the pamphlet of the hotel , so please" . 551.7338)
("There is the pamphlet of the hotel , so please" . 551.7338)
("There is a pamphlet of the hotel , so please" . 551.7338)
("There is a pamphlet of the hotel , so please" . 551.7338))
[SeoSim] (("There is the pamphlet of the hotel , so please" . 0.0013117122)
("There is a pamphlet of the hotel , so please" . 0.0013117122))
[Sumita] (("There is the pamphlet at the hotel , so please" . 7.0833435)
("There is a pamphlet at the hotel , so please" . 7.0833435))

143 (J "他にもあと何件か電話番号を調べてもらえませんか")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

144 (J "あまり高くないホテルを紹介してください")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

145 (J "一泊十万ウォン以下のホテルはありますか")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

146 (J "たくさんありますよ")

[Oi] (("It many" . 0.2777828)
("Many" . 0.2777828))
[SeoDis] (("It many" . 15.910038)
("Many" . 15.910038))
[SeoSim] (("There is many" . 0.27245456)
("Is many" . 0.27245456)
("Many" . 0.27245456))
[Sumita] (("Is many" . 0.22222723)
("Many" . 0.22222723))

147 (J "ちょっと中心街から離れていますがクラウンホテルはどうでしょう")

[Oi] nil
[SeoDis] nil
[SeoSim] nil

[Sumita] nil

148 (J "クラウンホテルはご存知ですか")

[Oi] (("Is crown hotel in know ?" . 1.0555606)
("Is crown hotel in know ?" . 1.0555606)
("Is crown hotel in know ?" . 1.0555606)
("Is crown hotel in know ?" . 1.0555606))
[SeoDis] (("Is know crown hotel ?" . 159.80458)
("Is know crown hotel ?" . 159.80458))
[SeoSim] (("Is crown hotel in know ?" . 0.0259)
("Is crown hotel in know ?" . 0.0259)
("Is crown hotel in know ?" . 0.0259)
("Is crown hotel in know ?" . 0.0259))
[Sumita] (("Do you know crown hotel ?" . 0.29168668))

149 (J "知りません")

[Oi] (("I don't know" . 0.0))
[SeoDis] (("I don't know" . 0.0))
[SeoSim] (("I don't know" . 0.33333334))
[Sumita] (("I don't know" . 1.0e-5))

150 (J "一泊いくらですか")

[Oi] (("How much is it for one night ?" . 0.0))
[SeoDis] (("How much is it for one night ?" . 0.0))
[SeoSim] (("How much is it for one night ?" . 0.33333334))
[Sumita] (("How much is it for one night ?" . 0.33333334))

151 (J "シングルはないのですがツインでも六万ウォンぐらいです")

[Oi] (("There isn't a single is a twin and but,
it is sixty thousand won" . 32.500004)
("There isn't a single is a twin and but,
it is about sixty thousand won" . 32.500004)
("There isn't a single is a twin and but,
around sixty thousand won it is" . 32.500004)
("There isn't a single is a twin and but,
it is around sixty thousand won" . 32.500004))
[SeoDis] (("A missing single is a twin and but, that is sixty thousand won" . 250436.1)
("A missing single is a twin and but, that is about sixty thousand won" . 250436.1)
("A missing single is a twin and but, around sixty thousand won that is" . 250436.1)
("A missing single is a twin and but, that is around sixty thousand won" . 250436.1))
[SeoSim] (("There isn't a single a thing is a twin and but,
that is sixty thousand won" . 1.1473633e-33)
("There isn't a single a thing is a twin and but,
that is about sixty thousand won" . 1.1473633e-33)
("There isn't a single a thing is a twin and but,
around sixty thousand won that is" . 1.1473633e-33))

("There isn't a single a thing is a twin and but,
that is around sixty thousand won" . 1.1473633e-33))
[Sumita] (("A single missing , but a twin and but, it is about sixty thousand won" . 1.8611445)
("A single missing . a twin and but, it is about sixty thousand won" . 1.8611445)
("A single missing and a twin and but, it is about sixty thousand won" . 1.8611445))

152 (J "他にご希望はありますか ")

[Oi] (("Is there any other request ?" . 0.22222723)
("Is there any other request ?" . 0.22222723)
("Is there any other request ?" . 0.22222723))

[SeoDis] (("Is there any other request ?" . 7.780957)
("Is there any other request ?" . 7.780957)
("Is there any other request ?" . 7.780957))

[SeoSim] (("Is there any other request ?" . 0.22704546))

[Sumita] (("Is there any other request ?" . 0.33334336))

153 (J "この近辺にはありませんが少し離れた所でしたらありますよ ")

[Oi] (("There isn't this near and it is a little the place where left" . 1.3888988)
("There isn't this near and it is a little on the place where left" . 1.3888988)
("There isn't this near and is a little the place where left" . 1.3888988)
("There isn't this near and is a little on the place where left" . 1.3888988))

[SeoDis] (("There isn't this near and it is a little in the place where left" . 209.6681)
("There isn't this near and is a little in the place where left" . 209.6681))

[SeoSim] (("There isn't anything else .
is a little in the case of the place where left" . 1.1514734e-4))

[Sumita] (("There isn't this near and is a little in the place where left" . 1.5111477)
("There isn't this near and a little" . 1.5111477))

154 (J "どのくらい遠いのですか ")

[Oi] (("How is it far ?" . 6.0))

[SeoDis] (("How is it far ?" . 50000.0))

[SeoSim] (("How is it far ?" . 1.4012985e-10))

[Sumita] (("How is it far ?" . 0.26666668))

155 (J "ここから三十分ぐらいかかります ")

[Oi] (("It will take about thirty minutes from here" . 0.0))

[SeoDis] (("It will take about thirty minutes from here" . 0.0))

[SeoSim] (("It will take about thirty minutes from here" . 1.0))

[Sumita] (("It will take about thirty minutes from here" . 0.0))

156 (J "そこにはここからどのようにして行けばいいですか ")

[Oi] (("Could i go there ?" . 1.2777778)
("Could i go how doing from here there ?" . 1.2777778)
("Could i go from here there ?" . 1.2777778)
("Could i go how doing from here there ?" . 1.2777778)
("Could go from here there" . 1.2777778))

("Could go how doing from here there" . 1.2777778))
("I could go from here there" . 1.2777778)
("I could go how doing from here there" . 1.2777778)
[SeoDis] (("Could i go there ?" . 216.4107)
("Could go there" . 216.4107)
("I could go there" . 216.4107))
[SeoSim] (("How could i do and go from here there ?" . 0.022727273)
("How i could do and go from here there" . 0.022727273))
[Sumita] (("Could i go how doing from here there ?" . 1.1944494)
("I could go how doing from here there" . 1.1944494))

157 (J "歩いてですか")

[Oi] nil
[SeoDis] nil
[SeoSim] nil
[Sumita] nil

158 (J "いえ電車です")

[Oi] (("No, it is the train" . 0.44444945))
[SeoDis] (("No, it is the train" . 55.333336))
[SeoSim] (("No, it is the train" . 0.32110715))
[Sumita] (("No, it is the train" . 1.4999999e-5))