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Continued on last page.

(54) [TITLE OF THE INVENTION]

Conversation System and Conversation Processing
Program

(57) [ABSTRACT]

[PROBLEM]

To provide a conversation system that is able to determine accurately a subject indicated by a name spoken by a user during a conversation, and to return an appropriate response.

[MEANS FOR RESOLUTION]

A statement by a user, inputted through a voice inputting portion 12, is applied through an A/D converting portion 13 to a CPU 11. The CPU 11, through performing voice recognition on the user statement, detects, therefrom, the name of a person that is a specific subject, identifies the person indicated by the name from the similarity between the name detected from the user statement and each of the personal names stored in a nonvolatile memory 17, and returns, as a response to the user, a statement related to that person.

[SELECTED DRAWING] FIG. 1

11: CPU

12: Voice Inputting Portion

13: A/D Converting Portion

14: Voice Outputting Portion

15: D/A Converting Portion

16: Working Memory

16a: Conversation

Participant Number

16b: Subject Person Number

16c: Subject Person Number

Latest Setting

Date/Time

17: Nonvolatile Memory

18: Article Database

19: Name-Appropriate

Subsequent Noun Data

20a: Conversation

Participant 1 Name

Data

20b: Conversation

Participant 2 Name

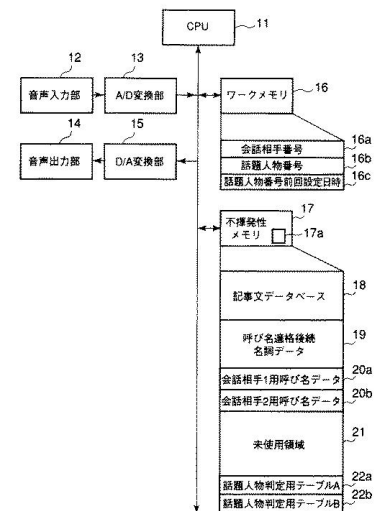
Data

21: Unused Region

22a: Subject Person

Identification Table A

22b: Subject Person Identification Table B



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[PATENT CLAIMS]

[CLAIM 1]

A conversation system for carrying out a conversation with a user, comprising:
inputting means for inputting a statement of a user that is a conversation participant;
name detecting means for detecting, from within a user statement inputted by the inputting means, a name indicating a specific subject;
storing means for storing names relating to individual subjects;
subject identifying means for identifying a subject indicated by the detected name, based on an identification result by evaluating a similarity relationship between a name detected by the name detecting means and a name stored in the storing means;
statement generating means for generating a statement relating to the subject identified by the subject identifying means; and
outputting means for outputting the statement generated by the statement generating means.

[CLAIM 2]

A conversation system set forth in claim 1, wherein:
the specific subject is a person; and
the name detecting means detect a name, from within the user statement, indicating the person.

[CLAIM 3]

A conversation system set forth in claim 1, wherein:
from within the user statement, the name detecting means detect, as the name of the subject, a specific proper noun and a noun immediately following or immediately previous thereto.

[CLAIM 4]

A conversation system set forth in claim 1, comprising:
subject designating means for designating a subject that is the current subject, wherein:
the subject identifying means, when evaluating the similarity relationship between a name detected by the name detecting means and names stored in the storing means, increase the evaluation of a name related to a subject that has been designated by the subject designating means.

[CLAIM 5]

A conversation system set forth in claim 1, comprising:
use count controlling means for controlling use count information for each subject name stored in the storing means, wherein:
the subject identifying means, when evaluating the similarity relationship between a name detected by the name detecting means and names stored in the storing means, take into consideration use count information of names controlled by the use count controlling means.

[CLAIM 6]

A conversation system set forth in claim 1, comprising:
registration controlling means for additionally registering, into the storing means, a name, as one name of the applicable subject, if the subject indicated by the name is not stored, by the detected name, in the storing means.

[CLAIM 7]

A conversation system set forth in claim 1, comprising:

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registration controlling means for registering a name, as a name of a new subject, in the storing means if the subject of the detected name cannot be identified.

[CLAIM 8]

A conversation processing program used on a computer that carries out a conversation with a user, wherein the computer is caused to achieve:

a function for inputting a statement by a user that is a conversation participant;

a function for detecting a name that indicates a specific subject, from within the user statement that has been inputted;

a function for identifying a subject that is indicated by the detected name, based on evaluation value by evaluating a similarity relationship between the detected name and names stored in a memory, using a memory that stores names related to various subjects;

a function for generating a statement related to the subject that has been identified; and

a function for outputting the generated statement.

[DETAILED EXPLANATION OF THE INVENTION]

[0001]

[FIELD OF TECHNOLOGY OF THE PRESENT INVENTION]

The present invention relates to a conversation system, and a conversation processing program, used in toys such as voice-interaction robots, a video consoles, or the like, to enable a user to achieve enjoyment or comfort through conversing with a computer.

[0002]

[PRIOR ART]

Conventionally, many conversation systems used in video consoles, toys, and the like, have employed systems wherein conversations are carried out following predetermined scenarios (hereinafter termed "scenario systems") (referencing, for example, Patent Document 1).

[0003]

Scenarios used in a "scenario system", to be practical, are configured so that the conversation system the first make a statement so as to limit the topics, so as to have extremely little branching even as the conversation progresses thereafter. Because of this, there is a drawback in that the person (user) is unable to guide the conversation, and the flow of the conversation will be mundane or unnatural.

[0004]

Given this, one may consider a conversation system that extracts specific keywords that are included in a user statement to determine the subject the user is discussing, to return a response in accordance therewith. However, in a conversation wherein a specific person, for example, is the subject the user may unconsciously change, depending on his or her mood, what a given person is called, making it impossible to identify the person correctly as being the same person, making the correct response impossible.

[0005]

Note that while there is also a method wherein the user is restricted to only one way of saying something, this would force the user into an extremely constrained conversation, and the user might forget, with the passage of time, how the reference is said. Moreover, because each individual has a different way of speaking, when a conversation system is shared by a plurality of users, the references will not correspond.

[0006]

Moreover, there are also cases wherein a reference that, at one particular time would be unanticipated, becomes the way in which that person is typically referred to in the future. For

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example, when an player who belongs to a team in Japan transfers to a US team, generally the name will emphasize the US team.

[0007]

Moreover, normally, after it has become clear who the subject in a conversation is, references to that person are omitted more often. For example, if at first someone is called "Matsui of xx," typically he would be referred to as just "Matsui" in the subsequent statements. Even in conversations on following days, there is the possibility that he will just be referred to "Matsui" from the first, because he is, of course, already understood. However, on the conversation system side, who "Matsui" is referring to is not known, making an appropriate response impossible.

[0008]

[PATENT DOCUMENT 1]

Japanese Unexamined Patent Application Publication 2002-169590

[0009]

[PROBLEM SOLVED BY THE PRESENT INVENTION]

As described above, there has been a problem in that it has not been possible to carry out a natural conversation, due to the inability to return a natural response when the subject of the current topic is unknown when the way a user speaks changes during a conversation, such as with, for example, the name of a person.

[0010]

Given this, the object of the present invention is to provide a conversation system, and a conversation processing program, able to return an appropriate response, in accordance with the subject at that time, through determining accurately the subject indicated by a name stated by a user during a conversation.

[0011]

[MEANS FOR SOLVING THE PROBLEM]

A conversation system according to the present invention is a conversation system for carrying out a conversation with a user, comprising: inputting means for inputting a statement of a user that is a conversation participant; name detecting means for detecting, from within a user statement inputted by the inputting means, a name indicating a specific subject; storing means for storing names relating to individual subjects; subject identifying means for identifying a subject indicated by the detected name, based on an identification result by evaluating a similarity relationship between a name detected by the name detecting means and a name stored in the storing means; statement generating means for generating a statement relating to the subject identified by the subject identifying means; and outputting means for outputting the statement generated by the statement generating means.

[0012]

In a conversation system having such a structure, when a statement of a user, who is the conversation participant, is inputted, the name that indicates the specific subject is detected from within the user statement. Following this, the subject indicated by the name is identified through the similarity relationship between the name that has been detected and names that are stored in the storing means, and a statement relating to that subject is generated and outputted as a response to the user. In this way, the subject that is indicated by the name stated by the user is identified through comparing the name that is included in the user statement and the name of each subject stored in advance in the storing means, enabling the

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conversation to progress naturally while returning appropriate responses in relation to the subject.

[0013]

In a conversation system of this configuration, the specific subject is a person; and the name detecting means detect a name, from within the user statement, indicating the person. This enables an appropriate response to be returned by identifying the person when the user has a given person as the subject.

[0014]

In a conversation system of this configuration, from within the user statement, the name detecting means detect as the name of the subject a specific proper noun and a noun immediately following or immediately previous thereto. If, for example, the name of a person, this enables extraction, from the user statement, of one way of saying the name, including the specific phrases that are before and after the person's name.

[0015]

A conversation system of this configuration comprises subject designating means for designating a subject that is the current subject, wherein the subject identifying means, when evaluating the similarity relationship between a name detected by the name detecting means and names stored in the storing means, increase the evaluation of a name related to a subject that has been designated by the subject designating means. This enables the name of the subject that is the current subject to be prioritized in identifying the subject that is to be designated.

[0016]

Moreover, a conversation system of this configuration comprises use count controlling means for controlling use count information for each subject name stored in the storing means, wherein: the subject identifying means, when evaluating the similarity relationship between a name detected by the name detecting means and names stored in the storing means, take into consideration use count information of names controlled by the use count controlling means. This enables names that are used often by the users to be prioritized to identify a subject indicated by the name.

[0017]

Moreover, a conversation system of this configuration comprises registration controlling means for registering, into the storing means, and additional name, as one name of the applicable subject, if the subject indicated by the name is not stored, by the detected name, in the storing means. This enables an additional name to be registered without the user having to go through the trouble to register another name for the subject.

[0018]

Moreover, a conversation system of this configuration comprises registration controlling means for registering a name, as a name of a new subject, in the storing means if the subject of the detected name cannot be identified. This enables registration of an additional name without the user having to register a name for a new subject.

[0019]

[EMBODIMENTS OF THE INVENTION]

Embodiments of the present invention will be explained below in reference to the drawings.

[0020]

FIG. 1 is a block diagram depicting a hardware configuration for a conversation system according to one embodiment according to the present embodiment. A conversation system

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according to the present invention is that which carries out a conversation by making a statement, as if a person were responding to a statement by the user, built into, for example, a toy such as a voice-interaction robot or a video game console.

[0021]

FIG. 1 depicts a basic configuration for a case wherein the system is embodied through a general use computer, configured from a CPU 11, a voice inputting portion 12, an A/D converting portion 13, a voice outputting portion 14, a D/A converting portion 15, a working memory 16, and a nonvolatile memory 17.

[0022]

The CPU 11, through reading in a program stored in the nonvolatile memory 17, or the like, executes prescribed processes by following the processes described in the program. The voice inputting portion 12 is a microphone for inputting the voice from the user during the conversation. The voice (analog data) of the user, inputted from the voice inputting portion 12, is converted into digital data by the A/D converting portion 13 and read into the CPU 11. The CPU 11 carries out processing using the working memory 16, to output, through the D/A converting portion 15, a response to a statement by the user. The D/A converting portion 15 converts, to analog data, voice data generated by the CPU 11 and applies it to the voice outputting portion 14. The voice outputting portion 14 is a speaker for outputting this to the outside.

[0023]

Data required for processing operations of the CPU 11 are stored in the working memory 16. The results of voice recognition of a statement by the user (text information) are buffered in this working memory 16, and information storing regions 16a through 16c are provided therein for storing, respectively, "conversation participant numbers," "subject person numbers," and "subject person number latest setting date/times," that are required in the conversation processing in the present system.

[0024]

The "conversation participant number" is a number for identifying a conversation participant. In the system, the conversation is carried out with a single user as the participant during a conversation, but who the conversation participant is at that time can be identified. The method for identifying the conversation participant may be a method wherein an image of the face of the user that is the conversation participant is captured using, for example, a camera and the image of the face is identified through analysis; however the identification here is through voice analysis.

[0025]

That is, after voice that has been inputted from the voice inputting portion 12 has been converted into digital data by the A/D converting portion 13, the frequency variations, or the like, of the data, are compared with voice data of various users that have been registered in advance to thereby identify the conversation participant. When a conversation participant is identified through such a method, a "conversation participant number," which is identification information that is unique to that conversation participant, is set in the information storing region 16a of the working memory 16. If the "conversation participant number" is 1, the conversation processing of the present invention is executed using name data 20a for the conversation participant 1, stored in the nonvolatile memory 17, described below.

[0026]

(7)

The "subject person number" is a number that indicates a person that is the present subject of the conversation. If the "subject person number" is at least 1, the conversation system continues the conversation with the person indicated by that number as the subject. On the other hand, if the "subject person number" is 0, then either no one has emerged as the subject since the beginning of the current conversation, or someone has emerged as the subject but it has been determined that there has been a shift to another subject because at least a prescribed amount of time (for example, 10 minutes) has elapsed without a name of that person being mentioned.

[0027]

The "subject person number latest setting date/time" is used for identifying that the prescribed time has elapsed, indicating the date/time at which the name of the person who is the current subject was last mentioned by the user that is the participant in the conversation.

[0028]

The nonvolatile memory 17 is a rewritable memory wherein the stored content is not lost even in the event that the power supply is cut, made from, for example, flash memory. Along with a program 17a for achieving the conversation system of the present invention, an article database 18, name-appropriate subsequent noun data 19, conversation participant 1 name data 20a, conversation participant 2 name data 20b, an unused region 21, a subject person identification table (A) 22a and subject person identification table (B) 22b, and the like, are stored in the nonvolatile memory 17.

[0029]

The article database 18 is a database for existing sentence information that does not include conversational statements, such as, for example, news articles (written sentence information), generated through extracting, from text information, partial sentences that can be used in conversation. This article database 18 is used when a name indicating a person cannot be detected from within a user statement, or when generating as a user response a statement corresponding to the name.

[0030]

The name-appropriate subsequent noun data 19 is data indicating a specific noun that is applied as a name following a personal name. FIG. 2 is a specific example thereof, wherein, for example, "player," "pitcher," "manager," "prime minister," or the like, are stored in a prescribed region of the nonvolatile memory 17 in advance as name-appropriate subsequent noun data 19.

[0031]

The name data 20a and 20b are data indicating names related to individual persons, stored for each individual conversation participant, and, as illustrated in FIG. 3, comprises a "person number," a "name," and a "name reference count." The "person number" indicates the number of that person. The "name" indicates the name of that person. In this case, a plurality of names is included for a single individual. The "name reference count" indicates the frequency with which the name has been used. In this case, having the conversation participant 1 name data 20a and the conversation participant 2 name data 20b in the nonvolatile memory 17 indicates that name data is controlled for each individual conversation participant. That is, the conversation participant 1 name data 20a is the name data that is referenced where the conversation participant 1 is conversing, and the conversation 1 name data 20a is the name data that is referenced when conversation participant 2 is conversing.

[0032]

Note that here name data are illustrated for only two people; however if the number of conversation participants increases, the name data for the conversation participants will be stored in the unused region 21 of the nonvolatile memory 17.

[0033]

The subject person identification table (A) 22a and subject person identification table (B) 22b are tables wherein are written procedures for identifying the person who is the current subject. Note that the configurations of the subject person identification table (A) 22a and the subject person identification table (B) 22b will be explained below in reference to FIG. 8 and FIG. 9.

[0034]

In a conversation system of such a configuration, the user voice inputted through the voice inputting portion 12 is converted into digital data by the A/D converting portion 13 and then applied to the CPU 11.

[0035]

FIG. 4 depicts the process flow of data, following A/D conversion, carried out by the CPU 11 that is built into the system. The voice data that has undergone A/D converter is dictated by voice recognition processing 31, to be converted into text-format sentences. Following this, conversation processing 32 is carried out on the text-format sentences, to generate a statement as a response to the statement of the user, to be read aloud by readout processing 33. In this case, the voice data of the statement generated by the CPU 11 as the response to the user is converted into an analog data by the D/A converting portion 15, followed by outputting through the voice outputting portion 14, such as a speaker, or the like.

[0036]

Here techniques that are generally known are used for the "voice recognition processing" and the "readout processing," so detailed explanations are omitted. In the below, specific procedures will be explained in detail referencing a flowchart, centering on the "conversation processing" in the present system. Note that the processes shown in each of the flowcharts below are executed by the CPU 11, which is built into in the present system, reading in programs.

[0037]

FIG. 5 is a flowchart depicting the flow of the conversation processing in the present system, showing the processing up until generating the response to the statement of the conversation participant, in a state wherein the conversation participant has been identified. Here the explanation will assume that the conversation participant in the present system has been identified as the user that is conversation participant 1. The "conversation participant number" 1 is set in the information storing region 16a of the working memory 16.

[0038]

When carrying out conversation with the user that is conversation participant 1, the CPU 11 that is built into the present system first checks whether or not the "subject person number latest setting date/time" that is stored in the information storing region 16c of the working memory 16 has been cleared, or checks whether or not a prescribed time (for example, no less than 10 minutes) has elapsed since that time (Step A11). The result is that if the "subject person number latest setting date/time" is cleared, or if a prescribed time has elapsed since that time (YES in Step A11), the CPU 11 sets the "subject person number" to 0 in the information storing portion 16b of the working memory 16, and clears the "subject person number latest setting date/time" (Step A12).

[0039]

Following this, the CPU 11 detects, from the statement of a user that has been inputted through the voice inputting portion 12, a name indicating a person (Step A13). If the result is an applicable name in that the user statement (YES in Step A14), the CPU 11 determines (identifies) the person indicated by that name, designates that person as the subject person, and sets the number of that person as the "subject person number" (Step A15). If, in the statement by the user, there is no personal name, the subject person identification processing is not carried out here.

[0040]

Following this, the CPU 11 checks whether or not the "subject person number" is 0 (Step A16). If the "subject person number" is not 0, that is, if in a state is wherein the subject person in the conversation has been identified (NO in Step A16), the CPU 11 carries out a process for generating a statement regarding the subject person (Step A17).

[0041]

On the other hand, if the "subject person number" is 0, that is, if in a state wherein the subject person in the conversation has not been identified (NO in Step A16), the CPU 11 carries out statement generation processing using the article database 18 that is stored in the nonvolatile memory 17 (Step A18). That is, a specific keyword is extracted from the user statement, and based on the keyword, the article database 18 is searched and an article in the article database 18 is used to generate a statement in response to the user. Note that the applicant has already filed an application (Japanese Patent Application 2002-233090) for statement generation processing using the article database 18, and thus detailed explanations thereof will be omitted here.

[0042]

The name detection processing executed in Step A13, the subject person identification processing executed in Step A15, and the subject person statement processing executed in Step A17 will be explained in detail below.

[0043]

The name detection processing that is executed in Step A13 will be explained first.

[0044]

FIG. 6 is a flowchart depicting the flow of the name detection processing in the conversation processing of the present system.

[0045]

The CPU 11 analyzes nouns that are included in the statement of the user (Step B11) to determine, based on the noun analysis result, whether or not there is, in the user statement, a proper noun that indicates a personal name (Step B12). A proper noun that indicates a personal name is, for example, "Matsui," "Matsuzaka," or the like, where these are registered in advance as personal names in the noun analysis data, not illustrated. If there is no proper noun that indicates a personal name in the user statement (NO in Step B12), the CPU 11 performs processing assuming that there is no personal name in the user statement.

[0046]

On the other hand, if, in the user statement, there is a proper noun that indicates a personal name (YES in Step B12), the CPU 11 determines whether or not a noun follows immediately after the proper noun (Step B13). If a noun follows immediately after the proper noun that indicates the personal name (YES in Step B14), then the CPU 11 determines whether or not that noun is a specific noun that is included in the name-appropriate subsequent noun data

(Step B14). The name-appropriate subsequent noun data is data indicating a noun that is suitable to follow a name that is a personal name, and, as illustrated in FIG. 2, may be, for example, "the player," "the pitcher," "the manager," "the prime minister," or the like. If there is a specific noun that is included in the name-appropriate subsequent noun data (YES in Step B14), the CPU 11 treats this noun as a portion of the name of a person, as a name suffix phrase (Step B15).

[0047]

Moreover, the CPU 11 determines whether or not the noun follows directly, or with an interposed possessive particle, the immediately previous proper noun that indicates the personal name (Step B16). If an applicable noun (YES in Step B16), the CPU 11 treats the noun as a portion of the name of the person, as a name prefix phrase (Step B17).

[0048]

When, in this way, a proper noun that indicates a personal name, a name suffix phrase that follows immediately thereafter, and a name prefix phrase that is contiguous immediately therefore are each obtained, the CPU 11 extracts these, from the user statement, as a single name (Step B18).

[0049]

This makes it possible to extract not only proper nouns that indicate personal names, but also to extract specific phrases, therefore and thereafter, as names, to extract as a name, for example, the phrase "Matsui of the Kyo**" from a user statement of "I am a fan of Matsui of the Kyo**". It is also possible to extract the name "Matsui" alone from a user statement of "Matsui is a superb player."

[0050]

Note that while in actuality a portion of a phrase (one or more characters) indicating the name of a given baseball team is present in the "**" part, this is expressed using the "**" to avoid using an actual name. The same is true in the explanations below, where portions are masked with "**" in relation to actual names.

[0051]

Moreover, through the use of name-appropriate subsequent noun data, as depicted in FIG. 2, it is possible to extract not only "Matsui the player," but also, names such as, for example, "Matsui the pitcher," "Matsui the manager," and "Matsui the Prime Minister." In this case, if a noun that follows a personal name is not included in the name-appropriate subsequent noun data 19 in Step B14, above, the omissions of such names that including personal names, makes it possible to avoid confusion with names such as "Matsui Bank," the "Matsui Incident," and the like. Because of this, it is necessary to register in advance, in the name-appropriate subsequent noun data 19, those nouns that can follow a personal name to indicate a name.

[0052]

The subject person identification processing that is executed in Step A15, above, will be explained next.

[0053]

FIG. 7 is a flowchart depicting the flow of the subject person identification processing in the conversation processing in the present system.

[0054]

When the name of a person is detected within a user statement through the name detection processing, described above, the CPU 11 extracts the nouns that structure the name

(hereinafter termed a "name-structuring element nouns") (Step C11). Given this, the CPU 11 calculates name similarity scores, using a method such as described below, for each name included in the current conversation participant 1 name data 20a, stored in the nonvolatile memory 17 (Step C12).

[0055]

(1) When there is, in the name data 20a, a name-structuring element noun that is not a personal name, one point is added to the name similarity score.

(2) When there is, in the name data 20a, a name-structuring element noun that is a personal name, two points are added to the name similarity score.

[0056]

When a name similarity score is calculated in this way, the CPU 11 identifies the person that has become the current subject through executing a handling process corresponding to the individual case using the subject person identification table (A) 22a and subject person identification table (B) 22b, stored in the nonvolatile memory 17 (Step C13).

[0057]

That is, when the "subject person number" is 0 or the name similarity scores for the subject person are all 0, the CPU 11 carries out identification of the subject person using the subject person identification table (A) 22a that is depicted in FIG. 8.

[0058]

Handling processes are defined, divided into cases A1 through A4, by the subject person identification table (A) 22a. For example, if, in the relationships between the name at this time (the name obtained from the user statement through the name detection processing described above) and the names of other than the subject person in the name data 20a, there is only one name that matches, the process corresponding to Case A1 is executed, to identify, as the subject person, the person with the matching name.

[0059]

Moreover, if there is a plurality of names that match, the process corresponding to the Case A2 is executed, and a person, among those with matching names, who has a name reference count that is a prescribed proportion greater than the others is identified as the subject person. Note that if such a condition is not satisfied, the person to be designated as the subject person is identified through narrowing down to a single person by questioning the user.

[0060]

Moreover, if there is no matching name but there is a name for which the name similarity score is not zero, the process corresponding to Case A3 is executed to question the user, sequentially in descending order of name similarity scores, as to whether or not the person is the same, and the subject person is identified depending on the response. Note that if nobody is the same person, then the process corresponding to the case 4A is executed.

[0061]

Moreover, if the name similarity scores are all 0 or if there is no name registered in the name data 20a other than the subject person, the process corresponding to the Case A4 is executed, and the current name is additionally registered, in the name data 20a, with a new person number, and a name reference count of 0 is set. That person is identified as the subject person.

[0062]

On their hand, if the "subject person number" is not 0 (that is, > 0), and a name similarity score is not 0 for the subject person, the CPU 11 identifies the subject person using the subject person identification table (B) 22b that is depicted in FIG. 9.

[0063]

The handling processes are defined by this subject person identification table (B) 22b divided into Cases B1 through B5. For example, if, in the relationships between the name at this time (the name obtained from the user statement through the name detection processing described above) and the names of subject persons included in the name data 20a, there is a matching name, the process corresponding to Case B1 is executed and the current subject person is continued as-is and designated as the subject person.

[0064]

If there is no matching name but there is a name that is completely included (that is, the current name is included in the name of the subject person), the process corresponding to Case B2 is executed, the current name is additionally registered to the name data 20a as the name of the subject person, and 0 is written as the name reference count. Given this, the current subject person is continued as-is and designated as the subject person.

[0065]

Moreover, if there is no matching name and also no name that is completely included, then if there is a name that matches in the relationship between the current name and names of other than the subject person that are included in the name data 20a, then, depending on the number of the name that matches, the process corresponding to Case A1 or Case A2, described above, is executed as the process corresponding to Case B3.

[0066]

Moreover, in a case wherein there is no matching name and also no name that is included completely, then if, in the relationships between the current name and the names other than the subject person that are included in the name data 20a, there is no matching name but there is a name wherein the name similarity score is not 0, then the handling process of Case A3, described above, is executed as the process corresponding to Case B4.

[0067]

When there is no matching name and no name that is completely included, then if, in the relationships between the current name and the names of other than the subject person that are included in the name data 20a, the name similarity scores are all 0 or there are no names other than the subject person registered in the name data 20a, the process corresponding to Case B5 is executed, where the user is questioned as to whether or not the current name is the name of the subject person, and if so, the current name is registered additionally in the name data 20a as the name of the subject person and 0 is written as the name reference count. Given this, the current subject person is continued as-is and designated as the subject person. If the current name is not the name of the subject person, the handling process of Case A4, described above, is executed.

[0068]

Returning to Step C13 of FIG. 7, the CPU 11, after identifying the subject person in accordance with the subject person identification table (A) 22a and subject person identification table (B) 22b, carries out processing such as the following:

[0069]

- (1) The person number of the person identified is written to the "subject person number."
- (2) The current date/time is written to the "subject person number latest setting date/time."
- (3) The "name reference count" corresponding to the name that was used and currently identified in the name data 20a is incremented by 1.

[0070]

Here the situation wherein the name of the subject person is registered in the name data 20a through the process set forth above will be explained using FIG. 10.

[0071]

FIG. 10 is a diagram depicting states of updating of the name data 20a, where FIG. 10 (a) through (e) depict various states of the name data.

[0072]

For each name, there is a "person number," "name," and "name reference count" in the name data 20a. When the user has not yet said anyone's name to the conversation system (such as is the case immediately after the conversation system is purchased), no name data 20a is stored. In this case, the "subject person number" is 0, and the "subject person number latest setting date/time" is cleared.

[0073]

In such a state, when, for example, the user has said "business conditions are bad," no name is included in the statement, and thus processing advances to Step A18, and, given this, the article database 18 is searched using "bad business conditions" as keywords, to generate a response based on sentences therein that include "bad business conditions."

[0074]

Here let us assume the user says "I like Matsui of the Kyo**." Since "Matsui" is a proper noun that indicates a personal name, the name "Matsui of the Kyo**" is detected with this as a clue. In this case, there is not even a single name registered in the name data 20a, and thus the handling process of Case A4, described above, is executed. Through this, the name data 20a will be in State 1, such as in FIG. 10 (a), when the subject person identification processing has been completed. In this case, the person number will be 1.

[0075]

Let us assume that the user next says "Matsui is strong," where this time "Matsui" is detected as the name. The name similarity score for "Matsui of the Kyo**," in respect to this name, will be "2" because "Matsui" is a noun indicating a personal name, and because "Matsui" is completely included in "Matsui of the Kyo**," the handling process of Case B2 is executed. Through this, State 2 of the name data 20a, as in FIG. 10 (b), will be produced when the subject person identification processing has been completed.

[0076]

Let us assume that the user next says "Matsui is good at defense as well," where the name detected from that statement will again be "Matsui." This time this matches the "Matsui" that has already been registered as a name for the subject person, so the handling process for the Case B1 is executed, where it will be determined that the subject, person number 1, is to be continued at this time as well. In this case, the name reference count for the name "Matsui" becomes "2."

[0077]

Let us assume that the conversation on this date is terminated in this state and, on a later date, the user suddenly] asks, "How is Matsui doing?" At this time, the "subject person number" is 0, so the handling process for Case A1 is executed, to identify "Matsui" as being "Matsui of the Kyo**," so a statement is generated with person number 1 as the subject person.

[0078]

When, on yet a later date, the user says "Matsui of the Sei** is fast," the target person number = 0 and the current name is "Matsui of Sei**," so the name-structuring element nouns are "Matsui" and "Sei**," and the respective name similarity scores for person number

1 will be 2, where "Matsui of the Sei**" and "Matsui of the Kyo**" are not a match, and thus Case A3 applies.

[0079]

In the handling process for Case A3, the user is questioned if "Matsui of Sei**" is the same person as person number 1. At this time, the name for person number 1 uses that which has the greatest number of name-structuring element nouns. In this case, that which has the largest number of name-structuring element nouns is "Matsui of the Kyo**." Given this, the question is asked, "Is Matsui of the Sei** the same person as Matsui of the Kyo**?" If the user responds negatively, such as "No," the handling process of Case A4 is executed. The result is that the name data 20a will go into State 3, as in FIG. 10 (c) when the target person identification processing has been completed. In this case, there is a change to person number 2.

[0080]

Let us assume that here the user makes a statement using merely "Matsui" as the name. This corresponds to Case B2, where the subject is identified as continuing to be person number 2, and State 4 of the name data 20a, as in FIG. 10 (d) will be the result. In this way, even if the same name of simply "Matsui" is used for the person, the conversation system can identify the subject person correctly depending on the flow of the conversation.

[0081]

Let us assume that the conversation ends in this state, and that, on a later date, the user asks, "How is Matsui doing?" Case A2 applies here, where the name reference counts for the two names, "Matsui," are compared. If we assume here the "greater than a prescribed proportion" is greater than five times that of the others, this time it is not more than three times, and thus the user is questioned as to which "Matsui." The names used in this questioning will be the names that are mutually different that have the greatest number of name-structuring element nouns. In this case, the question will be "Is that 'Matsui' Matsui of the Kyo** or Matsui of the Sei**?"

[0082]

When the user answers "It is Matsui of the Kyo**," the person that is person number 1 is identified as the subject. At this time, that for which the name reference count is incremented by one will be the "Matsui" that is person number 1. If the name reference count for the "Matsui" that is person number 1 is at least five times that of the "Matsui" that is person number 2, then, even in this same scenario, the user would not be questioned, but rather the "Matsui" that is person number 1 would be identified as the subject person. This enables a natural conversation to be achieved given that, for a person who is frequently the subject, it is normal for the name to always be shortened.

[0083]

Moreover, in the aforementioned State 4, let us assume that the user says "Matsui of the Gia**" rather than "Matsui of the Kyo**", for example. In this situation, Case B4 or Case A3 would apply. The name similarity score would be the same for person number 1 and person number 2, so a confirmation would be carried out by questioning the user, such as "Is Matsui of the Gia** referring to Matsui of the Kyo**?" Moreover, the same would be true thereafter if, for example, he was called "Matsui Godzi**" rather than "Matsui of the Kyo**." State 5, wherein "Matsui of the Gia**" and "Matsui Godzi**" have been registered is shown in FIG. 10 (e). Following State 5, "Matsui of the Gia**" and "Matsui Godzi" would both be handled in the exact same way as "Matsui of the Kyo**."

[0084]

In this way, when, in this system, a given person is to be the subject, it is not necessary always to use the exact same name, making it possible to have a conversation with the name that is used without having to think about it, as is the case in a conversation held between people. Moreover, it is possible to handle even a case wherein a name that, at some time would have been unanticipated, has, at a later date, come into general use, such as, for example, "Matsui of the Yank**."

[0085]

FIG. 11 and FIG. 12 are diagrams showing examples of the conversation participant 1 name data 20a and conversation participant 2 name data 20b.

[0086]

This system stores name data 20a and 20b, for the respective conversation participants, where if, for example, conversation participant 1 says "Matsui," this would indicate "Matsui of the Kyo**," but if conversation participant 2 were to say "Matsui," this would indicate "Matsui of the Sei**." In this way, the use of names can be divided up freely depending on the conversation participant.

[0087]

The subject person statement processing, executed in Step A17, above, will be explained next.

[0088]

FIG. 13 is a flowchart depicting the flow of the subject person generation processing in the conversation processing in the present system.

[0089]

When a subject person is identified by the subject person identification processing set forth above, the CPU 11 first clears the raw data for statement generation, for generating a statement regarding the subject person (Step D11), and then uses, as the subject for processing, a single name from among the names of the person designated by the "subject person number" (Step D12). Note that the raw data for statement generation is stored in a prescribed region in the working memory 16, for example.

[0090]

If here there are at least two name-structuring element nouns in the name that is being used as the processing subject (YES in Step D13), the CPU 11 searches the article database 18 for these name-structuring element nouns with an AND condition (Step D14), to extract applicable articles from the article database 18 and add them to the raw data for statement generation (Step D15).

[0091]

Such a process is carried out for each name included in the names for the person designated by the "subject person number" (Steps D16, D17). Given this, when processing has been completed for all of the names (NO in Step D16), the CPU 11 selects a single article randomly from the various articles accumulated in the raw data for statement generation (Step D18), and generates a statement using the selected article, where this statement is used as a response to the user (Step D19).

[0092]

In this way, the article database 18, in which news articles for a variety of subjects are recorded, is used and an article that applies to the subject person is selected therefrom. The nouns that structure the name of the subject person, that is, the name-structuring element nouns, are used in this case.

[0093]

That is, in State 5, depicted in, for example, FIG. 10 (e), if there is only a single person number, then articles that include both "Kyo**" and "Matsui," articles that include both "Gia**" and "Matsui," and articles that include both "Godzi**" and "Matsui" will be extracted as raw material for statement generation. An article is selected at random from among these articles, and the selected article is used to generate the statement. At this time, the name, "Matsui," includes only a single name-structuring element noun, and thus this name is not used alone. This is because if articles that include "Matsui" alone were extracted, other Matsui's, such as "Matsui of the Sei**," would be mixed in.

[0094]

Because the present system, as set forth above, enables detection of arbitrary personal names, and nouns included in the phrases there before and thereafter, from a user statement, the conversation can advance using names that are used in ordinary conversation, rather than being limited to static names. Moreover, for a phrase linked to a personal name, the type of phrase, such as the part of speech, is designated to identify that that phrase applies to the name, and thus phrases that are not names, such as, for example, the "Matsui Incident," will not be detected mistakenly as being a name.

[0095]

Carrying out processes such as determining, based on the similarities between a name a user has used in a statement and the names that have already been registered for the person that is the current subject and based on the similarities with names that have already been registered for persons who are not the current subject, a person for which there is a high possibility that the name is indicating that person, and, depending on the possibility, associating that name and that person, or making an association with a high-likelihood person after questioning the user, enables appropriate identification of who is indicated by a name used by the user in the natural flow of conversation. In particular, because the process distinguishes between the name of the person that is the current subject and the names of people who are not, it is possible to perform the identification correctly by considering other people as well, while focusing on the person that is the current subject.

[0096]

If the name used by the user is not registered as the name of a person, a registration is added automatically as a name for that person, where if no person can be found that is associated to a name used by the user, a registration for that name is added as being for a new person, thus eliminating the need for a name registering operation disrupts the flow of conversation (for example, an operation wherein the conversation is interrupted, for example, to launch a name registration mode to register the name), as has been required in a conventional conversation system.

[0097]

The result is that it is not necessary to remember accurately the names that are allowed for each individual person, making it possible to use a plurality of names whimsically, without worry, for a given person, the same as it is in a normal conversation. Moreover, because the same name can be used for multiple people, there is no need to go through the effort of artificially using different ways of referring to different people that would normally be referred to using the same name. In particular, shortened names that are normally used after it has become clear who the subject is will be the same for many individuals, and this enables the same use as is natural.

[0098]

Because use counts are recorded for each name and the counts are used to identify a person when there are identical names, the conversation regarding a person who is often the subject can proceed without the effort of having to check through asking a question.

[0099]

Moreover, by having the points that are added to a name similarity score be greater in the case of a personal name than a case that is not a personal name, this approach is a reality wherein it is easy to identify that it is the same person when the name matches. For example, if both the surname and the given match, this would be four points, with a high probability that it is the same person. Even if there is no name in the user statement, if the subject person number is not zero then statements relating to the same person will continue, so the conversation will not jump to another subject.

[0100]

This makes it possible to enhance the satisfaction of the user with the conversation system as having heard and understood the user's statements. Moreover, if the user has, for a prescribed period of time, not used the name of a person, the subject person number is set to 0, and no statement is made regarding that person, thus enabling appropriate statements corresponding to the conversation having moved away from the subject of that person.

[0101]

Because conversation participant are identified and names are registered and used depending on the individual conversation participant, the names used by each conversation participant will have no effect on the names used by others. This enables each individual conversation participant to use, without any type of limitation, the names that he or she always uses. Moreover, this enables the conversation system to carry out conversations by interpreting the same name as naming different people depending on the conversation participant.

[0102]

Moreover, when collecting articles, from an article database 18, regarding the person that is the subject, even in regard to a name used by a user at a given time that is a name wherein the name-structuring element nouns is only a single name, the article would be retrieved using the name, among all the names for that person, that has the greatest number of name-structuring element nouns, rather than using the name that was used, thus reducing the likelihood of mixing in articles about someone else, thereby reducing statements that mistake the subject person.

[0103]

Moreover, when collecting, from the article database 18, articles regarding a subject person, a plurality of names of that person is used, making it possible to collect more articles regarding the person, producing rich content for statements by the conversation system.

[0104]

Note that while in the embodiments set forth above the descriptions had names of people registered through conversation with the user, several names may be registered in advance instead. For example, "Matsui of the Kyo**" and "Matsui of the Gia**," and the like, may be registered in advance for the same person, and when the user uses a name that has not yet been registered, such as "Matsui Godzi**," that name, "Matsui Godzi**," may be registered additionally when this is identified as being the same person.

[0105]

Moreover, while the descriptions were for a case wherein statements are generated using the article database 18, other techniques may also be used, such as using a chatbot system. Here names such as, for example, "Matsui of the Kyo**" are registered in advance, and also specific statements regarding "Matsui of the Kyo**" are prepared in advance, to make the specific statement regarding other names that are identified as being the same person.

[0106]

Moreover, a process other than the subject person identification processing of FIG. 7 may be carried out instead. For example, in a case wherein names of people are registered at the start in consideration of the possibility of error in part-of-speech analysis, name extraction, and the like (Case A4), a confirmation may be carried out after questioning the user that is the conversation participant as to whether a name actually indicates a specific person.

Conversely, even if there is only a single "Matsui" registered in the name data, a check may be performed, by questioning the user as to whether or not this is "Matsui of the Kyo**" when "Matsui" is mentioned the first time in a conversation on a given day (when a name that has a single name-structuring element noun is used for a name that is not a person that is the subject).

[0107]

Moreover, names may be extracted instead by a process other than the name detection processing of FIG. 6. A technique that is other than extraction of a name prefix phrase or name suffix phrase may be used. For example, suffixes such as "San," "Kun," "Chan," or the like, or prefixes such as "former," "ex-," or the like, etc., may also be included in the names. Modifiers, or other phrases that achieve roles similar to that of "of" or indicating the possessive case, included in parts of speech other than nouns may be included in name prefix phrases. While nouns that may be included in names as name suffix phrases were extracted as names through having and using name-appropriate subsequent noun data 19, there may be data such as nouns that should not be included in names, and these may be used to exclude those which are inappropriate.

[0108]

While in the embodiments set forth above only that which included proper nouns indicating personal names for people were extracted, for simplicity, that which includes other phrases may also be extracted. In such a case, it becomes difficult to distinguish between personal names and place names, so proper nouns that indicate place names may be included, all proper nouns may be included, unknown words that cannot be identified as to whether or not they are proper nouns, and the like, may be included.

[0109]

Moreover, when a word is discovered that is not a proper noun but tends to be included in names, a name may be extracted therefrom. For example, a list of words that tend to be included in names, such as "father," "teacher," "senior," "uncle," "big sister," and the like, may be stored in advance in the nonvolatile memory 17, and when these are in statements by users, names may be extracted by examining what comes before and after these words. This enables registration of natural names for people who are close. For example, "the avuncular guy next door," "the senior on the baseball team," "the homeroom teacher," and the like, can be registered. At this time, use together with the methods of the present embodiment enables registration of "my senior on the tennis team," "senior Yamazaki," "senior," and the like, as names for the same person. However, when such a close person is the subject, using only a statement generation processing that uses an article database 18, such as news stories, will

not result in a conversation; rather other techniques, such as recording conversations with that conversation participant and generating statements from past conversations will be necessary.

[0110]

When such methods are used, it will be possible to use respectively different names, together with names that do not include names that include proper nouns, to refer to the same person, such as a father using "Aya," a mother using "Aya-chan," and a younger sister using "big sister."

[0111]

Moreover, while in the embodiments set forth above names were always extracted through going through parts-of-voice analysis, or the like, from a user statement, instead whether or not a name that has been registered in advance in name data is included in a user statement may be checked first. If a name that has been registered through a confirmation by questioning a user as to whether or not the name refers to a specific person, it is particularly effective to skip the time and effort to do so again. However, even in this case there is the possibility that there is an even longer name that includes that name, and thus preferably processing looks at similarities, and the like, through techniques similar to the subject person identification processing, described above.

[0112]

While, as the method for calculating name similarity scores, the number of points added was doubled depending on whether or not the name-structuring element noun is a personal name, the same number of points may be used, or points with different ratios may be used. The algorithm itself for calculating the score may be varied. Moreover, a different method for discerning what names are similar may be used.

[0113]

Moreover, while in the embodiments set forth above personal names or used as an example wherein the subject can be picked up most easily, this may be applied to names of a variety of objects, such as animals, organizations, inanimate objects, or the like, such as, for example, pets, race horses, baseball teams, characters from mangas, stuffed toys, robots, and the like.

[0114]

Basically, the present invention is not limited to the embodiments set forth above, but rather a variety of modifications are possible during implementation within a range that does not deviate from the spirit or intent of the present invention. Moreover, the inventions of a variety of stages are included in the embodiments set forth above, and a variety of inventions may be extracted through arbitrary combinations of the plurality of structural elements disclosed. For example, even if several of the structural elements were removed from the full set of structural matters disclosed in an embodiment, the configuration wherein the structural matters have been removed could be extracted as an invention if the effect is that of solving the "Problem to Be Solved by the Present Invention," and there is the effect described in the "Effects of the Invention" section.

[0115]

Moreover, the method described in the embodiments set forth above may be applied as a program that can be executed by a computer, applied in various types of devices, through writing to, for example, a magnetic disk (a flexible disk, a hard disk, or the like), an optical disc (a CD-ROM, a DVD ROM, or the like), a semiconductor memory, or another recording medium, or through the program itself being transmitted through a transmission medium

such as a network. The computer for achieving the device reads in the program that is recorded on the recording medium, or the program provided through the transmission medium, and the operations thereof are controlled by the program, to execute the processes described above.

[0116]

[EFFECTS OF THE INVENTION]

The conversation system according to the present invention, described in detail above, enables correct determination of a person indicated by a name, even in statements wherein the user uses different names for the person, in a conversation wherein, for example, a person is the subject, enabling an appropriate response to be returned at that time in accordance with the subject. This makes it possible to achieve a natural conversation, such as with a conversation between people.

[BRIEF DESCRIPTIONS OF THE DRAWINGS]

FIG. 1 is a block diagram showing a hardware structure for a conversation system according to one embodiment according to the present invention.

FIG. 2 is a diagram depicting an example of name-appropriate subsequent noun data stored in nonvolatile memory of the conversation system.

FIG. 3 is a diagram depicting an example of name data stored in the nonvolatile memory of the conversation system.

FIG. 4 is a diagram depicting the flow of processing of data after A/D conversion, performed by a CPU that is built into in the conversation system.

FIG. 5 is a flowchart depicting the flow of conversation processing in the conversation system.

FIG. 6 is a flowchart depicting the flow of name detection processing in the conversation processing of the conversation system.

FIG. 7 is a flowchart depicting the flow of subject person identification processing in the conversation processing in the conversation system.

FIG. 8 is a diagram depicting an example of a subject person identification table (A) that is stored in the nonvolatile memory of the conversation system.

FIG. 9 is a diagram depicting an example of a subject person identification table (B) that is stored in the nonvolatile memory of the conversation system.

FIG. 10 is a diagram depicting states of updating of name data that is stored in the nonvolatile memory of the conversation system.

FIG. 11 is a diagram depicting an example of name data for a conversation participant 1, stored in the nonvolatile memory of the conversation system.

FIG. 12 is a diagram depicting an example of name data for a conversation participant 2, stored in the nonvolatile memory of the conversation system.

FIG. 13 is a flowchart depicting the flow of subject person statement processing in conversation processing of the conversation system.

[EXPLANATIONS OF REFERENCE SYMBOLS]

11: CPU

12: Voice Inputting Portion

13: A/D Converting Portion

14: Voice Outputting Portion

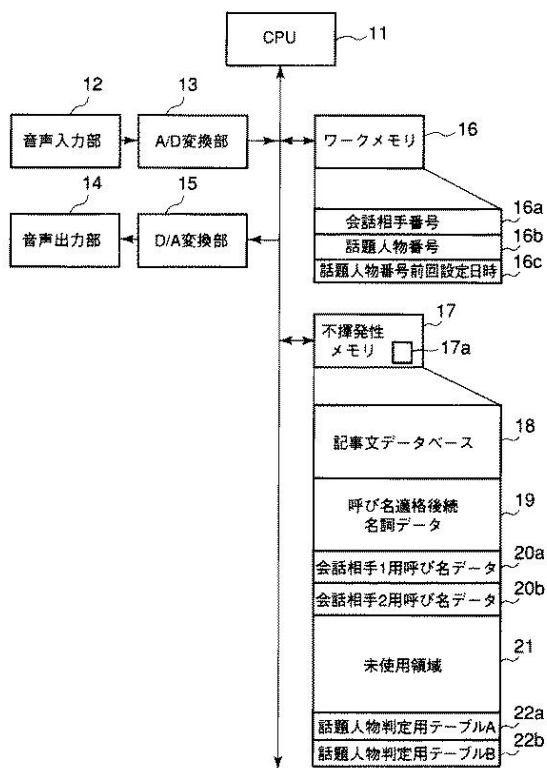
15: D/A Converting Portion

16: Working Memory

(21)

16a through 16c: Information Storing Regions
 17: Nonvolatile Memory
 17a: Program
 18: Article Database
 19: Name-Appropriate Subsequent Noun Data
 20a: Conversation Participant 1 Name Data
 20b: Conversation Participant 2 Name Data
 21: Unused Region
 22a: Subject Person Identification Table (A)
 22b: Subject Person Identification Table (B)

[FIG. 1]



11: CPU
 12: Voice Inputting Portion
 13: A/D Converting Portion
 14: Voice Outputting Portion
 15: D/A Converting Portion
 16: Working Memory
 16a: Conversation Participant Number
 16b: Subject Person Number
 16c: Subject Person Number Latest Setting Date/Time
 17: Nonvolatile Memory
 18: Article Database
 19: Name-Appropriate Subsequent Noun Data
 20a: Conversation Participant 1 Name Data
 20b: Conversation Participant 2 Name Data
 21: Unused Region
 22a: Subject Person Identification Table A
 22b: Subject Person Identification Table B

(22)

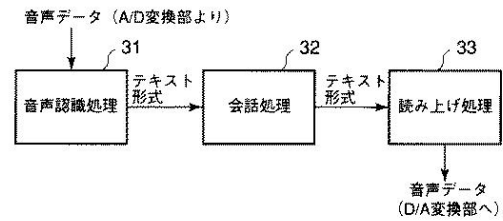
[FIG. 2]
Name-Appropriate Subsequent Noun Data

Player
Pitcher
Manager
...
Prime Minister
...

[FIG. 3]
Name Data

Person Number	Name	Name Reference Count

[FIG. 4]



[UPPER LEFT] Voice Data (from A/D Converting Portion)

31: Voice Recognition Processing

[RIGHT OF 31] Text Format

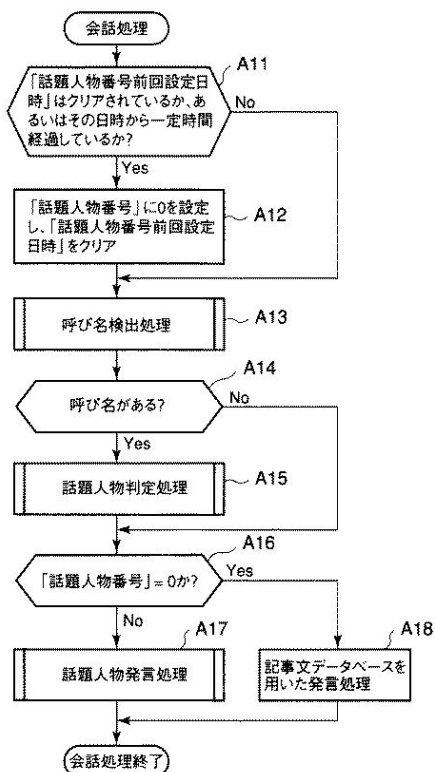
32: Conversation Processing

[RIGHT OF 32] Text Format

33: Reading Processing

[BOTTOM RIGHT] Voice Data (To D/A Converting Portion)

[FIG. 5]



[TOP] Conversation Processing

A11: Is the "subject person number latest setting date/time" cleared or a has prescribed time elapsed since that time?

A12: Set the "subject person number" to 0 and clear the "subject person number latest setting date/time."

A13: Name Detection Processing

A14: Is there a name?

A15: Subject Person Identification Processing

A16: "Subject person number" = 0?

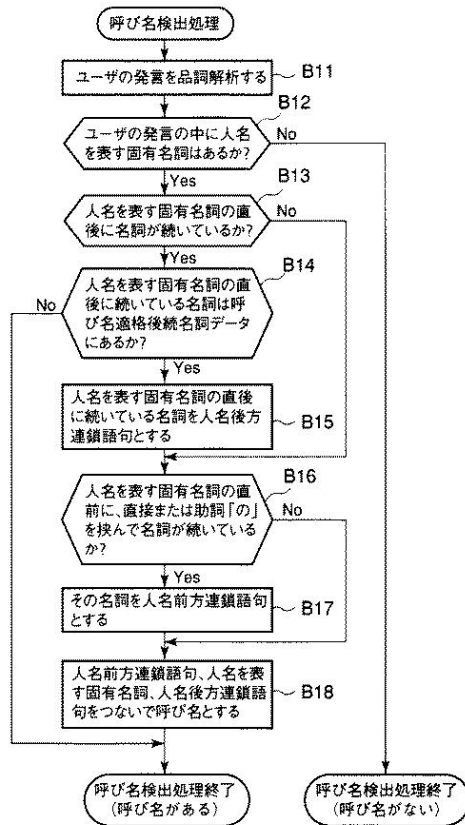
A17: Subject Person Statement Generation Processing

A18: Statement Generation Processing Using Article Database

[BOTTOM] Terminate Conversation Processing.

(23)

[FIG. 6]



[TOP] Name Detection Processing

B11: Perform part-of-speech analysis on user statement.

B12: Is there a proper noun that indicates a personal name in the user statement?

B13: Is there a noun directly following the proper noun that indicates the personal name?

B14: Is the noun that follows immediately the proper noun that indicates the personal name in the name-appropriate subsequent noun data?

B15: Define the noun that follows directly after the proper noun that indicates a personal name as a name suffix clause.

B16: Is there a noun immediately prior to the proper noun that indicates the personal name, or with a possessive particle therebetween?

B17: Define the noun as a name prefix clause

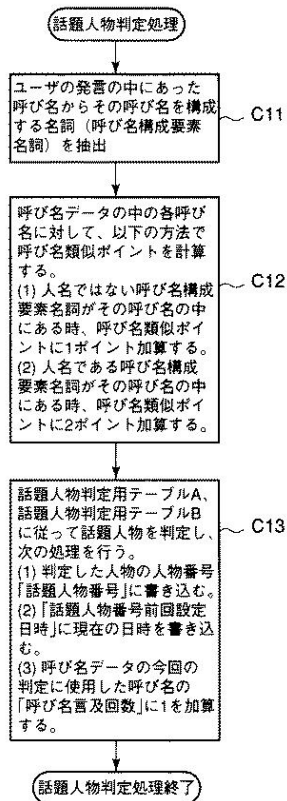
B18: Define, as the name, the combination of the name prefix clause, the proper noun that indicates the personal name, and the name suffix clause.

[LOWER LEFT] Terminate the Name Detection Processing (Name Found)

[LOWER RIGHT] [Terminate the Name Detection Processing (Name Not Found)]

(24)

[FIG. 7]



[TOP] Subject Person Identification Processing

C11: Extract, from the name that was within the user statement, the nouns that structure the name (the name-structuring element nouns).

C12: For each name in the name database, calculate a name similarity score through the following method:

(1) Add 1 point to the name similarity score if the name includes a name-structuring element noun that is not a personal name.

(2) Add 2 points to the name similarity score if the name includes a name-structuring element noun that is a personal name.

C13: Identify the subject person following subject person identification table A or subject person identification table B, and perform the following processing:

(1) Write the person number of the identified person to the "subject person number."

(2) Write the current time to the "subject person number latest setting date/time."

(3) Increment by 1 the "name reference count" of the name, in the name data, used in the identification this time.

[BOTTOM] Terminate Subject Person Identification Processing

[FIG. 8]

When the Subject Person Number = 0 or All Name Similarity Scores for the Subject Person Are 0

Case No.	Relationships Between the Current Name and Names of Other Than The Subject Person	Corresponding Process
Case A1	Only a single matching name	Define, as the subject person, the person with the matching name.
Case A2	A plurality of matching names	Compare the name reference counts among the matching names, and if there is one that is greater by a prescribed ratio, designate that person as the subject person. If such a condition is not satisfied, question the user to narrow to a single person and designate that person as the subject person.
Case A3	No matching name, but there is a name for which the name similarity score is nonzero	Confirm by questioning, sequentially starting with the person with the highest name similarity score, by asking the user if it is the same person. When there is a response that it is the same person, define that person as the subject person. If the same person does not exist, perform the corresponding process of Case A4.
Case A4	The name similarity scores are all 0 or there is no name registered for other than the subject person	Add the current name to the name registration data, using a new person number, and Write 0 to the name reference count. Define that person as the subject person.

"Current name" = The name obtained from the user statement through the name detection processing.

(25)

[FIG. 9]

When the Subject Person Number > 0 and There is a Name Similarity Score for the Subject Person that is Nonzero

Case No.	Relationships Between the Current Name and the Names of the Subject Person	Relationships between the Current Name and Names Other Than Those of the Subject Person	Handling Process
Case B1	There is a matching name.	*	Define the current subject person as the (continuing) subject person.
Case B2	There is no matching name but there is a name that is included completely. (The current name is included completely in a name for the subject person.)	*	Add a registration for the current name as the name of the subject person, set the name reference count to 0, and designate the current subject person as the (continuing) subject person.
Case B3	There is no matching name and no name that is included completely.	There is a matching name.	Perform the corresponding process of Case A 1 or Case A2 depending on the number of matching names.
Case B4	There is no matching name and no name that is included completely.	There is no matching name, but there is a name for which the name similarity score is nonzero.	Perform the corresponding process of Case A3.
Case B5	There is no matching name and no name that is included completely.	The name similarity scores are all zero or there is no name registered for other than the subject person.	Confirm by asking the user if the current name is a name for the subject person. If so, add a registration for the current name to the names of the subject person, set the name reference count to 0, and define the current subject person as the (continuing) subject person. If the current name is not a name of the subject person, perform the handling process for Case A4.

*: Indicates that this is unconditional.

[FIG. 10]

State 1			
	Person Number	Name	Name Reference Count
(a)	1	Matsui of the Kyo**	1
State 2			
	Person Number	Name	Name Reference Count
(b)	1	Matsui of the Kyo**	1
	1	Matsui	1
State 3			
	Person Number	Name	Name Reference Count
(c)	1	Matsui of the Kyo**	1
	1	Matsui	3
	2	Matsui of the Sei**	1
State 4			
	Person Number	Name	Name Reference Count
(d)	1	Matsui of the Kyo**	1
	1	Matsui	3
	2	Matsui of the Sei**	1
	2	Matsui	1
State 5			
	Person Number	Name	Name Reference Count
(e)	1	Matsui of the Kyo**	1
	1	Matsui	3
	2	Matsui of the Sei**	1
	2	Matsui	1
	1	Matsui of the Gia**	1
	1	Matsui Godzi**	1

(26)

[FIG. 11]

Conversation Participant 1 Name Data

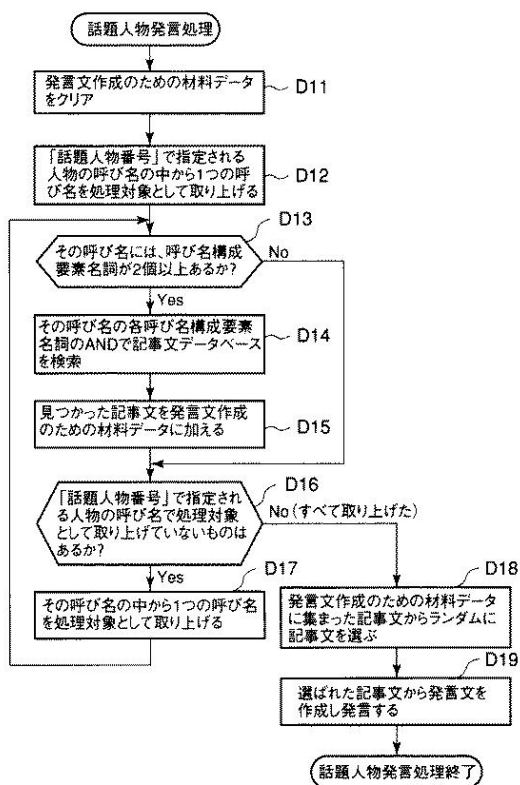
Person Number	Name	Name Reference Count
1	Matsuri of the Kyo**	1
1	Matsui	2
1	Matsuri of the Gia**	1
1	Matsuri Godzi**	1

[FIG. 12]

Conversation Participant 2 Name Data

Person Number	Name	Name Reference Count
2	Matsuri of the Sei**	1
2	Matsui	1

[FIG. 13]



[TOP] Subject Person Statement Generation Processing

D11: Clear the raw data for statement generation.

D12: Select, for processing, one of the names for the person specified by the "subject person number."

D13: Are there at least two name-structuring element nouns in the name?

D14: Search the article database with an AND condition for each name-structuring element noun of the name.

D15: Add, to the raw data for statement generation, the article(s) that are found.

D16: Are there names yet to be processed for the person indicated by the "subject person number"?

[RIGHT OF D16] No (All have been processed)

D17: Select one of the names for processing.

D18: Selected at random an article from among the articles gathered in the raw data for statement generation.

D19: Generate and speak a statement from the selected article.

[BOTTOM RIGHT] Terminate subject person statement processing.

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Sun IP hereby certifies that the attached translation has been translated by experienced and qualified translators and that, to the best of our knowledge, the translated text reflects the content, meaning and style of the original text and constitutes a true and accurate translation of the original document.

December 31, 2024

Alexander P. Dockery

SENIOR PROJECT MANAGER