Dictionary generator for machine translation system

Wörterbuchgenerator für ein maschinelles Übersetzungs-system

Générateur de dictionnaire pour un système de traduction automatique

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Description

Field of the Invention

[0001] The present invention relates to machine translation and, more particularly, is directed to a multi-lingual machine translation system for programs to translate a pseudo code program written in an arbitrary language into a pseudo code program written in another language.

Description of the Prior Art

[0002] In relation to the present invention, the following two documents are mentioned.

[0003] EP-A-0 368 148 describes a multi-language conversion system comprising a multi-language conversion table comprising a plurality of sub-tables for individual languages, including a keyword module for managing a keyword to be subject to a conversion in a predetermined sequence and a data module for storing data corresponding to said keyword in accordance with the order of the keyword, a multi-language conversion table selection unit for selecting at least one of said multiple language conversion sub-tables in accordance with a language designation and a multi-language conversion module unit for determining whether the language data subject to conversion in accordance with the selected language conversion sub-table exists in the keyword, and for determining said data as a conversion data when said language data subject to conversion exists in the keyword.

[0004] IBM Technical Disclosure Bulletin Vol. 17, No. 6, November 1974, pages 1763-4 "Language Translation of Code" by T.N. Brown describes means for translating a source model in a first language into a national model in a second language. The source model is composed of physical lines or logical lines which are sequence numbered. These lines are coded translatable (T) or non-translatable (NT). A translate file in the second language is match-merged in the translation process with the source file. T records in the source file which are matched are dropped and T records in the source file which are unmatched are flagged. The resulting merged file is the desired national model in the second language.

[0005] Recently, a kind of compiler has been realized to convert a pseudo code program written as a structured chart expression in the Japanese language into a code that computers can execute, thus enabling Japanese people to make a program with ease. The above pseudo code program is substantially similar to the detailed design document level and, therefore, has the advantage that it requires little labor to develop. The program development period is much less than when a program is made by means of program languages, such as FORTRAN, C, COBOL or the like.

[0006] Recently, an increasing number of programs developed in Japan have been utilized overseas. Thus, the description of the program in the Japanese language causes the problem that, when it has to be maintained, users cannot understand the program itself or the Japanese manual, thus making maintenance of the program impossible. This problem is not limited to the Japanese language, but commonly occurs in other countries, for example, when a plurality of countries cooperate in developing a program. Thus, to simplify maintenance of the program, the pseudo code program described in the language of a certain country must be converted into a program described in the language of other countries. Machine translation systems have been proposed to automatically translate a sentence in one language to a sentence in another language (e.g., the Japanese and the English languages). For these machine translation systems, dictionaries for the required fields must be prepared both languages.

[0007] However, the language described in the above pseudo code program is an artificial language, so, the syntaxes can be easily made coincident. However, most of the words expressing the world to be programmed, i.e., most names of variables and constants, are separately prepared for individual programs.

[0008] However, the names of variables and constants in pseudo code programs exported overseas are frequently described in the form of a list table on the design document in a plurality of languages.

Summary of the Invention

[0009] The present invention is intended to generate a bilingual dictionary with respect to words such as variables, constants and the like, utilized in the pseudo code program from the design document and to automatically translate a pseudo code program described in a language of a certain country into a pseudo code program described in a language of another country by using the above bilingual dictionary.

[0010] According to the present invention, therefore, there is provided a machine translation system including a classified-by-field dictionary generating apparatus comprising: notation data memory means for storing notation data used to describe a design document which produces a pseudo code program in which names are defined by at least two languages; extracting means supplied with a design document described by said notation data and extracting bilingual information necessary for translating a pseudo code program of a predetermined field described in a certain language into a pseudo code program described in another language on the basis of said notation data stored in said notation data memory means; and dictionary generating means for generating a classified-by-field dictionary corresponding to a field of a pseudo code program to be translated in which translation information on all notation data described in said input design document is written in a predetermined format on the basis of said bilingual
information extracted by said extracting means.

Brief Description of the Drawings

[0011]

Figure 1 is a block diagram for explaining the principle of the present invention;
Figure 2 is a block diagram showing an arrangement of a system according to an embodiment of the present invention;
Figure 3 is a diagram showing an example of a hardware arrangement used in an embodiment of the present invention;
Figure 4 is a diagram showing another example of a hardware arrangement used in an embodiment of the present invention;
Figure 5 (5A, 5B) is a schematic diagram used to explain the operation of an embodiment of the present invention;
Figure 6 is a diagram showing symbol data used to describe a design document;
Figure 7 is a flowchart to which references will be made in explaining the process of a machine translation apparatus; and
Figure 8 is a flowchart to which references will be made in explaining more fully the generation of a classified-by-field dictionary.

Description of the Preferred Embodiment

[0012] Figures 1 block diagrams used to explain the principle of the present invention.
[0013] A classified-by-field dictionary generating apparatus 11 shown in Figure 1 is constructed as follows.
[0014] A notation data memory means 1 is adapted to store notation data used to describe a design document for making a pseudo code program in which names of variables, constants, etc., are defined in at least two languages. This notation data memory means 1 is composed of, for example, a DASD (Direct Access Storage Device).
[0015] An extracting means 3 is supplied with a design document 2 described in the above notation data and utilizes the notation data stored in the above notation data memory means 1 to extract bilingual information which is required to translate a pseudo code program of a predetermined field written in a certain language into a pseudo code program of another language. The extracting means 3 is formed of, for example, a CPU (Central Processing Unit).
[0016] A dictionary generating means 15 is adapted to generate, on the basis of the bilingual information extracted by the extracting means 3, a classified-by-field dictionary corresponding to the field of the pseudo code program to be translated in which translation information of all notation data described in the above input design document 2 are described in the predetermined format.

The dictionary generating means 15 is formed of, for example, a CPU.

[0017] The design document 2 is made, for example, by a display editor, and the notation data thereof is composed of a graphic symbol and data presented in the form of a table.

[0018] The machine translation apparatus 20 shown in Figure 1 is constructed as follows.

[0019] The classified-by-field dictionary 4 shown in Figure 1 is employed as a bilingual dictionary of all notation data which describes the design document 2 generated by the above classified-by-field dictionary generating apparatus 11 and made, for example, in the DASD, as a file.

[0020] A natural language dictionary 6 is employed to translate a natural language expressing the translation pseudo code program 5 to be translated into another natural language and is made, for example, in the DASD, as a file. This natural language dictionary 6 is a dictionary for translating original sentences in one language into sentences in another language. Examples are an English-Japanese dictionary and a Japanese-English dictionary.

[0021] A translation dictionary 8 is employed for translating the above translation pseudo code program 5 described in one language into a pseudo code program described in another language with reference to the above classified-by-field dictionary 4 and the above natural language dictionary 6. The translation dictionary 8 is formed of, for example, a CPU.

[0022] The machine translation apparatus 20 shown in Figure 1 is constructed as follows.

[0023] Classified-by-field dictionaries 4-1 through 4-N are prepared for a plurality of natural languages.

[0024] Natural language dictionaries 6-1 through 6-N are prepared for the classified-by-field dictionaries 4-1 to 4-N in a one-to-one relation.

[0025] The above classified-by-field dictionaries 4-1 to 4-N and natural language dictionaries 6-1 to 6-N are formed, for example, within the DASD as files.

[0026] A dictionary selecting means 9 is employed for selecting the classified-by-field dictionary (4-I; I = 1, 2, ..., N) and the above natural language dictionary (6-I; I = 1, 2, ..., N) corresponding to the language expressing the translation pseudo code program 5 to be translated from the plurality of classified-by-field dictionaries 4-1 through 4-N and the plurality of natural language dictionaries 6-1 through 6-N. The dictionary selecting means 9 is formed of, for example, a CPU.

[0027] A translating means 10 is employed for translating the translation pseudo code program 5 into the pseudo code program 7 described in another desired language, with reference to the above classified-by-field dictionary 4-I (I=1,2, ..., N) and the above natural language dictionary 6-I (I=1,2, ..., N) selected by the above dictionary selecting means 9. The translating means 10 is formed of, for example, a CPU.

[0028] The machine translation system described in Claims 4 - 32 has a configuration in which, for example,
the classified-by-field dictionary generating apparatus 11 and machine translation apparatus 20 are connected to a network such as a local, wide area, metropolitan, or in-house network.

[0029] As an appropriate implementation of the above described machine translation apparatus.

[0030] The classified-by-field dictionary generating apparatus 11 and the machine translation apparatus 20 are connected in the same network. The machine translation apparatus 20 receives the classified-by-field dictionary 4 from the classified-by-field dictionary generating apparatus 11 through the network and translates the translation pseudo code program 5 described in a certain language into the pseudo code program 7 described in another desired language with reference to the thus received classified-by-field dictionary 4 and the natural language dictionary 6 prepared therein.

[0031] When the network is a local area network, the above described classified-by-field dictionary generating system is provided in a server node, for example, and the machine translation apparatus is provided in a client node, for example.

[0032] As another appropriate implementation, the classified-by-field dictionary generating apparatus 11 and the machine translation apparatus 20 are provided for a specific computer in the network, and the specific computer receives a translation pseudo code program from another computer or terminal in the network through a circuit of the network, converts the received translation pseudo code program to a pseudo code program described in a language specified by the above described computer or terminal, and transmits the converted pseudo code program to the computer or terminal through a circuit of the network.

[0033] When the network is a local area network, for example, the above described specific computer is a server node.

[0034] The action of the present invention is as follows.

[0035] The classified-by-field dictionary generating apparatus 11 of claim 1 is supplied with the design document 2 made from the predetermined notation data. It extracts all notation data described in the input design document 2 with reference to the notation data stored in the notation data memory means 1 and in which names are defined by at least two languages, thereby extracting the bilingual information necessary for translating the pseudo code program of the predetermined field described in a certain language (e.g., the Japanese language) into a pseudo code program of another language (e.g., the English language). The dictionary generating means 15 generates, on the basis of the thus extracted bilingual information, the classified-by-field dictionary 4 in which the translation information of all notation data described in the input design document 2 are described in the predetermined format.

[0036] Thus, the classified-by-field dictionary 4 is generated, by which the arbitrary translation pseudo code program 5 can be translated into many languages in a two-way fashion.

[0037] Then, in the machine translation apparatus 20, the translating means 8 translates the translation pseudo code program described in one language into the pseudo code program described in another language on the basis of the classified-by-field dictionary 4 generated by the above classified-by-field dictionary generating apparatus 11 and the natural language dictionary 6 for the former language.

[0038] Therefore, the translation pseudo code program 5 can be translated into pseudo code programs of arbitrary languages in a two-way fashion.

[0039] Further, in the machine translation apparatus 20, the dictionary selecting means 9 selects the classified-by-field dictionary 4-I (I = 1, 2, ..., N) of the field corresponding to the translation pseudo code program 5 and the natural language dictionary 6-I corresponding to the natural language expressing the translation pseudo code program 5 from the plurality of classified-by-field dictionaries 4-1 to 4-N and the plurality of natural language dictionaries 6-1 through 6-N. Then, the translating means 10 translates the above translation pseudo code program 5 into the pseudo code program 7 described in the other desired language with reference to the thus selected classified-by-field dictionary 4-I and natural language dictionary 6-I.

[0040] Therefore, the pseudo code program can be translated into other pseudo code programs of many languages in a two-way fashion.

[0041] In the machine translation system, the classified-by-field dictionary 4 is generated by the classified-by-field dictionary generating apparatus 11 connected in the same network. When translating the translation pseudo code program 5, the machine translation apparatus 20 receives the classified-by-field dictionary 4 from the classified-by-field dictionary generating apparatus 11 and translates the above translation pseudo code program 5 into the pseudo code program 7 described in the other desired language with reference to the thus received classified-by-field dictionary 4 and the natural language dictionary 6 prepared therein.

[0042] As described above, since the classified-by-field dictionary 4 and the pseudo code program 7 are generated by the above two apparatuses coupled on the same network 30 in a distributed processing fashion, it becomes possible to perform the machine translation of the pseudo code program by effectively utilizing the resources of the network 30. Embodiments of the present invention will hereinafter be described with reference to the drawings.

[0043] Figure 2 is a block diagram of an embodiment of the present invention. It illustrates an arrangement of the system in which a pseudo code program written in the Japanese language and a pseudo code program written in the English language are translated into each other in a two-way fashion.

[0044] The system shown in Figure 2 comprises a
work station 100 composed of a CPU 110, a CRT (cathode ray tube) 120, a keyboard 130, a main memory 140, a DASD (Direct Access Storage Device) 150 formed of a magnetic disc, and a printer 160 as shown in Figure 3. Alternatively, as shown in Figure 4, this system may be comprised of a computer network or the like in which two personal computers 200, each formed of a CPU 210, a CRT 220, a keyboard 230, a main memory 240, a DASD 250 and a printer 260 are coupled together by means of a network line 400 such as a LAN (local area network).

[0045] Referring to Figure 2, a design document 40 is composed of a module arrangement diagram 40a, a common table list 40b, a parameter list prepared for every module, and a macro instruction list or the like, not shown, in which the module arrangement diagram 40a, the common table list 40b, the parameter list for every module and the macro instruction are described in the Japanese language and in an English language expression corresponding to the Japanese language expression. A plurality of design documents 40 are formed, one for each of a plurality of classifications. Then, the pseudo code program is formed from design information described in the plurality of design documents 40.

[0046] Each design document 40 is stored as a file within the DASD 150 of the work station 100 shown in Figure 3 and/or within a DASD 250 of a personal computer 200-1, which serves as the machine translation dictionary generating apparatus in the computer network shown in Figure 4. The design document 40 is made by activating an editor stored in the DASD 150 or 250 by operating the keyboard 130 in the above work station 100 or the keyboard 230 of the personal computer 200-1 in the above computer network.

[0047] The machine translation dictionary generating apparatus 50 comprises a design document notation data storage unit 51, an extracting unit 52 and a dictionary generating unit 53. The data storage unit 51 stores graphic symbols or data of a table to be extracted at every field of the design document. The extracting unit 52 extracts description data about the module name, the common table name or the like from the above design document 40 on the basis of the graphic symbol and table data stored in the design document notation data storage unit 51. The dictionary generating unit 53 generates a classified-by-field dictionary 61 used to perform the original translation of the Japanese language and the English language on the basis of the information extracted in a two-way fashion by the extracting unit 52.

[0048] The design document data storage unit 51 is stored in the DASD 150 in the work station 100 shown in Figure 3 or in the DASD 250 of the personal computer 200-1 of the personal computer shown in Figure 4. The functions of the extracting unit 52 and the dictionary generating unit 53 are executed by the execution of the CPU 110 in the work station 100 shown in Figure 3 or by the execution of the CPU 210 of the personal computer 200-1 in the computer network shown in Figure 4.

[0049] The machine translation apparatus 60 is composed of a standard dictionary (natural language dictionary) 61, a classified-by-field dictionary 62 and a translation processing unit 63. The standard dictionary 62 is used to translate general sentences in a machine translation fashion. The classified-by-field dictionary 62 is generated by the dictionary generating unit 53 of the above machine translation dictionary generating apparatus 50. The translation processing unit 63 converts and makes a pseudo code program 70 described in the Japanese language and a pseudo code program 80 described in the English language in a two-way fashion with reference to the standard dictionary 61 and the classified-by-field dictionary 62.

[0050] In the work station 100 shown in Figure 3, the standard dictionary 61 and the classified-by-field dictionary 62 are generated in the DASD 150 as the files and the function of the translation processing unit 63 is realized by the execution of the CPU 110.

[0051] Further, in the computer network shown in Figure 4, the standard dictionary 61 and the classified-by-field dictionary 62 are generated within the DASD 250 of the personal computer 200-2 as the files and the function of the translation processing unit 63 is realized by the execution of the CPU 210 of the personal computer 200-2.

[0052] The pseudo code program 70 and the pseudo code program 80 are pseudo code programs expressed in the form of structured charts in the Japanese language and the English language, respectively. The pseudo code program 70 (hereinafter referred to as a Japanese language program 70) and the pseudo code program 80 (hereinafter referred to as an English language program 80) are translated to each other in a two-way fashion by the machine translation apparatus 60.

[0053] Reference numeral 62a shown in Figure 2 shows a part of the classified-by-field dictionary 62. In this part, the machine translation dictionary generating apparatus 50 generates bilingual information 62a-1 and 62a-2 of "line state variable supervisory processing to stat-supvis" and "line state variable acquisition processing to stat-polii" from the description of a module 40a-1 connected to the module arrangement diagram 40a of the design document 40. Also "line state variable supervisory processing" in the Japanese language and "stat-supvis" in the English language are presented, and a module 40a-2 in which "line state variable acquisition processing" in the Japanese language and "stat-polii" in the English language are presented. Similarly, bilingual data 62b-1 of "state variable table to stcbh" are generated from the common table list 40b of the design document 40 shown in Figure 2.

[0054] Operation of the thus arranged embodiment will be described next.

[0055] Figure 5A and Figure 5B are a schematic diagram used to explain how the classified-by-field dictionary information is extracted by the extracting unit 52 of the machine translation dictionary generating apparatus.
A design document notation data storage unit 51 shown in Figure 5A(c) stores graphics symbol data 100a, 100b and 100c of the module; the common routine; and the diverted routine shown in Figures 6(a), (b) and (c) in association with the names thereof.

Initially, the user activates the display editor stored in the DASD 150 (250) by operating the keyboard 130 (230) to make a design diagram of a supervisory device control task of the supervisory control interface apparatus shown in Figure 5A(a) on the picture screen of the CRT 120 (220).

In the example shown in Figure 5A(a), a supervisory device control task main module (English name: SVDMAIN) 200 comprises an initialization processing module (English name: SVDC001) 201, a DISC command issue processing module (English name: SVDC002) 202, an activating factor analyzing processing module (English name: SVDFIAL) 230, etc. Further, the design document 100 is displayed. The DISC command issue processing module 220 includes a U frame generating processing common routine (English name: SVDMU) 221 and the above activating factor analyzing processing module 230 includes a data classification analyzing processing module (English name: SVDFDAT). Incidentally, although the above U frame generating processing common routine 221 and the data classification analyzing processing routine 231 are not fully displayed in the picture shown in Figure 5A(a), the whole of the U frame generation processing common routine 221 and the data classification analyzing processing module 231 can be made and checked by horizontal scrolling. Also, another module 100a, a common routine 100b, a system call 100c, etc., forming the supervisory device control task, can be made and referred to by vertical scrolling.

The extracting unit 52 of the machine translation dictionary device 50 extracts all module 100a and common routine 100b from the design drawing 100 of the supervisory device control task of the supervisory control interface device, which is partly shown in Figure 5A(a), with reference to a module graphic symbol data 100a, common routine graphic symbol data 100b and diversion routine graphic symbol data 100c stored in the design document data storage unit 51 and which are illustrated in Figures 6(a), 6(b) and 6(c) thereby to extract classified-by-field dictionary data 301, 302, 303 such as module (initialization processing, DISC command setting processing, activating factor analyzing processing, supervisory device control task main), common routine (U frame generation processing, one frame generation processing, S frame generation processing), common data name (M message header, M message priority, ...) and so on as shown in Figure 5B(b). On the basis of the thus extracted classified-by-field data 301, 302, and 303 of the design document 100, the dictionary generating unit 53 generates the classified-by-field dictionary 62 with the dictionary generating unit 53 of the machine translation dictionary generating device 50 will be described with reference to the flowcharts of Figures 7 and 8.

If the user inputs a pseudo code program (hereinafter simply referred to as a program) to be translated by operating the keyboard 130 (230), the extracting unit 52 extracts all design document names associated with the program with reference to the directory associated with the design document 40 formed, for example, within the DASD 150 (250), and writes the extracted file name of the design document 40 in the work area of the main memory 140 (240) (in step S1). Then, the design document classification data (design document classified-by-field data) is also written in the above work area in response to the thus extracted design document name.

Then, the file name of the first design document 40 is extracted from a plurality of file names of the design documents 40 (in step S2) and the file of the design document 40 is read out from the DASD 150 (250). Also, the notation data corresponding to the above design document 40 is read out from the design document data storage unit 51 similarly formed within the DASD 150 (250), and the process (step S3) for compiling the classified-by-field dictionary 62 associated with the design document 40 is executed. After the classified-by-field dictionary 62 associated with the first design document 40 is compiled by the above process S3, it is determined in step S4 whether or not the classified-by-field dictionaries 62 are to be produced for all of the design documents 40. If the classified-by-field dictionary 62 is not to be fully compiled for all of the design documents 40, as represented by a NO at step S4, then the above steps S2 to S4 are repeated for the next design document 40.

If it is determined that the classified-by-field dictionaries 62 are to be compiled for all of the design documents 40 associated with the above program as represented by a YES at step S4, then the processing is ended.

The above process for compiling classified-by-field dictionary will be described more fully with reference to the flowchart in Figure 8.

Initially, in step SA1 the extracting unit 52 determines the classification of the extracted design document 40 and in step SA2 reads out notation data (module, common routine, system call graphic symbol data, data name, data type name, constant name, etc.) corresponding to the classification of the thus determined design document 40 from the design document notation data of storage unit 51.

Then, in step SA3 the file of the above design document 40 is opened. In step SA4, it is determined whether or not the description data (module, common routine, system call graphic data, data name, data type name, constant name, etc.) of the design document 40 stored within the thus opened file are coincident with the
notation data read out in step SA2, and corresponding data of Japanese names and English names with respect to the module, common routine, data name or the like are made as shown in Figure 5(d).

[0067] Furthermore, the dictionary generating unit 53 generates the classified-by-field dictionary 62 in which Japanese names and English names are mapped in a one-to-one fashion with respect to the module, common routine, system call, data name, data type name, constant name or the like as shown in the diagram 62a in Figure 2 on the basis of the data indicating the corresponding relation of Japanese names and English names with respect to the module, common routine, data name and so on made by the extracting unit 52. Then, in step SA5, the dictionary generating unit 53 makes the file of the thus generated classified-by-field dictionary 62 in the DASD 150 of the work station 100 shown in Figure 3 or in the DASD 250 of the personal computer 200-2 of the computer network shown in Figure 4.

[0068] The thus generated classified-by-field dictionary 62 is used when the translation processing unit 63 translates the pseudo code program 70 expressed in Japanese into the pseudo code program 80 expressed in English or when the translation processing unit 63 translates the pseudo code program 80 expressed in English into the pseudo code program 70 expressed in Japanese. That is, by utilizing the classified-by-field dictionary 62 generated as described above, the pseudo code program 70 expressed in Japanese and the pseudo code program 80 expressed in English can be translated in a two-way fashion.

[0069] While the pseudo code programs expressed in Japanese and in English are translated two-way as described above, the present invention is not limited thereto and pseudo code programs expressed in a plurality of other languages can be translated in a two-way fashion. More specifically, according to the present invention, since selection data such as graphic symbols, table type data and the like for describing the design document are stored beforehand, and one or a plurality of classified-by-field dictionaries for two arbitrary languages are automatically generated from the design document, the pseudo code programs expressed in a plurality of arbitrary languages can be translated in a two-way fashion.

[0070] Further, if the design documents and the dictionary (classified-by-field dictionary and standard dictionary) data are transferred between terminals via the network, then the present invention can be realized by using a system in which the above design documents and dictionary data are stored in the respective terminals in a decentralized fashion.

[0071] That is, in the configuration where the machine translation dictionary generating apparatus (classified-by-field dictionary generating apparatus) 50 is provided in a server node and the machine translation apparatus 60 is provided in a client node in the local area network, wherein the server node manages the generation of a classified-by-field dictionary while the client node translates a pseudo code program, a classified-by-field dictionary required for the translation can be obtained from the server node through a circuit of the local area network. However, both the machine translation dictionary generating apparatus (classified-by-field dictionary generating apparatus) 50 and the machine translation apparatus 60 can be provided in a server node. In this case, when a client node has to translate a pseudo code program, the information of the translation pseudo code program and the language to be translated is transmitted to the server node in which the pseudo code program is translated. Then, after the translation, the server node transmits the result through a circuit of the local area network to the client node which requested the translation.

[0072] The above described system configuration can be applied to a computer network where a plurality of terminals are connected to a host computer comprising general purpose computers, etc. That is, in such a system, a host computer acts as an above described server node, and the computer network can be a wide area, metropolitan (city area) or in-house network.

[0073] As explained above, according to the classified-by-field dictionary generating apparatus, it is possible to make a classified-by-field dictionary which can be used to translate the pseudo code program described in one language into the pseudo code program described in another language.

[0074] According to the machine translation apparatus 60, the pseudo code program described in one language can be automatically translated into the pseudo code program described in another language by using the above classified-by-field dictionary, and the process of translating the pseudo code program described in one language into the pseudo code program described in another language can be automatically executed for a plurality of languages (a multilingual fashion).

[0075] In accordance with the machine translation system, since the apparatus for making the classified-by-field dictionary and the apparatus for executing the machine translation are connected on the same network in which the machine translation apparatus receives the classified-by-field dictionary from the classified-by-field dictionary generating apparatus through the above network, the resource (classified-by-field dictionary) can be utilized effectively and many users can utilize the machine translation.

[0076] Furthermore, when the pseudo code program made in a certain country by the above apparatus is utilized in another country using another language, its maintenance can be facilitated and its development and maintenance can be smoothly performed in an internationally-distributed fashion.
Claims

1. A machine translation system including a classified-by-field dictionary generating apparatus (11) said classified-by-field dictionary generating apparatus being characterized by:

- notation data memory means (1) for storing notation data used to describe a design document which produces a pseudo code program in which names are defined by at least two languages;
- extracting means (3) supplied with a design document described by said notation data and extracting bilingual information necessary for translating a pseudo code program of a predetermined field described in a certain language into a pseudo code program described in another language on the basis of said notation data stored in said notation data memory means; and
- dictionary generating means (15) for generating a classified-by-field dictionary (4) corresponding to a field of a pseudo code program to be translated in which translation information on all notation data described in said input design document is written in a predetermined format on the basis of said bilingual information extracted by said extracting means.

2. A machine translation system according to claim 1, wherein

said classified-by-field dictionary is used to translate said notation data describing said design document for bilingual use.

3. A machine translation system according to claim 2, further comprising:

- a natural language dictionary (6) for translating a natural language expressing a translation pseudo code program to be translated into another natural language; and
- translating means (8, 10) for translating said translation pseudo code program described in a certain language into a pseudo code program described in another language with reference to said classified-by-field dictionary (4) and said natural language dictionary (6).

4. A machine translation system according to claim 1, further comprising a machine translation apparatus (20), said machine translation apparatus comprising:

- a plurality of classified-by-field dictionaries (4-1...4-N), one being provided to each of a plurality of natural languages;
- multilingual natural language dictionaries (6-1...6-N) corresponding to said classified-by-field dictionaries;
- dictionary selecting means (9) for selecting from said classified-by-field dictionaries the classified-by-field dictionary corresponding to the language expressing said translation pseudo code program and for selecting from said natural language dictionaries the natural language dictionary corresponding to the language expressing said translation pseudo code program; and
- translating means (8, 10) for translating said translation pseudo code program described in a certain language into said pseudo code program described in another language with reference to said classified-by-field dictionary and said natural language dictionary selected by said dictionary selecting means.

5. A machine translation system according to claim 3 or claim 4, wherein

said classified-by-field dictionary generating apparatus (11) is connected to said translating means (8, 10) via a network.

6. A machine translation system according to claim 5, wherein

said network is a local area network.

7. A machine translation system according to claim 5, wherein

said network is a wide area network.

8. A machine translation system according to claim 5, wherein

said network is a metropolitan area network.

9. A machine translation system according to claim 5, wherein

said network is an in-house network.

10. A machine translation system according to any one of claims 5 to 9, wherein

said classified-by-field dictionary (4) is received from said classified-by-field dictionary generating apparatus (11) through said network, and said received classified-by-field dictionary and said natural language dictionary (6) are referred to by said translating means (8, 10) for translating said translation pseudo code pro-
gram into a pseudo code program described in another specified language.

11. A machine translation system according to claim 10, wherein said classified-by-field dictionary generating apparatus (11) is provided in a server node, and said machine translation apparatus (20) is provided in a client node.

12. A machine translation system according to any one of claims 6 to 9, wherein said classified-by-field dictionary generating apparatus (11) and said machine translation apparatus (20) are provided for specific computers in said network; said specific computers receiving a translation pseudo program from another computer or terminal through a circuit of said network, converting said received translation pseudo code program to a pseudo code program in a language specified by another computer or terminal, and transmitting the converted pseudo code program to said other computer or terminal through a circuit of said network.

13. A machine translation system according to claim 12, wherein said specific computer is a server node.

Patentansprüche

1. Maschinelles Übersetzungssystem mit einer Vorrichtung (11) zur Erzeugung eines nach Feldern klassifizierten Diktionärs, wobei die Vorrichtung zur Erzeugung des nach Feldern klassifizierten Diktionärs gekennzeichnet wird durch:

   eine Notationssystem-Speichereinrichtung (1) zur Speicherung von Notationsdaten, welche verwendet werden zur Beschreibung eines Entwurfsdokumentes, welches ein Pseudocodeprogramm erzeugt, in welchem Namen durch mindestens zwei Sprachen definiert sind;

   eine Extraktionseinrichtung (3), der ein Entwurfssystem zugeführt wird, welches durch Notationsdaten beschrieben wird, und welche zweisprachige Information extrahiert, die notwendig ist zur Übersetzung eines Pseudocodeprogrammes eines vorbestimmten Feldes, welches in einer bestimmten Sprache beschrieben wird, in ein Pseudocodeprogramm, welches in einer anderen Sprache beschrieben wird, auf der Grundlage der Notationsdaten, die in der Notationsdaten-Speichereinrichtung gespeichert sind, und


2. Maschinelles Übersetzungssystem nach Anspruch 1, wobei das nach Feldern klassifizierte Diktions-System verwendet wird zur Übersetzung der Notationsdaten, welche das Entwurfssystem beschreiben, für die zweisprachige Verwendung.

3. Maschinelles Übersetzungssystem nach Anspruch 2, ferner umfassend:

   ein Diktions-System natürlicher Sprache (6) zur Übersetzung von natürlicher Sprache, welche ein Übersetzungs-Pseudocodeprogramm ausdrückt, das in eine andere natürliche Sprache zu übersetzen ist; und

   eine Übersetzungs-Speichereinrichtung (8, 10) zur Übersetzung des Übersetzungs-Pseudocodeprogramms, welches in einer bestimmten Sprache beschrieben ist, in ein Pseudocodeprogramm, welches in einer anderen Sprache beschrieben ist, unter Bezugnahme auf das nach Feldern klassifizierte Diktions-System (4) und das Diktions-System (6) natürlicher Sprache.

4. Maschinelles Übersetzungssystem nach Anspruch 1, ferner umfassend eine maschinelle Übersetzungs-vorrichtung (20), wobei die maschinelle Übersetzungs-vorrichtung umfasst:

   eine Vielzahl von nach Feldern klassifizierten Diktions-Systemen (4-1 ... 4-M), wobei eines vorgesehen ist für jede eine Vielzahl von natürlichen Sprachen;

   eine mehrsprachige Diktions-Systeme (6-1 ... 6-N) natürlicher Sprache, welche den nach Feldern klassifizierten Diktions-Systemen entsprechen;

   eine Diktions-Auswahleinrichtung (9), um aus den nach Feldern klassifizierten Diktions-Systemen das nach Feldern klassifizierte Diktions-System auszuwählen, das der Sprache entspricht, welche das Übersetzungs-Pseudocodeprogramm ausdrückt, und um aus den Diktions-Systemen natür-
licher Sprache das Diktionär natürlicher Sprache auszuwählen, das der Sprache entspricht, welche das Übersetzungs-Pseudocodeprogramm ausdrückt, und

eine Übersetzungseinrichtung (8, 10) zur Übersetzung des Übersetzungs-Pseudocodeprogramms, welches in einer bestimmten Sprache beschrieben wird, in das Pseudocodeprogramm, welches in einer anderen Sprache beschrieben wird, unter Bezugnahme auf das nach Feldern klassifizierte Diktionär und das Diktio-
när natürlicher Sprache, welche durch die Diktio-
när-Auswahleinrichtung ausgewählt wur-
den.

5. Maschinelles Übersetzungssystem nach Anspruch 3 oder 4, wobei
die Vorrichtung (11) zur Erzeugung des nach
Feldern klassifizierten Diktionärs mit der Über-
setzungsseinrichtung (8, 10) über ein Netzwerk verbunden ist.

10. Maschinelles Übersetzungssystem nach Anspruch 5, wobei das Netzwerk ein Lokalbereichs-Netzwerk ist.

15. Maschinelles Übersetzungssystem nach Anspruch 5, wobei das Netzwerk ein Breitbereichs-Netzwerk ist.

20. Maschinelles Übersetzungssystem nach Anspruch 5, wobei das Netzwerk ein Stadtbereichs-Netzwerk ist.

25. Maschinelles Übersetzungssystem nach Anspruch 5, wobei das Netzwerk ein Inhaus-Netzwerk ist.

30. Maschinelles Übersetzungssystem nach einem der Ansprüche 5 bis 9, wobei
das nach Feldern klassifizierte Diktionär (4) aus
der Erzeugungsvorrichtung (11) für das nach
Feldern klassifizierte Diktionär durch das Netz-
werk empfangen wird, und

35. in dem empfangenen, nach Feldern klassifi-
zierten Diktionär und dem Diktionär (6) natürli-
cher Sprache von der Übersetzungseinrich-
tung (8, 10) nachgeschlagen wird, zur Überset-
zung des Übersetzungs-Pseudocodepro-
gramms in ein Pseudocodeprogramm, welches
in einer anderen spezifizierten Sprache be-
schrieben wird.

40. Maschinelles Übersetzungssystem nach Anspruch 10, wobei
die Erzeugungsvorrichtung (11) für das nach
Feldern klassifizierte Diktionär, in einem Ser-
ver-Knoten vorgesehen ist, und

die maschinelle Übersetzungsvorrichtung (20)
in einem Klienten-Knoten vorgesehen ist.

45. 12. Maschinelles Übersetzungssystem nach einem der
Ansprüche 6 bis 9,

wobei die Erzeugungsvorrichtung (11) für das
nach Feldern klassifizierte Diktionär und die
maschinelle Übersetzungsvorrichtung (20) für
spezifische Computer in dem Netzwerk vorge-
sehen sind, die spezifischen Computer ein
Übersetzungs-Pseudocodeprogramm von einem
anderen Computer oder Endgerät durch eine
Schaltung des Netzwerkes empfangen, das
empfangene Übersetzungs-Pseudocodepro-
gramm in ein Pseudocodeprogramm überset-
zein in einer Sprache, welche von einem ande-
ren Computer oder Endgerät spezifiziert wird,
und das umgewandelte Pseudocodeprogramm
an den anderen Computer oder Endgerät über
eine Schaltung des Netzwerkes übertragen.

50. 13. Maschinelles Übersetzungssystem nach Anspruch
12, wobei der spezifische Computer ein Ser-
ver-Knoten ist.

Revendications

1. Système de traduction par machine comprenant un
appareil (11) de création d’un dictionnaire classé
par champs, ledit appareil de création d’un diction
naire classé par champs étant caractérisé par:

un moyen (1) à mémoire pour données de not-
tation, pour conserver des données de notation
utilisées pour décrire un document graphique
qui produit un programme en pseudo code
dans lequel des noms sont définis dans au
moins deux langues;

un moyen d’extraction (3) recevant un docu-
ment graphique décrit par lesdites données de
notation et extrayant les informations bilingues
nécessaires pour traduire un programme en
pseudo code d’un champ prédéterminé décrit
dans une certaine langue en un programme en
pseudo code décrit dans une autre langue, sur
base desdites données de notation conservées
dans ledit moyen à mémoire pour données de
notation; et

un moyen (15) de création de dictionnaire pour
créer un dictionnaire (4) classé par champs cor
respondant à un champ d’un programme en
pseudo code à traduire, dans lequel des infor-
mations de traduction concernant toutes les données de notation décrites dans ledit document graphique d'entrée sont écrites dans un format prédéterminé sur base desdites informations bilingues extraites par ledit moyen d'extraction.

2. Système de traduction par machine selon la revendication 1, dans lequel:

ledit dictionnaire classé par champs est utilisé pour traduire lesdites données de notation décrivant ledit document graphique en vue d’une utilisation bilingue.

3. Système de traduction par machine selon la revendication 2, comportant en outre:

un dictionnaire (6) en langue naturelle pour traduire une langue naturelle exprimant un programme en pseudo code de traduction à traduire dans une autre langue naturelle; et

un moyen de traduction (8, 10) pour traduire ledit programme en pseudo code de traduction décrit dans une certaine langue en un programme en pseudo code décrit dans une autre langue, en référence audit dictionnaire (4) classé par champs et audit dictionnaire (6) de langue naturelle.

4. Système de traduction par machine selon la revendication 1, comportant en outre un appareil (20) de traduction par machine, ledit appareil de traduction par machine comportant:

plusieurs dictionnaires classés par champs (4-1...4-N), un dictionnaire étant prévu pour chacune des plusieurs langues naturelles; des dictionnaires multilingues en langues naturelles (6-1...6-N) correspondant auxdits dictionnaires classés par champs; un moyen (9) de sélection de dictionnaire pour sélectionner, parmi lesdits dictionnaires classés par champs, le dictionnaire classé par champs qui correspond à la langue exprimant ledit programme en pseudo code de traduction et pour sélectionner, parmi lesdits dictionnaires en langues naturelles, le dictionnaire en langue naturelle qui correspond à la langue exprimant ledit programme en pseudo code de traduction; et

un moyen de traduction (8, 10) pour traduire ledit programme en pseudo code de traduction décrit dans une certaine langue en ledit programme en pseudo code décrit dans une autre langue, en référence audit dictionnaire classé par champs et audit dictionnaire en langue naturelle choisi par ledit moyen de sélection de dictionnaire.

5. Système de traduction par machine selon la revendication 3 ou la revendication 4, dans lequel:

ledit appareil (11) de création d’un dictionnaire classé par champs est relié audit moyen de traduction (8, 10) par l’intermédiaire d’un réseau.

6. Système de traduction par machine selon la revendication 5, dans lequel ledit réseau est un réseau local.

7. Système de traduction par machine selon la revendication 5, dans lequel ledit réseau est un réseau de grande étendue.

8. Système de traduction par machine selon la revendication 5, dans lequel ledit réseau est un réseau de zone métropolitaine.

9. Système de traduction par machine selon la revendication 5, dans lequel ledit réseau est un réseau interne.

10. Système de traduction par machine selon l’une quelconque des revendications 5 à 9, dans lequel

ledit dictionnaire classé par champs (4) est relié par l’intermédiaire dudit réseau en provenance de l’appareil (11) de création de dictionnaire classé par champs; et

ledit moyen de traduction (8, 10) se réfère audit dictionnaire classé par champs reçu et audit dictionnaire (6) en langue naturelle pour traduire ledit programme en pseudo code de traduction en un programme en pseudo code décrit dans une autre langue spécifiée.

11. Système de traduction par machine selon la revendication 10, dans lequel

ledit appareil (11) de création de dictionnaire classé par champs est prévu dans un noeud serveur, et

ledit appareil (20) de traduction par machine est prévu dans un noeud client.

12. Système de traduction par machine selon l’une quelconque des revendications 6 à 9, dans lequel ledit appareil (11) de création de dictionnaire classé par champs et ledit appareil (20) de traduction par machine sont prévus pour des ordinateurs spécifiques dudit réseau, lesdits ordinateurs spécifiques recevant un programme en pseudo code de traduction d’un autre ordinateur ou terminal par l’intermédiaire
d'un circuit dudit réseau, convertissant ledit programme en pseudo code de traduction reçu en un programme en pseudo code dans une langue spécifiée par un autre ordinateur ou terminal, et transmettant le programme en pseudo code converti àudit autre ordinateur ou terminal par un circuit dudit réseau.

13. Système de traduction par machine selon la revendication 12, dans lequel ledit ordinateur spécifique est un noeud serveur.
Fig. 2
CONTINUED FROM (c) IN Fig. 5A

(d)

<table>
<thead>
<tr>
<th>JAVA SOURCE LANGUAGE</th>
<th>ENGLISH CAPITAL LETTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECLARE ARRIVAL DIAMETER</td>
<td>DECLARE AS JAPANESE NAME</td>
</tr>
<tr>
<td>DECLARE INITIALIZATION</td>
<td>DECLARE AS JAPANESE NAME</td>
</tr>
<tr>
<td>DECLARE COMMAND ISSUE PROCESSING</td>
<td>DECLARE AS JAPANESE NAME</td>
</tr>
<tr>
<td>DECLARE ACTIVATING FACTOR</td>
<td>DECLARE AS JAPANESE NAME</td>
</tr>
<tr>
<td>DECLARE MESSAGE ISSUE TASK</td>
<td>DECLARE AS JAPANESE NAME</td>
</tr>
<tr>
<td>DECLARE CURRENT ISSUE</td>
<td>DECLARE AS JAPANESE NAME</td>
</tr>
<tr>
<td>DECLARE LINE ISSUE</td>
<td>DECLARE AS JAPANESE NAME</td>
</tr>
<tr>
<td>DECLARE INPUT/OUTPUT ISSUE</td>
<td>DECLARE AS JAPANESE NAME</td>
</tr>
<tr>
<td>DECLARE COMMAND ISSUE</td>
<td>DECLARE AS JAPANESE NAME</td>
</tr>
<tr>
<td>DECLARE DATA CLASSIFICATION ISSUE</td>
<td>DECLARE AS JAPANESE NAME</td>
</tr>
<tr>
<td>DECLARE SUPERVISORY DEVICE CONTROL TASK MAIN</td>
<td>DECLARE AS JAPANESE NAME</td>
</tr>
</tbody>
</table>

END

JAVA SOURCE LANGUAGE

DECLARE

DECLARE FRAME GENERATION PROCESSING | DECLARE AS JAPANESE NAME |
DECLARE FRAME GENERATION PROCESSING | DECLARE AS JAPANESE NAME |
DECLARE FRAME GENERATION PROCESSING | DECLARE AS JAPANESE NAME |

EXTRACTION

DECLARE JAPANESE NAME | DECLARE AS JAPANESE NAME |
DECLARE MESSAGE HEADER | DECLARE AS JAPANESE NAME |
DECLARE MESSAGE PRIORITY | DECLARE AS JAPANESE NAME |

DELETE SENTENCE-DESELECT RANGE ENGLISH CAPITAL LETTER

F I G. 5 B
START

S1

EXTRACT ALL DESIGN DOCUMENT NAMES ASSOCIATED WITH A PROGRAM TO BE TRANSLATED

S2

EXTRACT ONE DESIGN DOCUMENT

S3

CLASSIFIED-BY-FIELD DICTIONARY GENERATION PROCESSING

S4

CLASSIFIED-BY-FIELD DICTIONARIES PRODUCED FOR ALL DESIGN DOCUMENTS

YES

END

NO

Fig. 7
START

JUDGE THE CLASSIFICATION OF THE EXTRACTED DESIGN DOCUMENT

READ NOTATION DATA CORRESPONDING TO THE DESIGN DOCUMENT CLASSIFICATION

OPEN THE DESIGN DOCUMENT FILE

EXTRACT THE DESCRIPTION CORRESPONDING TO THE NOTATION INFORMATION

DICTIONARY OUTPUT BY THE DICTIONARY GENERATING UNIT

END

51 DESIGN DOCUMENT DISPLAY DATA STORAGE UNIT

DIAGRAM OF MODULE ARRANGEMENT

1. MODULE BOX
2. COMMON ROUTINE BOX
3. SYSTEM CALL BOX

COMMON DATA LIST

1. DATA NAME
2. DATA TYPE NAME
3. CONSTRUCT NAME

F i g . 8