

Title	Talking-NAGATACHO : A virtual dialog system for politician agents
Author	Murakami, Harumi / Hirata, Takashi
Citation	大阪市立大学学術情報総合センター紀要. Vol. 4, p.37-44.
Issue Date	2003-03
ISSN	1345-4145
Type	Departmental Bulletin Paper
Textversion	Publisher
Publisher	大阪市立大学学術情報総合センター
Description	

Placed on: 大阪市立大学学術機関リポジトリ

Placed on: Osaka City University Repository

Talking-NAGATACHO: A Virtual Dialog System for Politician Agents

MURAKAMI Harumi[†] and HIRATA Takashi[‡]

We examine whether it is possible to achieve virtual dialog by constructing Agent knowledge from human utterance text in newspaper articles. In this research, we formed the following three hypotheses: (1) "It is possible to achieve Agent virtual dialog by creating associative representation from human utterance text in newspaper articles"; (2) "Agent virtual dialog systems created from newspaper articles are useful in understanding topics"; and (3) "topics related to politics are effective as contents." We then created a trial virtual dialog system for politician Agents, called Talking-NAGATACHO. The results of preliminary tests showed that it is possible to establish virtual dialog in cases where associative representation is created manually from the utterance text of politicians in newspaper articles, and that the system can be useful in the understanding of the characteristics of politicians' utterances and related topics.

Keywords: Talking-NAGATACHO, Agent, associative representation, virtual dialog system, understanding of opinions and topics

Talking-永田町：政治家エージェントの疑似会話システム

村上 晴美[†] 平田 高志[‡]

新聞記事中の人間の発言テキストからエージェントの知識を構築して疑似会話が可能かどうか検討する。本研究では、(1)「新聞記事中の人間の発言テキストから連想表現を作成することによりエージェントの疑似会話が可能である」、(2)「新聞記事から作成したエージェントの疑似会話システムが話題の理解に役立つ」、(3)「コンテンツとして政治の話題が有効である」、という仮説をたて、政治家エージェントの疑似会話システム Talking-永田町を試作した。予備的な実験の結果、新聞記事中の政治家の発言テキストから手作業で連想表現を作成してエージェントに与える場合に、疑似会話が成立する可能性と、システムが政治家の発言の特徴や、話題の理解に役立つ可能性を示した。

キーワード: Talking-永田町, エージェント, 連想表現, 疑似会話システム, 意見と話題の理解

1 Introduction

Up to now, we have been conducting research and development on the CoMeMo-Community[1, 2], a system for supporting the mutual understanding and sharing of knowledge among members of a community. In this system, the community members record knowledge using a form of knowledge representation called "associative representation," and provide this knowledge to an Agent that represents that member, sometimes referred to as the member's "virtualized ego." The Agent monitors a virtual dialog space; when a word contained in its own associative representation is selected, the Agent then approaches the area surrounding that

word. When the user selects an Agent, the associative representations of that Agent are displayed and read out loud. When the user selects a word from among the displayed associative representation, the Agent corresponding to that word approaches the word again. This type of continuous action is considered an "Agent virtual dialog." Through virtual dialog, the user discloses his own knowledge, gains an understanding of the knowledge of others, and adds new knowledge to that of others for disclosure. In the CoMeMo-Community, we tested whether or not it is possible to conduct an virtual dialog using the concepts of associative representation and the Agent, and achieved consistent results. Among the possible reasons for this are that in the community, there is a degree of shared background knowledge which enables an understanding of the associative representations created by others, and that members

[†] Media Center, Osaka City University
大阪市立大学 学術情報総合センター

[‡] Japan Ground Self Defense Force
防衛庁 陸上自衛隊

are able to add their own associative representations while viewing the associative representations of others.

In this research, we examine whether it is possible to achieve virtual dialog by constructing Agent knowledge from human utterance text in newspaper articles. In this research, we formed the following three hypotheses: (1) "It is possible to achieve Agent virtual dialog by creating associative representation from human utterance text in newspaper articles"; (2) "Agent virtual dialog systems created from newspaper articles are useful in understanding topics"; and (3) "topics related to politics are effective as contents"; and created a trial virtual dialog system for politician Agents called Talking-NAGATACHO using the CoMeMo-Community as a base.

In Section 2 of this paper, we provide an outline of the trial system, and in Section 3 we discuss tests conducted using the 2000 general election for the House of Representatives as topic material.

2 Talking-NAGATACHO

Talking-NAGATACHO is a virtual dialog system for politician Agents. Talking-NAGATACHO is comprised of two stages: (1) the construction of Agent knowledge, and (2) the Agent virtual dialog.

Figure 1 shows an outline of the system. In (1) construction of Agent knowledge, the user finds an utterance by a politician (a character string contained in Japanese brackets 「」) within a newspaper article, and creates an associative representation for each politician linking the utterance with a main group of keywords contained in the utterance. For example, let us assume that in a given newspaper article, it says, "According to A, 「…」." In this case, the segment 「…」 is considered Utterance 1; the main keywords key1 and key2 included in Utterance 1 are extracted; an associative representation linking key1 and key2 with Utterance 1 "key1 & key2 → Utterance 1" is created; and this associative representation is included in Agent A's knowledge. In (2) Agent virtual dialog, a series of actions is executed according to the basic approach that "when the user or the system provides a keyword, the Agent with that keyword contained in its associative representation makes an utterance"; this is considered a virtual dialog. For example, when a keyword (key1) is entered, this triggers an utterance by Agent A, which has key1 in its associative representation; another keyword (key2) contained in that associative representation triggers an utter-

ance by Agent B, which has key2 in its associative representation. Then, another keyword (key3) contained in Agent B's associative representation (key3) triggers another utterance by Agent A. This is the process of the virtual dialog.

2.1 Construction of Agent knowledge

Construction of Agent knowledge can be carried out manually using an editor, but it can also be carried out using an Overlay web browser and a

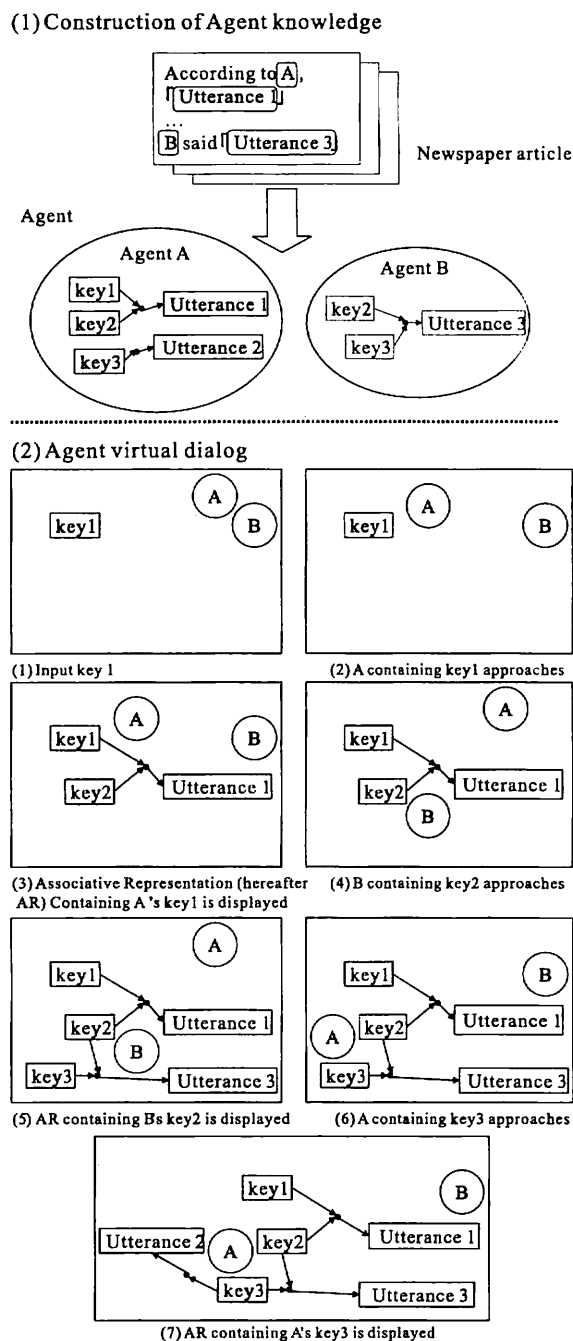


Figure 1: Outline of Talking-NAGATACHO.

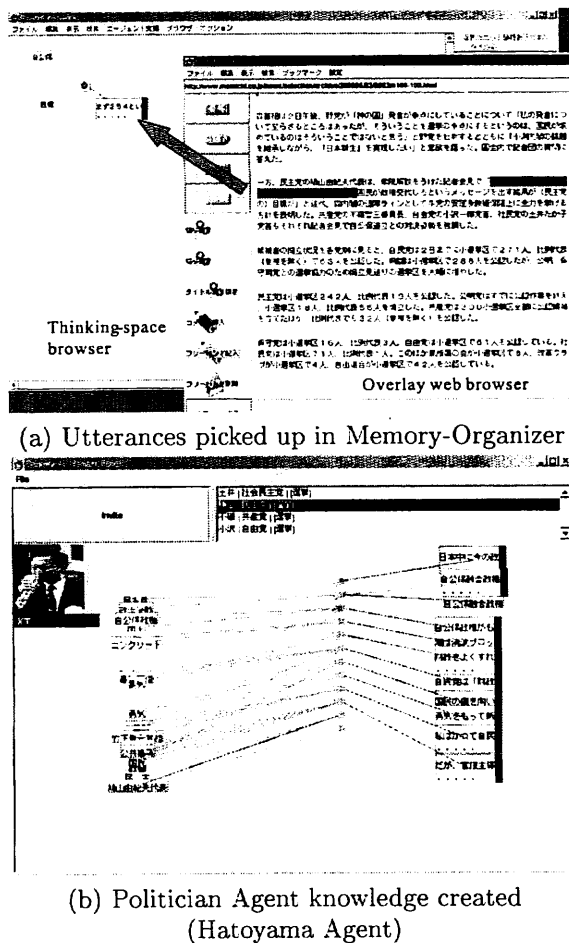


Figure 2: Construction of Agent knowledge.

Thinking-space browser, components of the Memory-Organizer[3,4] (a system for constructing externalized memory), using the following procedure.

1. In a newspaper article displayed on the Overlay web browser, when a politician's utterance is selected using a mouse, keywords are picked up from the selected segment; a relationship is established with the utterance, and the keywords are displayed on the Thinking-space browser as an associative representation.
2. Keywords are added, edited, or erased as required on the Thinking-space browser.
3. Associative representations are saved on the Thinking-space browser as Agent knowledge.

The algorithm used for picking up keywords from Japanese texts is a simple one, comprised of two processes: (1) extract character strings made up of two or more successive characters other than

hiragana and special characters; then (2) execute "stop term" processing. For details, refer to [3, 4].

Figure 2 shows an example of a screen related to the construction of Agent knowledge. For example, in a newspaper article displayed on the Overlay web browser, if the segment 「まず254という自公保の目標を割らせることだ。(The first thing will be to divide the goals of the LDP, Komeito, and Conservative parties, which account for a total of 254 seats.)」 is selected using the mouse, a relationship between the keywords “自公保 (LDP, Komeito, and Conservative parties)” and “目標 (goals)” and the entire utterance will be created as an associative representation (Figure 2(a)). The group of associative representations created in this way is saved as the politician Agent's knowledge (Figure 2(b)).

2.2 Agent virtual dialog

The Agent virtual dialog is comprised of two stages: (1) selection of keywords and (2) selection of Agents. There are two types of virtual dialogs: a manual mode, which is carried out by the user, and an automatic mode, which is carried out by the system.

2.2.1 Manual Mode

In the manual mode, the user selects the keywords and Agents. There are two basic operations carried out by the user:

- When the user inputs or selects a keyword, the Agent with the selected keyword approaches.
- When the user selects an Agent, one of the associative representations containing that keyword is displayed, and the Agent makes an utterance.

2.2.2 Automatic Mode

In the automatic mode, there is a wide range of approaches regarding the types of keywords and Agents selected by the system.

Here, we will simulate a situation in which “politicians don't listen closely to what others are saying, but instead only pick up on the last few words of another person's utterance to make their own assertions.” We designed the following algorithm, in which one Agent makes an utterance based on a given topic (keyword) and another Agent then makes a different utterance based on a separate topic (keyword) that is an extension of the first topic.

```

begin
  user inputs or selects 'current keyword';
  repeat
    if 'current keyword' is found within
    an associative representation
    not yet uttered by any Agent
    then
      begin
        Agent with an associative
        representation in which the
        keyword is found approaches;
        system selects Agent and
        associative representation;
        selected associative
        representation is displayed;
        selected Agent makes an
        utterance;
        keyword displayed last becomes
        'current keyword'
      end
      else keyword displayed immediately
      before becomes 'current keyword';
    until all associative representations
    are uttered
  end.

```

3 Experiment

3.1 Experiment 1

Purpose We conducted preliminary tests using the 2000 general election for the House of Representatives (June 25, 2000) as topic material.

We examined the extent to which it is possible to construct Agent knowledge from newspaper articles and achieve virtual dialog.

Method We constructed Agent knowledge targeting the following two information sources.

- (a) Feature articles on the election in Asahi.com (hereafter referred to as "asahi.com feature articles")
- (b) Articles from Mainichi Interactive News Selection from June 1 to June 25 (hereafter referred to as "Mainichi June")

Six politicians, including the top figures in Japan's main political parties, were selected to become Agents: Chikage Oogi, Ichiro Ozawa, Takako Doi, Yukio Hatoyama, Tetsuzo Fuwa, and Yoshiro Mori.

We subjectively selected articles related to the election for the House of Representatives that included utterances by the above six individuals,

Table 1: Summary of Agent knowledge created.

Agent	asahi.com		Mainichi June	
	number of utterances	number of keywords	number of utterances	number of keywords
Oogi	11	18	3	7
Ozawa	10	22	6	12
Doi	10	15	1	1
Hatoyama	10	19	12	20
Fuwa	10	29	1	2
Mori	4	5	21	26
Total	55	108	44	68

Number of keywords excludes keywords duplicated by individual Agents.

and constructed Agent knowledge using the methods outlined in Section 2. After constructing this Agent knowledge, we conducted trials of the virtual dialog (manual mode and automatic mode).

Construction of Agent knowledge was conducted by the second author in the case of asahi.com feature articles, and by a female 3rd year university student (19 yrs. old) in the case of Mainichi June. Virtual dialog trials were conducted by the first author.

Results Table 1 shows a summary of the Agent knowledge created.

There was a smaller variance in the number of utterances per Agent in asahi.com feature articles ($SD=2.6$) than in Mainichi June ($SD=7.9$). It is clear that creating Agent knowledge from Mainichi June, which contains regular articles, results in a far greater number of utterances by Mori, who was Prime Minister at the time, and by Hatoyama, the leader of the top opposition party, than from asahi.com feature articles.

When conducting trials in the automatic mode, it was possible to create virtual dialog to some degree using both asahi.com feature articles and Mainichi June. There was a greater degree of incongruity in the latter case, however: for example, utterances were dominated by the Mori Agent, and topics were occasionally incoherent. This is possibly due to the variance in the number of utterances by politicians, and to the differences in utterance content.

Below, we show an example of virtual dialog trials in both manual and automatic modes, in cases where the first user inputs the keyword [景気 (economy)], using asahi.com feature articles. These trials generally resulted in fairly good virtual dialog. Figure 3 shows an example of the automatic mode screen.

Example in Manual Mode

1. User enters keyword [景気 (economy)].
 - (a) Oogi Agent, Ozawa Agent, Hatoyama Agent, Fuwa Agent, and Mori Agent approach.
2. User selects Oogi Agent.
 - (a) Associative representation containing [景気 (economy)] is displayed.
 - (b) Oogi Agent utterance: [景気はせっかく上向いてきたが、まだ本物の回復にはなっていない。 (“Although the economy is finally looking up, it has yet to demonstrate true recovery.”)]
3. User selects Fuwa Agent.
 - (a) Associative representations including [政府 (government)] [景気 (economy)] [失業者 (unemployed person)] [国民 (citizens)] are displayed.
 - (b) Fuwa Agent utterance: [政府は景気が回復したと大騒ぎしているが、失業者や倒産の状況を見ると、国民には実感が無い。 (“The government is making lots of noise about an economic recovery, but looking at the state of bankruptcies and the unemployed, Japanese citizens don't feel that the recovery is real.”)]
4. User selects Hatoyama Agent.
 - (a) Associative representations including [景気 (economy)] and [政府 (government)] are displayed.
 - (b) Hatoyama Agent utterance: [財政をよくすれば、景気もよくなるのに、今の政権はなぜそれができないのか。 (“If we improve the government, then the economy will also improve. So why can't the government do that now?”)]
5. User selects Ozawa Agent.
 - (a) Associative representations including [自民党 (LDP)] [幹事長 (Secretary General)] [補正予算 (revised budget)] [公共事業 (public enterprise)] and [景気 (economy)] are displayed.
 - (b) Ozawa Agent utterance: [自民党の幹事長が秋に補正予算を組むというが、従来型の公共事業の追加であり、景気はよくなる。 (“The Secretary General

of the LDP says that a revised budget will be put together in the fall, but this is simply an addition of traditional-style public enterprises, and will not contribute to an improvement in the economy.”)]

6. User selects keyword [公共事業 (public enterprise)].
 - (a) Ozawa Agent, Hatoyama Agent, and Fuwa Agent approach.

Example in Automatic Mode

1. User enters keyword [景気 (economy)].
 - (a) Oogi Agent is automatically selected from among Agents containing [景気 (economy)].
 - (b) Associative representation including [景気 (economy)] is displayed.
 - (c) Oogi Agent utterance: [景気はせっかく上向いてきたが、まだ本物の回復にはなっていない。 (“Although the economy is finally looking up, it has yet to demonstrate true recovery.”)]
 - (d) Ozawa Agent is automatically selected from among Agents containing [景気 (economy)].
 - (e) Associative representation including [景気 (economy)] [自民党 (LDP)] [幹事長 (Secretary General)] [補正予算 (revised budget)] and [公共事業 (public enterprise)] is displayed.
 - (f) Ozawa Agent utterance: [自民党の幹事長が秋に補正予算を組むというが、従来型の公共事業の追加であり、景気はよくなる。 (“The Secretary General of the LDP says that a revised budget will be put together in the fall, but this is simply an addition of traditional-style public enterprises, and will not contribute to an improvement in the economy.”)]
 - (g) Ozawa Agent is automatically selected from among Agents containing [公共事業 (public enterprise)].
 - (h) Associative representation including [公共事業 (public enterprise)] and [金利 (interest)] is displayed.
 - (i) Ozawa Agent utterance: [単に金利をいじったり、公共事業にカネを使うだけではよくなる。 (“(The economy) will

not improve simply by toying with interest rates and using money for public enterprises.”)

- (j) Fuwa Agent is automatically selected from among Agents containing [公共事業 (public enterprise)].
- (k) Associative representation including [予算 (budget)] [ゼネコン (general contractors)] [公共事業 (public enterprise)] [福祉 (welfare)] and [教育 (education)] is displayed.
- (l) Fuwa Agent utterance: [予算をゼネコン中心の公共事業から福祉、教育に切り替えるべきだ。 (“The (focus of the) budget should be shifted from general contractors and other public enterprises to welfare and education.”)]

In the automatic mode, the virtual dialog will continue as long as the user does not give the instruction to stop. When [景気 (economy)] was entered as the first keyword, 22 consecutive utterances were made from the asahi.com feature articles. This represents 40% of all utterances. Similarly, 30 utterances were made from Mainichi June, accounting for 68% of all utterances. We believe that this indicates the potential to achieve virtual dialog using the method in question.

It is a very time-consuming process for a user to read newspapers one by one to gain an understanding of a politician’s opinions. In this research, we focused on the utterance text in newspaper articles, and showed that it is possible to extract opinions from those articles and have these opinions read out loud by Agents using portrait photos. We also showed that this process can be useful in enabling the user to gain an understanding of the opinions of one politician while confirming differences from the opinions of other politicians.

In the future, it will be necessary to conduct tests to make both qualitative and quantitative evaluations of the effectiveness of virtual dialog. It will also be necessary to conduct continued studies of which types of newspaper articles should be targeted for which themes.

3.2 Experiment 2

Purpose To study whether Agent knowledge construction methods are effective in understanding the unique characteristics of politicians’ utterances.

Method We created a two-dimensional display according to Hayashi’s quantification theory III

(hereafter Hayashi’s theory III), using keywords included in Agent knowledge created from asahi.com feature articles in Experiment 1. Hayashi’s theory III is a kind of principle component analysis for qualitative data that quantifies binary elements, classifies samples or categories, and investigates characteristics of the data. By using Hayashi’s theory III, similar data can be arranged close by; for example, sample and sample data, category and category data, or sample data and category data. For further information regarding Hayashi’s theory III, refer to [5].

- (a) 93 keywords from the total 108 keywords indicated in column (a) of Table 1 (excluding keywords duplicated by individual Agents), further excluding keywords duplicated by all Agents.
- (b) 16 keywords from the above 93 keywords, which appeared in the Agent knowledge of two or more Agents: [景気 (economy)], [国民 (citizens)], and [政治 (politics)] (appeared in Agent knowledge for four Agents); [公共事業 (public enterprise)] and [政権 (political power)] (three Agents); [公明 (Komeito)], [自民 (Liberal Democrat)], [自民党 (LDP)], [政党 (political party)], [選挙 (election)], [増税 (tax increase)], [不況 (recession)], [平和 (peace)], [保守党 (Conservative Party)], [野党 (opposition party)], and [連立政権 (coalition government)] (two Agents).

Results In the cases of both groups (a) and (b) above, using the Agent knowledge construction methods proposed in this research, we were able to output distribution charts with labels utilizing Axis 1 and Axis 2 from Hayashi’s theory III. There was no significant visible difference in the characteristics of the two groups. Here, we apply Hayashi’s theory III to group (b), and show a distribution chart with labels output using Axis 1 as the x-axis and Axis 2 as the y-axis (Figure 4).

Following are the keywords that appeared two times or more for each Agent.

- Oogi Agent: [野党 (opposition party)] (2 times)
- Ozawa Agent: [公共事業 (public enterprise)] and [国民 (citizens)] (2 times)
- Doi Agent: [沖縄 (Okinawa)] and [憲法 (constitution)] (3 times)
- Hatoyama Agent: [政治 (politics)] (4 times), [国民 (citizens)] and [政権 (political power)] (3 times), [自民党 (LDP)] and [勇氣 (courage)] (2 times)

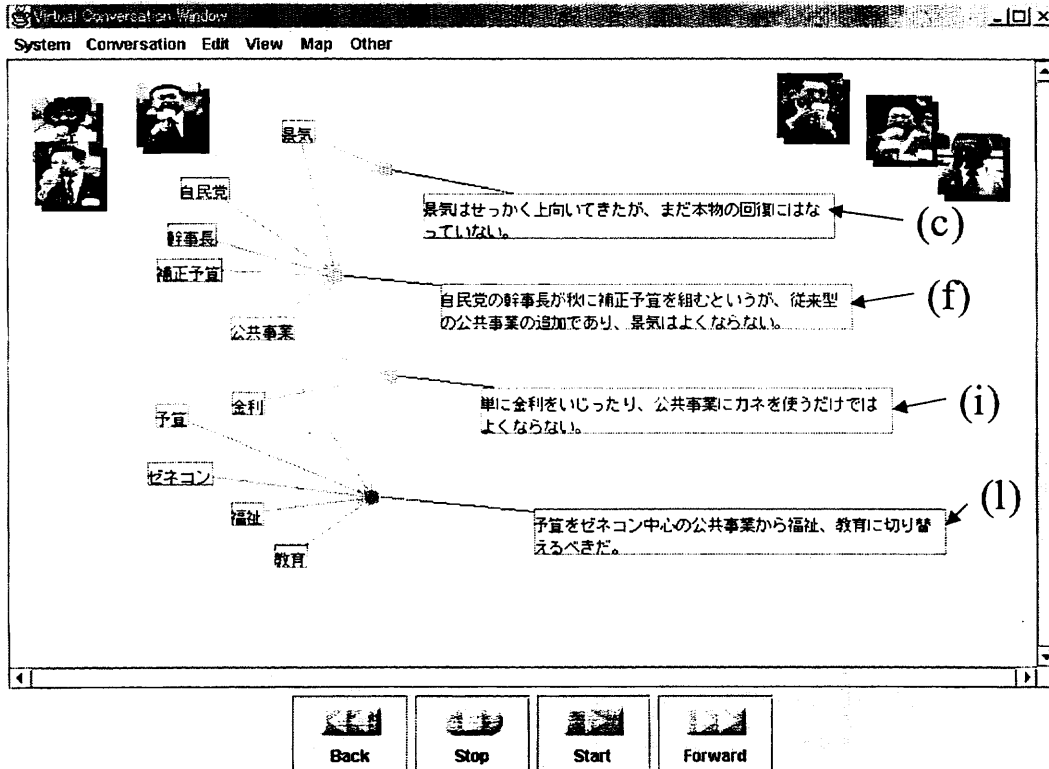


Figure 3: Sample topic: Example of screen for 2000 general election for the House of Representatives (automatic mode).

- Fuwa Agent: [共産党 (Communist Party)], [国民 (citizens)], and [政治 (politics)] (2 times)
- Mori Agent: [公明 (Komeito)], [日本経済 (Japanese economy)], and [野党 (opposition party)] (2 times)

From Figure 4(a), we can see that Agents are divided into three main groups Mori Agent, Doi Agent, and Ozawa/Hatoyama Agents, and that Oogi Agent and Fuwa Agent are positioned roughly in the middle.

The only data used here is keywords appearing in utterances; the data does not encompass agreement or opposition regarding these keywords. For this reason, keywords appear frequently in a critical context; for example, [公共事業 (public enterprise)] for Ozawa Agent, [自民党 (LDP)] for Hatoyama Agent, and [野党 (opposition party)] for Mori Agent. The most common keywords for Doi Agent were [沖縄 (Okinawa)] and [憲法 (constitution)], which did not appear at all for any other Agent. This indicates that Doi Agent differs significantly from the other Agents.

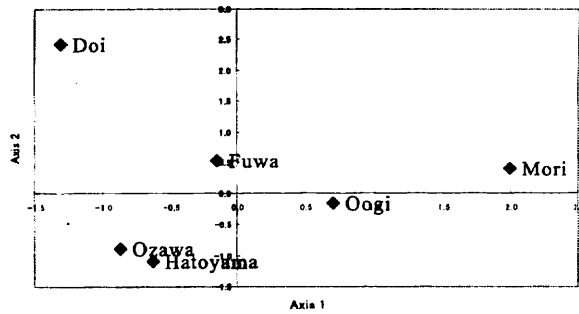
Interpretation of the axes is difficult, but we have confirmed that even using the simple method

proposed in this research, it is possible to gain a degree of understanding regarding the unique characteristics of the Politician Agents' utterances. Of course, these are not the characteristics of the utterances themselves; rather, they strongly reflect the trends in newspaper media.

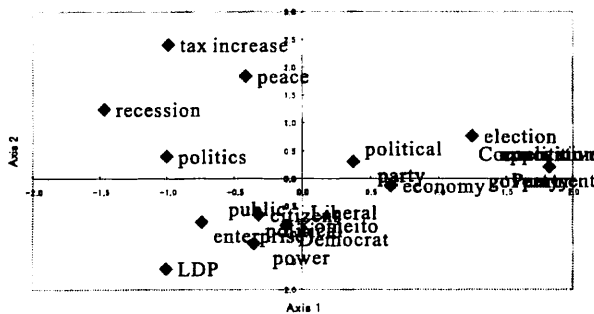
4 Summary

We created a trial virtual dialog system for politician Agents called Talking-NAGATACHO. We showed that it is possible to establish virtual dialog in cases where associative representation is created manually from the utterance text of politicians in newspaper articles, and that the system can be useful in the understanding of the characteristics of politicians' utterances and related topics.

In the future, it will be necessary to conduct tests to make both qualitative and quantitative evaluations of the effectiveness of virtual dialog. It will also be necessary to conduct continued studies of which types of newspaper articles should be targeted for which themes.



(a) Agents



(b) Keywords

Figure 4: Display using Hayashi's quantification theory III.

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