US 20110167065A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2011/0167065 A1

(43) Pub. Date: Jul. 7, 2011

Toyoda et al.

(54) **DATA GENERATING APPARATUS, INFORMATION PROCESSING APPARATUS, DATA GENERATING METHOD, INFORMATION PROCESSING METHOD, DATA GENERATING PROGRAM INFORMATION PROCESSING PROGRAM AND RECORDING MEDIUM**

(75) Inventors: **Shunsaku Toyoda**, Toshimaku (JP); **Takashi Hanyuda**, Kawagoe (JP); **Takashi Hashimoto**, Yokohama (JP); **Ippei Nambata**, Fujimi (JP); **Hajime Adachi**, Tsurugashima (JP)

(73) Assignees: **Pioneer Corporation**, Kanagawa (JP); **Increment P Corporation**, Kanagawa (JP)

(21) Appl. No.: **12/997,672**

(22) PCT Filed: **Jun. 17, 2008**

(86) PCT No.: **PCT/JP2008/061062**

§ 371 (c)(1), (2), (4) Date: **Feb. 9, 2011**

Publication Classification

(51) **Int. Cl.**
G06F 17/30 (2006.01)

(52) **U.S. Cl.** **707/737**; 707/E17.046

(57) **ABSTRACT**

A data generating apparatus includes an acquiring unit that acquires text data (name data) related to a name associated with position information; a classifying unit that using the acquired position data, classifies the name data according to given regions; an integrating unit that integrates neighboring regions such that the total data size of the name data included in regions to be integrated does not exceed a predetermined given data size; a storage unit that groups the name data according to integrated regions and stores the grouped name data as a name dictionary to be used in both a facility search process and a map display process; and an extracting unit that from the classified name data, extracts the name data common to regions of a given number or more, where the storage unit groups and stores the common name data as a common name dictionary different from the name dictionary.

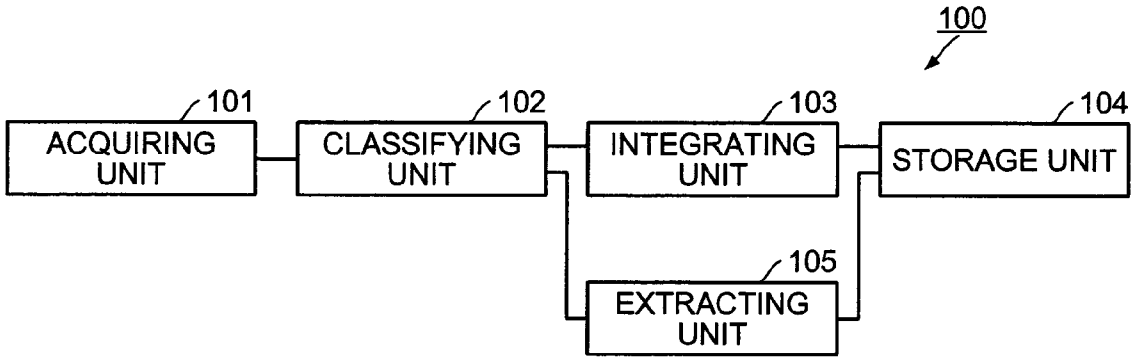


FIG.1

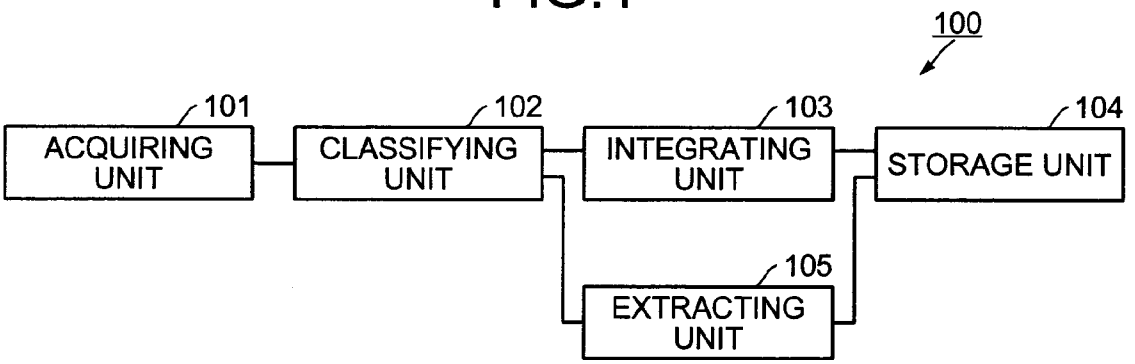

100
101
ACQUIRING UNIT
102
CLASSIFYING UNIT
103
INTEGRATING UNIT
104
STORAGE UNIT
105
EXTRACTING UNIT

FIG.2

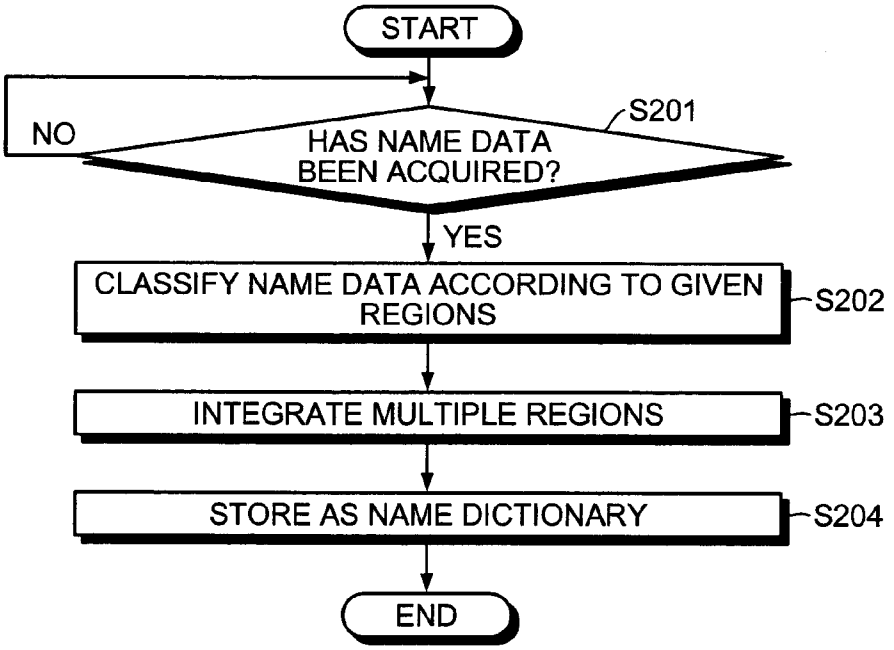

START
S201
NO
HAS NAME DATA BEEN ACQUIRED?
YES
CLASSIFY NAME DATA ACCORDING TO GIVEN REGIONS
S202
INTEGRATE MULTIPLE REGIONS
S203
STORE AS NAME DICTIONARY
S204
END

FIG.3

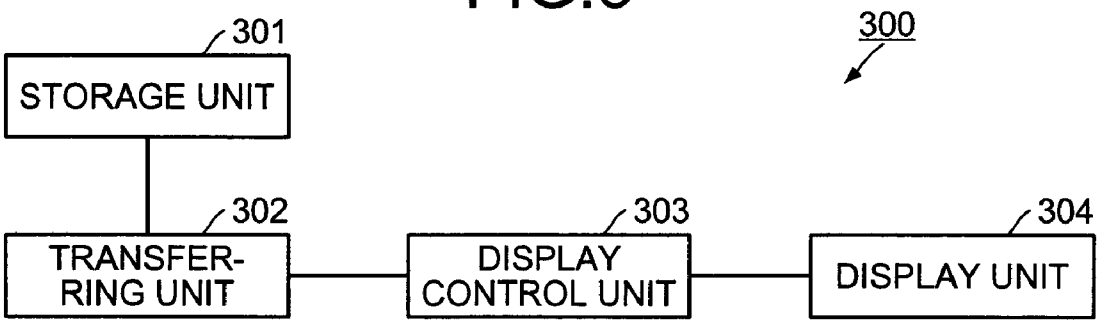

300
301
STORAGE UNIT
302
TRANSFER-RING UNIT
303
DISPLAY CONTROL UNIT
304
DISPLAY UNIT

FIG.4

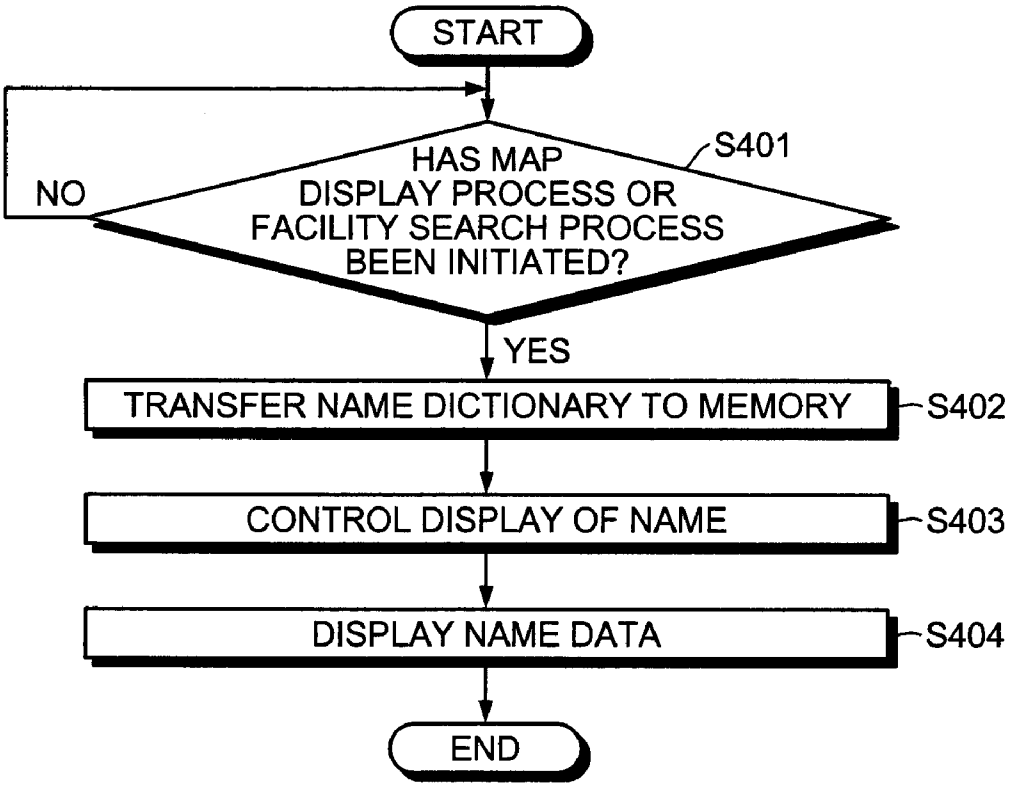

START
S401
HAS MAP DISPLAY PROCESS OR FACILITY SEARCH PROCESS BEEN INITIATED?
NO
YES
TRANSFER NAME DICTIONARY TO MEMORY
S402
CONTROL DISPLAY OF NAME
S403
DISPLAY NAME DATA
S404
END

FIG.5

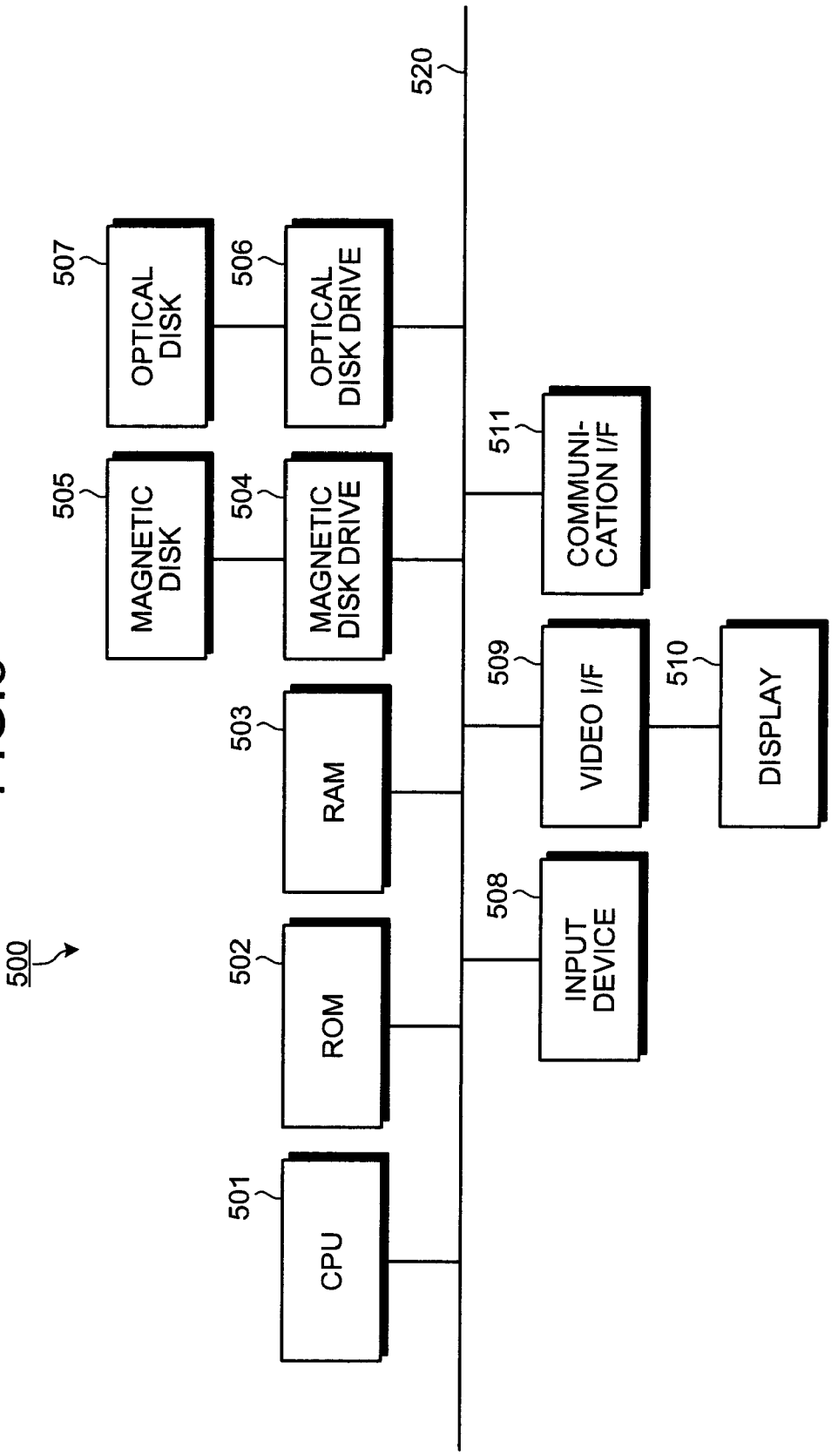

500
501
CPU
502
ROM
503
RAM
504
MAGNETIC DISK DRIVE
505
MAGNETIC DISK
506
OPTICAL DISK DRIVE
507
OPTICAL DISK
508
INPUT DEVICE
509
VIDEO I/F
510
DISPLAY
511
COMMUNI-CATION I/F
520

FIG.6

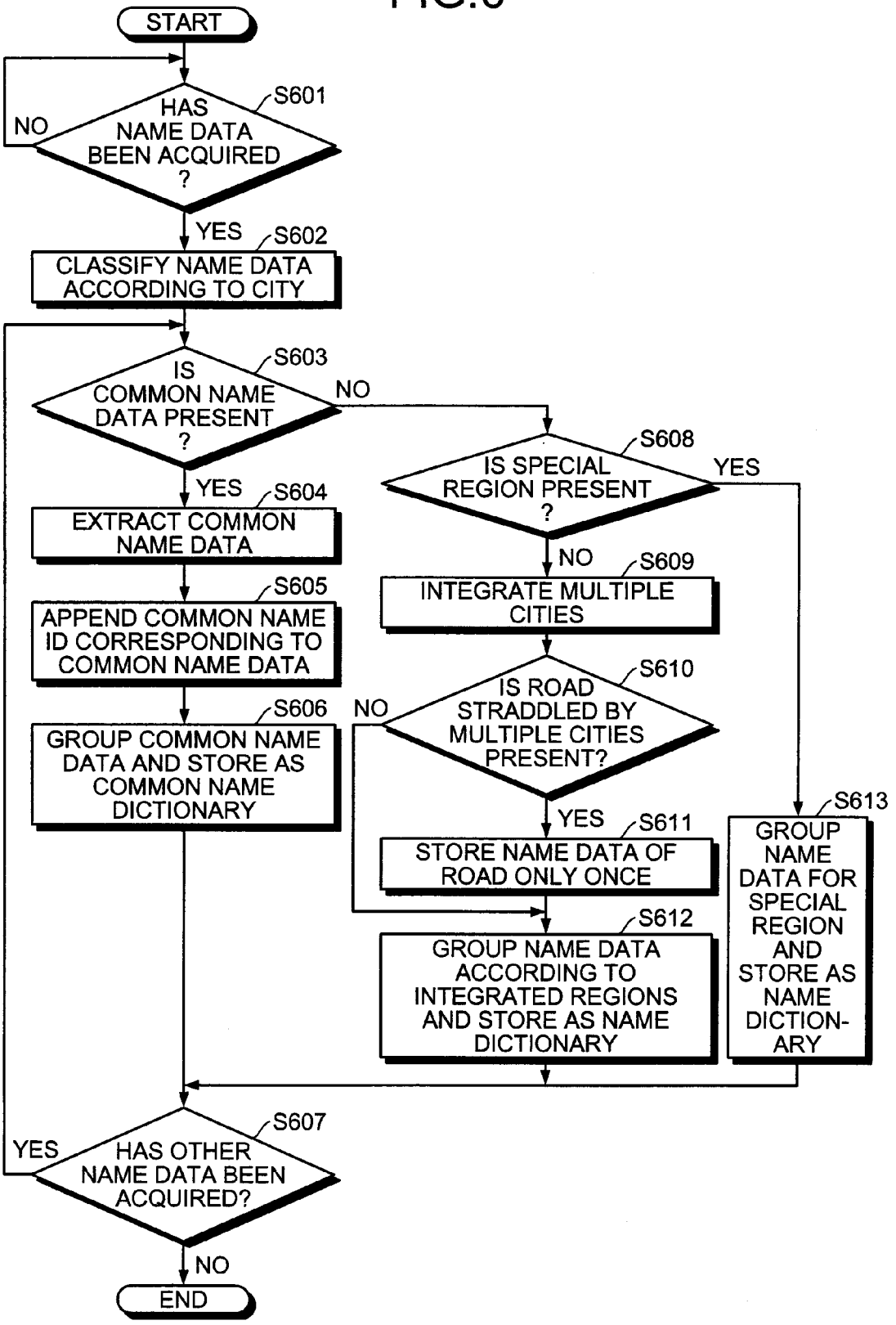

START
S601
HAS NAME DATA BEEN ACQUIRED ?
NO
YES
S602
CLASSIFY NAME DATA ACCORDING TO CITY
S603
IS COMMON NAME DATA PRESENT ?
NO
YES
S604
EXTRACT COMMON NAME DATA
S605
APPEND COMMON NAME ID CORRESPONDING TO COMMON NAME DATA
S606
GROUP COMMON NAME DATA AND STORE AS COMMON NAME DICTIONARY
S608
IS SPECIAL REGION PRESENT ?
YES
NO
S609
INTEGRATE MULTIPLE CITIES
S610
IS ROAD STRADDLED BY MULTIPLE CITIES PRESENT?
NO
YES
S611
STORE NAME DATA OF ROAD ONLY ONCE
S612
GROUP NAME DATA ACCORDING TO INTEGRATED REGIONS AND STORE AS NAME DICTIONARY
S613
GROUP NAME DATA FOR SPECIAL REGION AND STORE AS NAME DICTION-ARY
S607
HAS OTHER NAME DATA BEEN ACQUIRED?
YES
NO
END

FIG.7

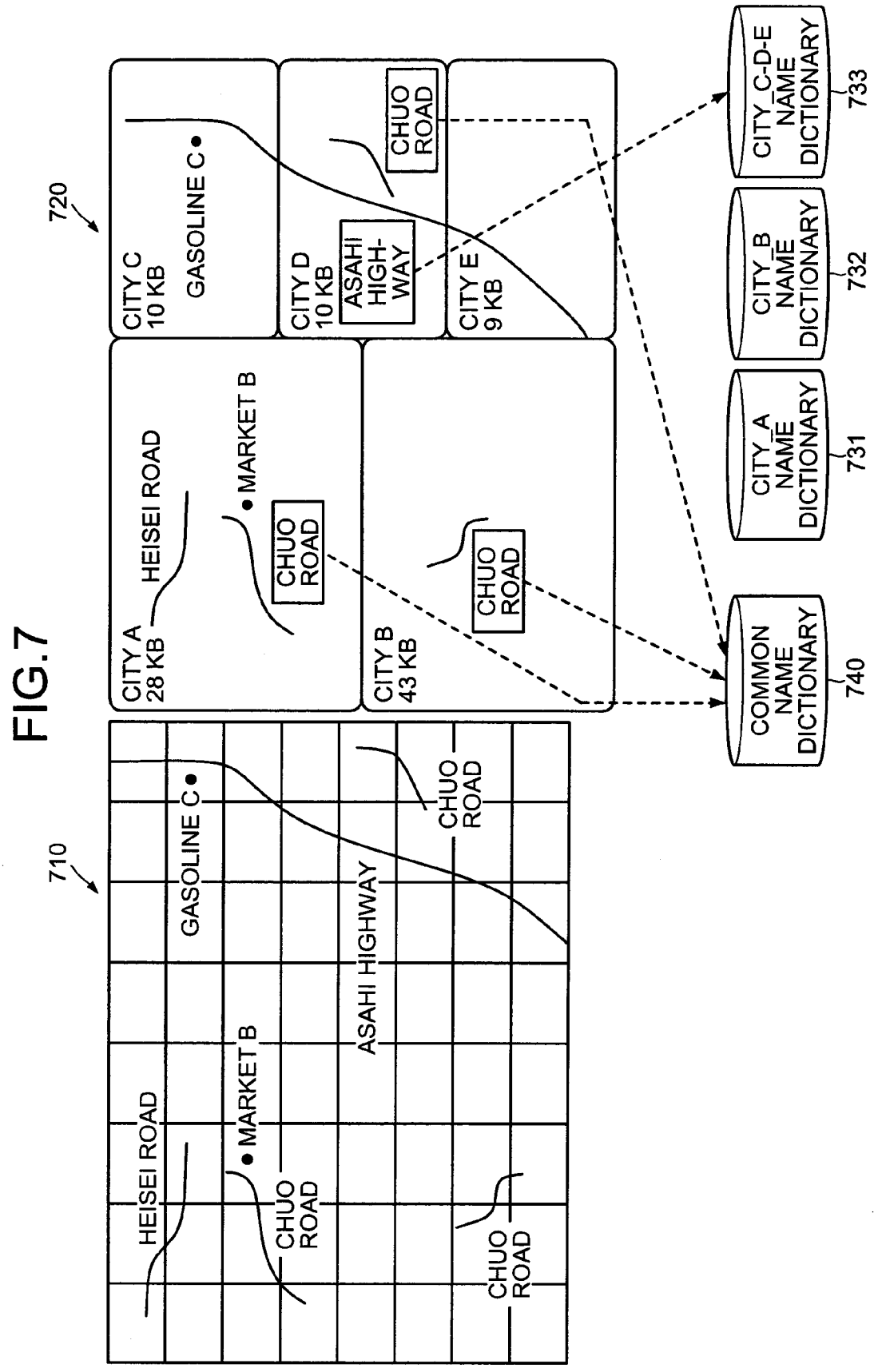
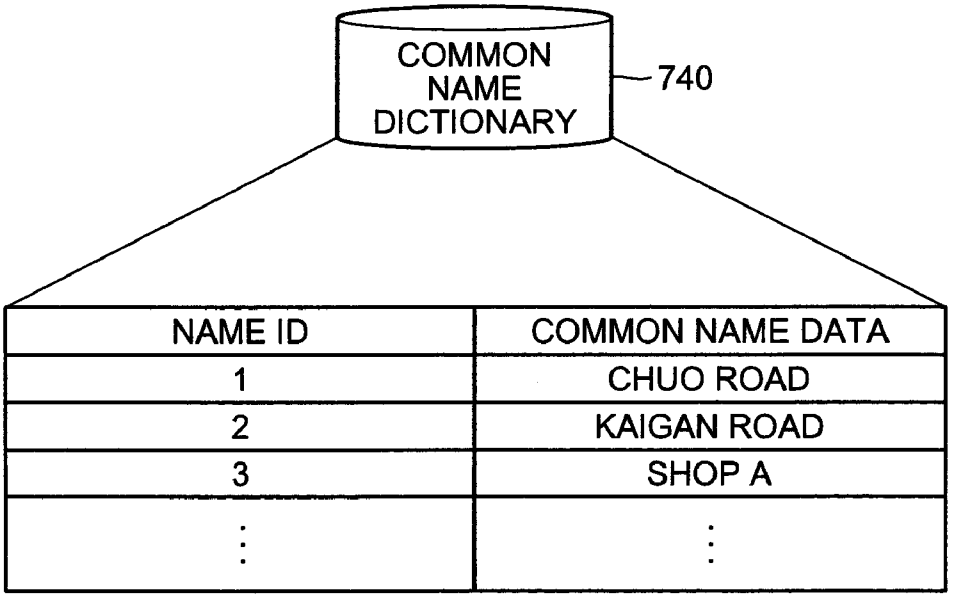
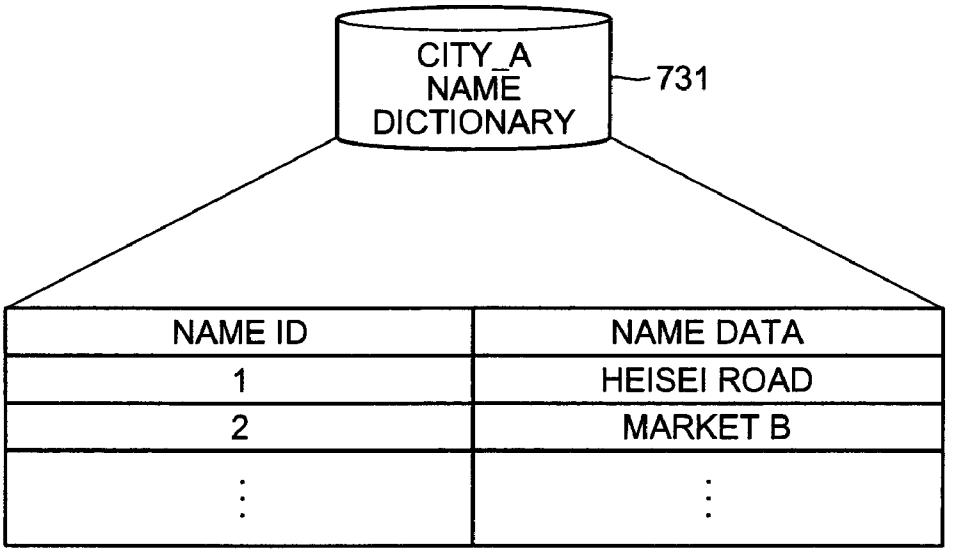

710
720
GASOLINE C
HEISEI ROAD
MARKET B
CHUO ROAD
ASAHI HIGHWAY
CHUO ROAD
CHUO ROAD
CHUO ROAD
CITY C
10 KB
CITY D
10 KB
ASAHI HIGH-WAY
CITY E
9 KB
CITY A
28 KB
CITY B
43 KB
COMMON NAME DICTIONARY
740
CITY_A NAME DICTIONARY
731
CITY_B NAME DICTIONARY
732
CITY_C-D-E NAME DICTIONARY
733

FIG.8



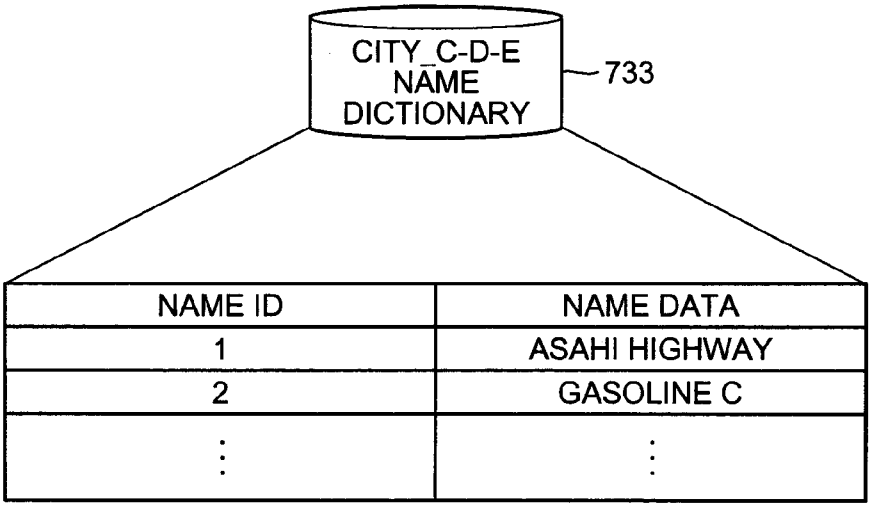
NAME ID	COMMON NAME DATA
1	CHUO ROAD
2	KAIGAN ROAD
3	SHOP A
⋮	⋮

FIG.9



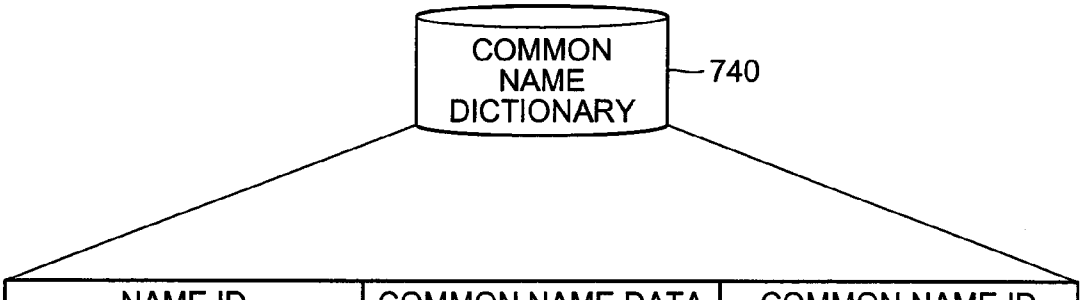
NAME ID	NAME DATA
1	HEISEI ROAD
2	MARKET B
⋮	⋮

FIG.10-1



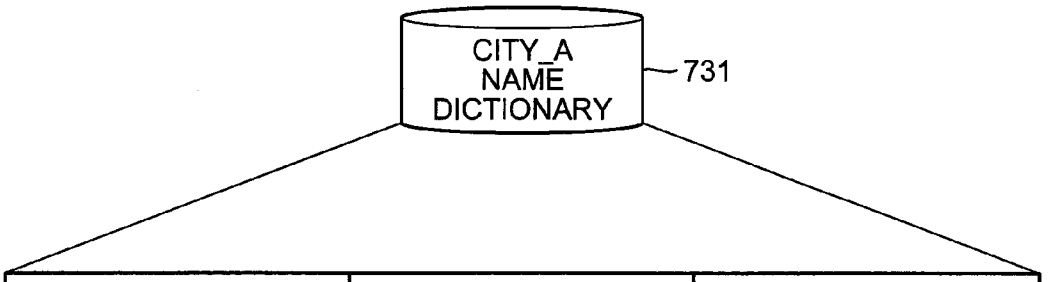
NAME ID	NAME DATA
1	ASAHI HIGHWAY
2	GASOLINE C
⋮	⋮

FIG.10-2



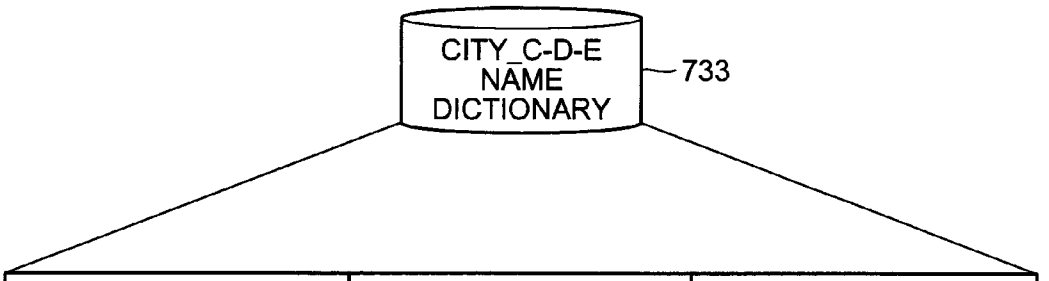
NAME ID	COMMON NAME DATA	COMMON NAME ID
1	CHUO ROAD	-
2	KAIGAN ROAD	-
3	SHOP A	-
⋮	⋮	⋮

FIG.10-3



NAME ID	NAME DATA	COMMON NAME ID
1	HEISEI ROAD	-
2	MARKET B	-
3	-	1
⋮	⋮	⋮

FIG.10-4



NAME ID	NAME DATA	COMMON NAME ID
1	ASAHI HIGHWAY	-
2	GASOLINE C	-
3	-	1
⋮	⋮	⋮

FIG.11

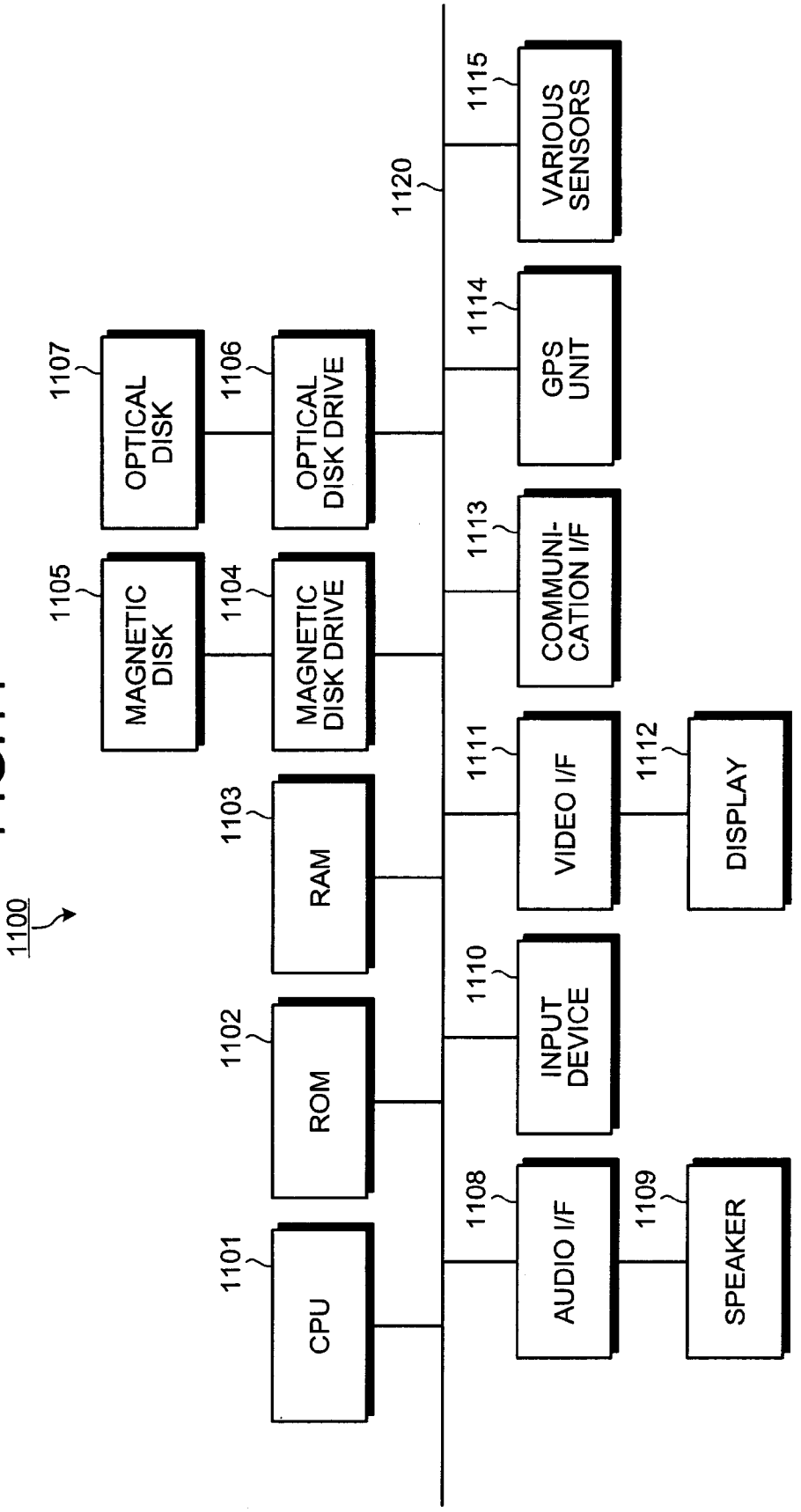

1100
CPU
1101
ROM
1102
RAM
1103
MAGNETIC DISK DRIVE
1104
MAGNETIC DISK
1105
OPTICAL DISK DRIVE
1106
OPTICAL DISK
1107
AUDIO I/F
1108
SPEAKER
1109
INPUT DEVICE
1110
VIDEO I/F
1111
DISPLAY
1112
COMMUNI-CATION I/F
1113
GPS UNIT
1114
VARIOUS SENSORS
1115
1120

FIG.12

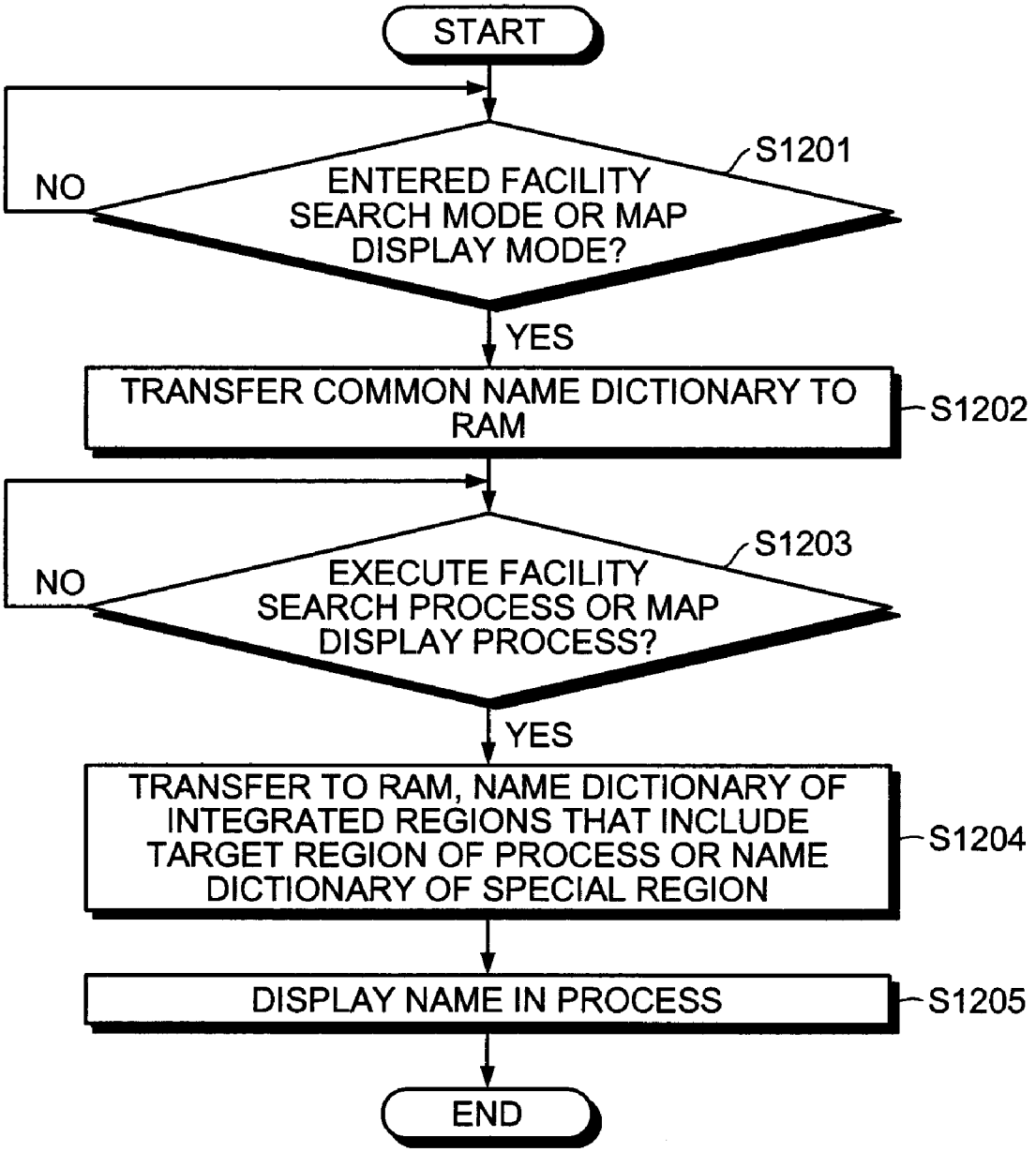

START
S1201
ENTERED FACILITY SEARCH MODE OR MAP DISPLAY MODE?
NO
YES
TRANSFER COMMON NAME DICTIONARY TO RAM
S1202
S1203
EXECUTE FACILITY SEARCH PROCESS OR MAP DISPLAY PROCESS?
NO
YES
TRANSFER TO RAM, NAME DICTIONARY OF INTEGRATED REGIONS THAT INCLUDE TARGET REGION OF PROCESS OR NAME DICTIONARY OF SPECIAL REGION
S1204
DISPLAY NAME IN PROCESS
S1205
END

FIG.13

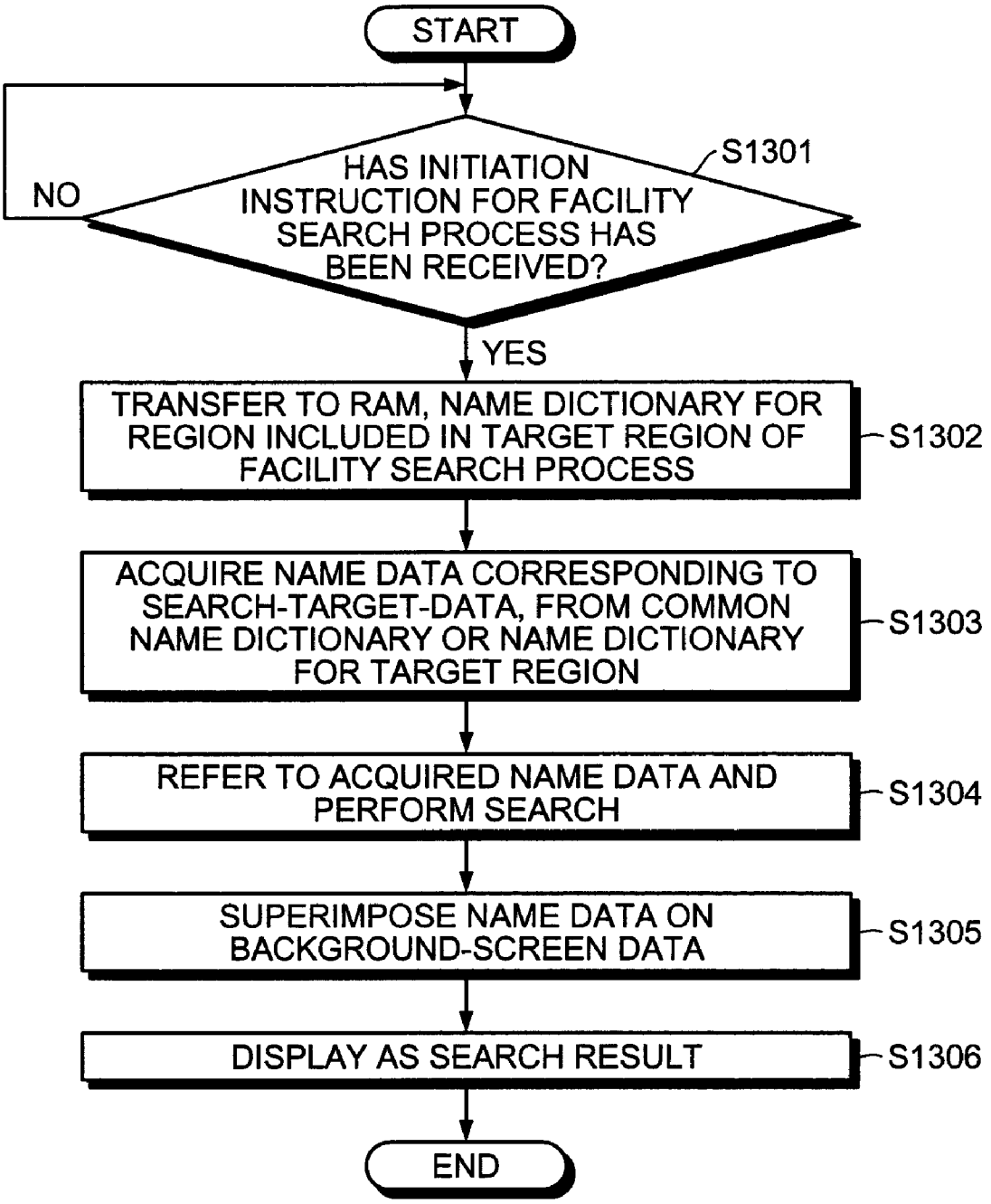

START
HAS INITIATION INSTRUCTION FOR FACILITY SEARCH PROCESS HAS BEEN RECEIVED?
S1301
NO
YES
TRANSFER TO RAM, NAME DICTIONARY FOR REGION INCLUDED IN TARGET REGION OF FACILITY SEARCH PROCESS
S1302
ACQUIRE NAME DATA CORRESPONDING TO SEARCH-TARGET-DATA, FROM COMMON NAME DICTIONARY OR NAME DICTIONARY FOR TARGET REGION
S1303
REFER TO ACQUIRED NAME DATA AND PERFORM SEARCH
S1304
SUPERIMPOSE NAME DATA ON BACKGROUND-SCREEN DATA
S1305
DISPLAY AS SEARCH RESULT
S1306
END

FIG.14

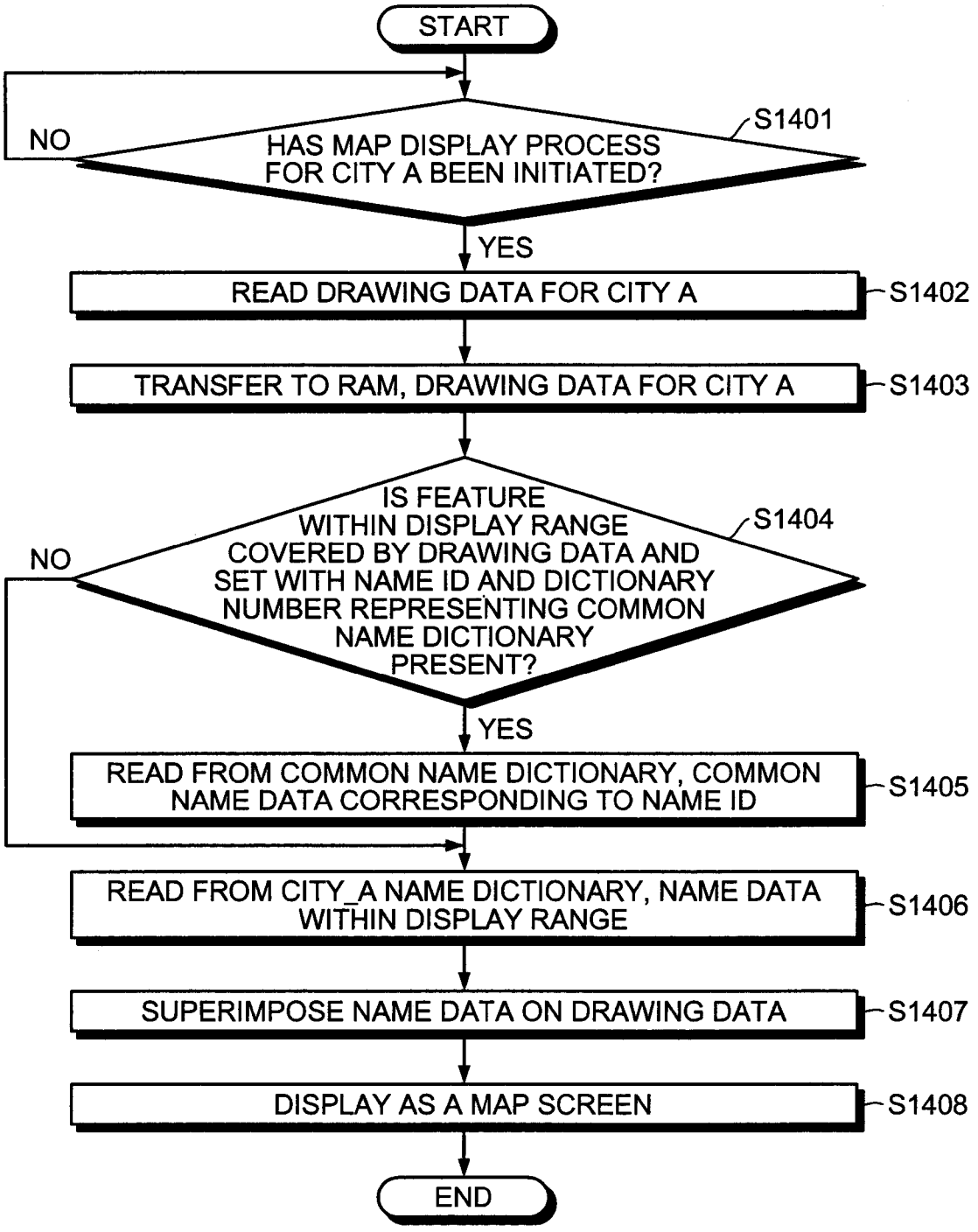
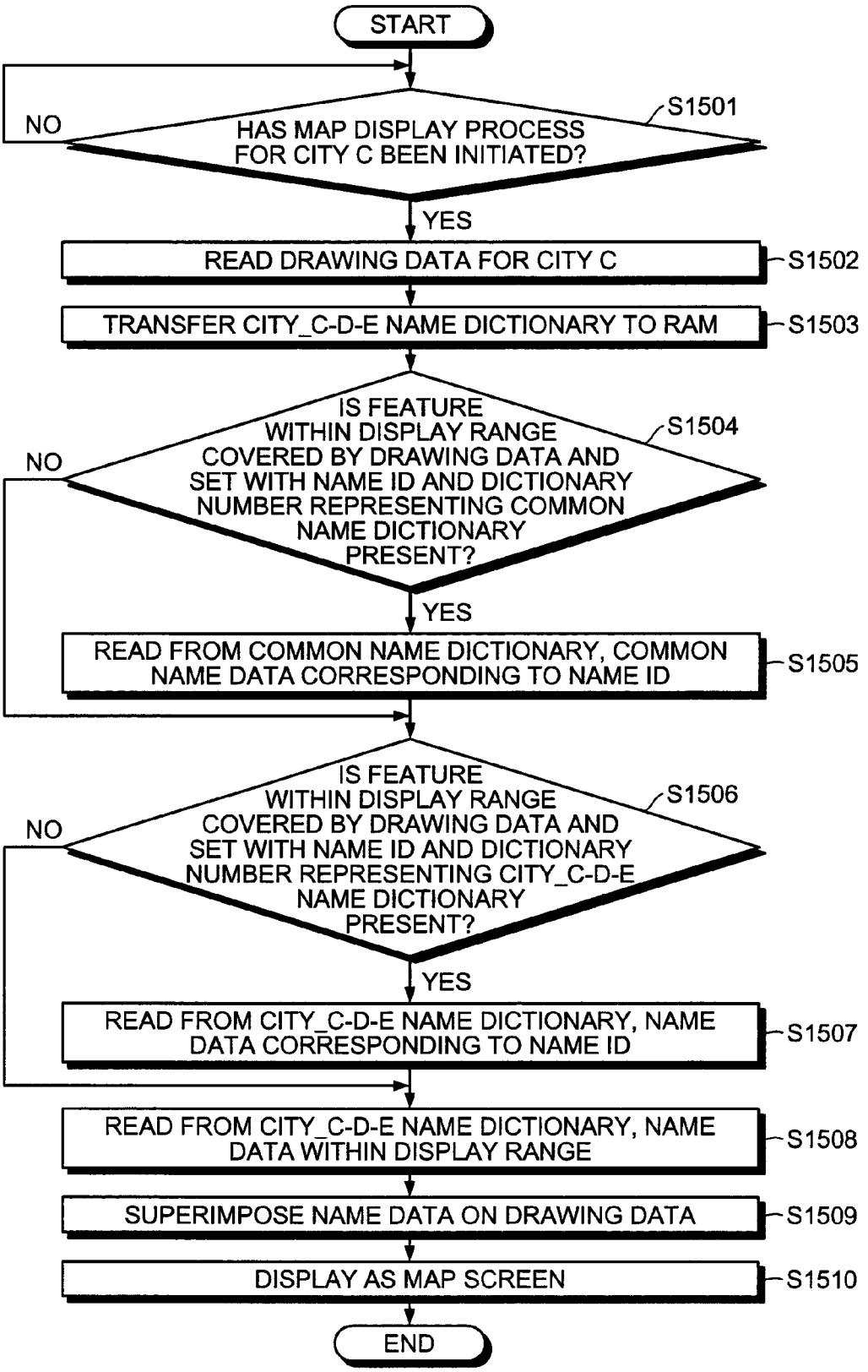

START
HAS MAP DISPLAY PROCESS FOR CITY A BEEN INITIATED?
S1401
NO
YES
READ DRAWING DATA FOR CITY A
S1402
TRANSFER TO RAM, DRAWING DATA FOR CITY A
S1403
IS FEATURE WITHIN DISPLAY RANGE COVERED BY DRAWING DATA AND SET WITH NAME ID AND DICTIONARY NUMBER REPRESENTING COMMON NAME DICTIONARY PRESENT?
S1404
NO
YES
READ FROM COMMON NAME DICTIONARY, COMMON NAME DATA CORRESPONDING TO NAME ID
S1405
READ FROM CITY_A NAME DICTIONARY, NAME DATA WITHIN DISPLAY RANGE
S1406
SUPERIMPOSE NAME DATA ON DRAWING DATA
S1407
DISPLAY AS A MAP SCREEN
S1408
END

FIG.15


START
S1501
HAS MAP DISPLAY PROCESS FOR CITY C BEEN INITIATED?
NO
YES
READ DRAWING DATA FOR CITY C
S1502
TRANSFER CITY_C-D-E NAME DICTIONARY TO RAM
S1503
S1504
IS FEATURE WITHIN DISPLAY RANGE COVERED BY DRAWING DATA AND SET WITH NAME ID AND DICTIONARY NUMBER REPRESENTING COMMON NAME DICTIONARY PRESENT?
NO
YES
READ FROM COMMON NAME DICTIONARY, COMMON NAME DATA CORRESPONDING TO NAME ID
S1505
S1506
IS FEATURE WITHIN DISPLAY RANGE COVERED BY DRAWING DATA AND SET WITH NAME ID AND DICTIONARY NUMBER REPRESENTING CITY_C-D-E NAME DICTIONARY PRESENT?
NO
YES
READ FROM CITY_C-D-E NAME DICTIONARY, NAME DATA CORRESPONDING TO NAME ID
S1507
READ FROM CITY_C-D-E NAME DICTIONARY, NAME DATA WITHIN DISPLAY RANGE
S1508
SUPERIMPOSE NAME DATA ON DRAWING DATA
S1509
DISPLAY AS MAP SCREEN
S1510
END

DATA GENERATING APPARATUS, INFORMATION PROCESSING APPARATUS, DATA GENERATING METHOD, INFORMATION PROCESSING METHOD, DATA GENERATING PROGRAM INFORMATION PROCESSING PROGRAM AND RECORDING MEDIUM

TECHNICAL FIELD

[0001] The present invention relates to a data generating apparatus, an information processing apparatus, a data generating method, an information processing method, a data generating program, an information processing program, and a recording medium. However, the invention is not limited to the data generating apparatus, the information processing apparatus, the data generating method, the information processing method, the data generating program, the information processing program, and the recording medium above.

BACKGROUND ART

[0002] Conventionally, information processing apparatuses such as personal navigation devices (PNDs), cellular telephones and personal digital assistants (PDAs) have functions of displaying map screens and of searching for facilities. When a map screen is displayed, text data (name data) correlated with road link data is displayed superimposed on drawing data for depicting landforms. Further, when a facility search is performed, the name data is displayed as a search result.

[0003] To display map screens and perform facility searches in this manner, name data including road names must be stored in advance. For example, a technology is known that separately stores name data for displaying a map screen and name data for facility searches and in the respective processing of the name data, reads out the separately stored name data (see, for example, Patent Document 1).

[0004] Patent Document 1: Japanese Patent Application Laid-Open Publication No. 2006-003286

DISCLOSURE OF INVENTION

Problem to be Solved by the Invention

[0005] However, one problem with the technology recited in Patent Document 1, is for example, since the name data for displaying map screens and for searching for facilities are stored separately, i.e., overlapping name data is stored, the amount of data stored is significant, inviting a drop in the performance of the information processing apparatus.

Means for Solving Problem

[0006] To solve the problems above and achieve an object, a data generating apparatus according to the invention of claim **1** an acquiring unit that acquires text data (name data) related to a name associated with position information; a classifying unit that using the position data associated with the name data acquired by the acquiring unit, classifies the name data according to given regions; an integrating unit that integrates neighboring regions such that the total data size of the name data included in regions to be integrated (integrated regions) does not exceed a given data size that is preliminarily set; and a storage unit that groups the name data according to integrated regions and stores the grouped name data as a name dictionary to be used in both a facility search process and a map display process.

[0007] An information processing apparatus according to the invention of claim **6** and executing the map display process and the facility search process, includes a storage unit storing therein the name dictionary and the common name dictionary generated by the data generating apparatus according to any one of claims **1** to **5**; a transferring unit that when the map display process or the facility search process is executed, reads from the storage unit and transfers to memory, the name dictionary for the integrated regions including a target region of the process executed; and a display control unit that uses the name dictionary stored to the memory and displays names in the process executed.

[0008] A data generating method according to the invention of claim **8** includes acquiring text data (name data) related to a name associated with position information; classifying the name data according to given regions, using the position data associated with the name data acquired by the acquiring unit; integrating neighboring regions such that the total data size of the name data included in regions to be integrated (integrated regions) does not exceed a given data size that is preliminarily set; and grouping the name data according to integrated regions and storing the grouped name data as a name dictionary to be used in both a facility search process and a map display process.

[0009] An information processing method according to the invention of claim **9** is performed by an information processing apparatus that executes a map display process and a facility search process and includes a storage unit grouping name data according to integrated regions and storing therein the grouped name data as name dictionaries to be used in both the facility search process and the map display process. The information processing method includes reading from the storage unit and transferring to memory when the map display process or the facility search process is executed, the name dictionary for the integrated regions including the target region of the process executed; and controlling display of names in the process executed by using the name dictionary stored to the memory.

[0010] A data generating program according to the invention of claim **10** causes a computer to execute the data generating method according to claim **8**.

[0011] An information processing program according to the invention of claim **11** causes a computer to execute the data generating method according to claim **9**.

[0012] A computer-readable recording medium according to the invention of claim **12** stores therein the data generating program according to claim **10** or the information processing program according to claim **11**.

BRIEF DESCRIPTION OF DRAWINGS

[0013] FIG. **1** is a block diagram of one example of a functional configuration of a data generating apparatus according to a first embodiment;

[0014] FIG. **2** is a flowchart of an example of a data generation process performed by the data generating apparatus according to the first embodiment;

[0015] FIG. **3** is a block diagram of one example of a functional configuration of an information processing apparatus according to a second embodiment;

[0016] FIG. **4** is a flowchart of an example of information processing performed by the information processing apparatus according to the second embodiment;

[0017] FIG. **5** is a block diagram of one example of a hardware configuration of a data generating server according to a first example;

[0018] FIG. **6** is a flowchart of an example of a data generating process performed by the data generating server according to the first example;

[0019] FIG. **7** depicts an example of a special region and integrated regions;

[0020] FIG. **8** depicts a data structure of a common name dictionary;

[0021] FIG. **9** depicts a data structure of a city_A name dictionary;

[0022] FIG. **10-1** depicts a data structure of a city_C-D-E name dictionary;

[0023] FIG. **10-2** depicts another example of a data structure of the common name dictionary;

[0024] FIG. **10-3** depicts another example of a data structure of the city_A name dictionary;

[0025] FIG. **10-4** depicts a data structure of the city_C-D-E name dictionary;

[0026] FIG. **11** is a block diagram of a hardware configuration of a navigation apparatus according to a second example;

[0027] FIG. **12** is a flowchart outlining information processing performed by the navigation apparatus according to the second example;

[0028] FIG. **13** is a flowchart of one example of information processing performed under a facility search;

[0029] FIG. **14** is a flowchart of one example of information processing performed when a map of a specified region is to be displayed; and

[0030] FIG. **15** is a flowchart of one example of information processing performed when a map of integrated regions is to be displayed.

EXPLANATIONS OF LETTERS OR NUMERALS

[0031] **100** data generating apparatus
[0032] **101** acquiring unit
[0033] **102** classifying unit
[0034] **103** integrating unit
[0035] **104** storage unit
[0036] **105** extracting unit
[0037] **300** information processing apparatus
[0038] **301** storage unit
[0039] **302** transferring unit
[0040] **303** display control unit
[0041] **304** display unit
[0042] **500** data generating server
[0043] **1100** navigation apparatus

BEST MODE(S) FOR CARRYING OUT THE INVENTION

[0044] Preferred embodiments of the data generating apparatus, the information processing apparatus, the data generating method, the information processing method, the data generating program, the information processing program, and the recording medium according to the present invention will be described with reference to the accompanying drawings.

First Embodiment

(Functional Configuration of Data Generating Apparatus)

[0045] With reference to FIG. **1**, a functional configuration of a data generating apparatus according to the first embodiment of the present invention will be described. The data generating apparatus is implemented, for example, by a computer apparatus such as a server, personal computer (PC), etc. FIG. **1** is a block diagram of one example of a functional configuration of the data generating apparatus according to the first embodiment. A data generating apparatus **100** includes an acquiring unit **101**, a classifying unit **102**, an integrating unit **103**, a storage unit **104**, and an extracting unit **105**.

[0046] The acquiring unit **101** acquires text data (hereinafter, "name data") related to names associated with position information. Position information is information for displaying name data superimposed on drawing data that represents landforms. For example, if the name information is "Kawagoe Kaido", position information is information associated with drawing data for Kawagoe City and the vicinity through which Kawagoe Kaido (highway) passes.

[0047] Although name data is typically text data related to road names, name data includes text data for the names of facilities and geographical features such as rivers and mountains. The means of acquisition by the acquiring unit **101** may be via input from an operation manager of the data generating apparatus **100**, via reading from a recording medium, and via receiving transmission from an external server.

[0048] The classifying unit **102** uses the position information associated with the name information acquired by the acquiring unit **101** to classify the name data according to given regions. A given region is typically the region of a single city, but may be that of a country, an area such as the Kanto Area and the Tohoku Area, a prefecture, local municipality, etc.

[0049] The integrating unit **103** integrates neighboring regions such that the total data size of the name data included in the integrated regions (hereinafter, "integrated regions") does not exceed a given data size preliminarily set. The storage unit **104** groups the name data according to integrated regions and stores the name data as a name dictionary to be used for both the facility search process and the map display process.

[0050] Further, in the first embodiment, the integrating unit **103** may be configured to not integrate a region (hereinafter, "special region") having name data that is equal to or exceeds the given data size or for which the total data size when integrated with a neighboring region equals or exceeds the given data size.

[0051] Specifically, for example, if a region for which the volume of name data is great such as a large urban area or if an integration of neighboring urban areas, such as mid-sized cities, causes the total data size of the name data to become equal to or exceed the given data size, the integrating unit **103** does not integrate such region. Such a large urban region or mid-sized cities are referred to as special regions. In the case of a special region, the storage unit **104** groups and stores the name data for the special region as a name dictionary to be used in both facility search process and in map display pro-

cess. In other words, the storage unit **104** stores the name data of a special region as an independent name dictionary.

[0052] Further, in the first embodiment, the integrating unit **103**, may change the given data size according to the storage capacity of the storage unit **104** to integrate regions. Specifically, the greater the capacity of the storage unit **104**, the more the integrating unit **103** increases the data size to integrate regions. In addition to the capacity of the storage unit **104**, the integrating unit **103** may change the given data size and integrate regions according to the capacity of a storage unit in an information processing apparatus furnished as a user terminal apparatus of the data generating apparatus **100**.

[0053] Also, in the first embodiment, the extracting unit **105** is an arbitrary component. The extracting unit **105**, from among name data classified according to given regions, extracts name data common to a given number of regions or more (hereinafter, "common name data"). Common name data are names commonly used in multiple regions, such as "Main Street" used abroad, "Chuo Dori", "Kaigan Dori", and "Odori" used domestically in Japan.

[0054] In the configuration including the extracting unit **105**, the storage unit **104** groups common name data and stores the grouped common name data as a common name dictionary different from the name dictionaries. In this case, common name data is not stored in the name dictionaries. For example, if name data for "Main Street" in city A exists, the storage unit **104** stores "Main Street" in the common name dictionary without storing "Main Street" to the name dictionary for city A.

[0055] In the first embodiment, an output unit, not depicted, may be included. The output unit transmits information in the name dictionary and in the common name dictionary stored by the storage unit **104**, to an information processing apparatus used as a user terminal apparatus and records the information to a recording medium for distribution, such as an optical disk.

(Data Generation Process of Data Generating Apparatus)

[0056] Next, with reference to FIG. **2**, a data generation process of the data generating apparatus **100** will be described. FIG. **2** is a flowchart of an example of a data generation process performed by the data generating apparatus **100** according to the first embodiment.

[0057] As depicted in FIG. **2**, the data generating apparatus **100** determines whether the acquiring unit **101** has acquired name data (step S**201**). The data generating apparatus **100** remains in a standby state until name data had been acquired (step S**201**: NO). When name data has been acquired (step S**201**: YES), the classifying unit **102** classifies the name data according to given regions, by using position information associated with the name data (step S**202**).

[0058] The integrating unit **103** integrates regions such that the total data size of the name data included in the integrated regions does not exceed a given data size preliminarily set (step S**203**), after which the storage unit **104** groups the name data according to integrated regions and stores the grouped name data as a name dictionary to be used in both the facility search process and the map display process (step S**204**), ending a series of operations.

[0059] As described, the data generating apparatus **100** according to the first embodiment integrates regions such that the total data size of the name data included in the integrated regions does not exceed a given data size preliminarily set, groups the name data according to integrated regions, and stores the grouped name data as a name dictionary to be used in both the facility search process and the map display process. Therefore, by not storing overlapping name data, the amount of data stored can be suppressed.

[0060] Further, with information processing apparatuses, such as a navigation apparatus using the name dictionary, when map display process is performed, compared to a case where a name dictionary is stored for each region, the number of processes for referencing the name dictionaries decreases by the number of dictionary divisions removed. Thus, rapid processing becomes possible, enabling improved performance of the information processing apparatus.

[0061] By not integrating special regions, which have name data that is equal to or exceeds the given data size or for which the total data size when integrated with a neighboring region equals or exceeds the given data size, the data size for each region can be optimized, enabling optimized performance of the information apparatus.

[0062] By changing the given data size according to the capacity of the storage unit **104** to integrate regions, integration suitable for the storage capacity can be performed. Therefore, the database can be optimized, enabling optimized performance of the information processing apparatus.

[0063] By using text data related to road names as name data, when regions straddling a road are displayed by the map display process of the information processing apparatus, the troublesome referencing of numerous dictionaries stored for each region can be suppressed, enabling improved performance. In other words, when a map display process is performed, compared to a case where a name dictionary is stored for each region, the number of dictionary references decreases by the number of dictionary divisions removed, enabling improved performance.

[0064] By extracting from name data classified according to region, common name data common to a given number of regions or more, grouping the extracted common name data, and storing the grouped common name data as a common name dictionary different from the name dictionary, name data common to multiple regions is stored only once in the common dictionary, enabling the data size of the dictionary overall to be suppressed.

Second Embodiment

(Functional Configuration of Information Processing Apparatus)

[0065] With reference to FIG. **3**, a functional configuration of an information processing apparatus according to the second embodiment will be described. The information processing apparatus of the second embodiment uses the name dictionary generated by the data generating apparatus **100** of first embodiment and performs the map display process and the facility search process. The information processing apparatus is implemented by, for example, an electronic device such as a navigation apparatus, a PND, a cellular telephone, a PDA, etc.

[0066] FIG. **3** is a block diagram of one example of the functional configuration of the information processing apparatus according to the second embodiment. As depicted in FIG. **3**, an information processing apparatus **300** includes a storage unit **301**, a transferring unit **302**, a display control unit **303**, and a display unit **304**.

[0067] The storage unit **301** stores therein the name dictionary generated by the data generating apparatus **100** accord-

ing to the first embodiment. To store the name dictionary to the storage unit **301**, the means of acquisition of the name dictionary from the data generating apparatus **100** may be via receiving transmission from the data generating apparatus **100** and via reading from a recording medium recorded by the data generating apparatus **100**. The storage unit **301** is implemented by a magnetic disk, a flash memory, etc.

[0068] The transferring unit **302**, when the map display process or the facility search process is performed, reads from the storage unit **301** and transfers to memory, the name dictionary for the integrated regions including the region to be displayed or searched for. The map display process is performed in a map display mode and specifically, for example, when a user selects to have a map screen displayed, when a setting is such that a map screen is to be displayed at startup, etc.

[0069] The facility search process is performed in a facility search mode and specifically, when a keyword is input by the user and a search is initiated. When the map display process is performed for a vicinity of the current position, a target region, for example, is the region for the vicinity of the current position and when the facility search process is performed for a given keyword, a target region is the region corresponding to the keyword. The memory is implemented a RAM.

[0070] The display control unit **303**, using the name dictionary recorded in the memory, displays names in the map display process and the facility search process. The display control unit **303**, during the map display process, superimposes name data on drawing data and displays the superimposed data. During the facility search process, the display control unit **303** performs control to superimpose name data on background data (search results) and display the superimposed data; and similar to the map display process, controls to superimpose name data on drawing data for the target region and display the superimposed data. The display unit **304** outputs display of name data under the control of the display control unit **303**.

[0071] In the second embodiment, besides the name dictionary generated by the data generating apparatus **100** of the first embodiment, the storage unit **301** may store therein the common name dictionary, in which case, the transferring unit **302** reads out from the storage unit **301** and transfers to the memory in advance, the common name dictionary; and when the map display process or the facility search process is performed, reads out from the storage unit **301** and transfers to the memory, the name dictionary for the integrated regions that include the target region. In other words, since the frequency of use of the common name data has the potential of being high, the common name dictionary is set to reside in the memory (RAM). The display control unit **303**, using the common name dictionary stored to the memory and the name dictionaries, displays names in the map display process and the facility search process.

(Information Processing by Information Processing Apparatus)

[0072] With reference to FIG. **4**, information processing of the information processing apparatus **300** according to the second embodiment will be described. FIG. **4** is a flowchart of an example of information processing performed by the information processing apparatus **300** according to the second embodiment.

[0073] As depicted in FIG. **4**, the information processing apparatus **300** determines whether processing is to be initiated, processing for either map display or a facility search (step S**401**). The information processing apparatus **300** remains in a standby state until the map display process or the facility search process is to be initiated (step S**401**: NO). When the map display process or the facility search process is initiated (step S**401**: YES), the transferring unit **302** reads out from the storage unit **301** and transfers to the memory, the name dictionary for the integrated regions including the target region of the map display process or the facility search process (step S**402**).

[0074] Subsequently, the display control unit **303**, using the name dictionary stored to the memory, performs display control to display names in the map display process or the facility search process (step S**403**). The display unit **304**, under the control of the display control unit **303**, displays the name data (step S**404**), ending a series of operations.

[0075] As described, when the map display process or the facility search process is performed, the information processing apparatus **300** transfers the name dictionary for the integrated regions including the target region of the process to the memory and uses the name dictionary stored to the memory to display names in the map display process and the facility search process; therefore, by not storing overlapping name data, the amount of data stored can be suppressed.

[0076] When the map display process is performed, compared to a case where a name dictionary is stored for each region, the number of processes for referencing the name dictionaries decreases by the number of dictionary divisions removed. Thus, rapid processing becomes possible, enabling improved performance of the information processing apparatus **300**.

[0077] By preliminarily transferring a common name dictionary to the memory to store the common name dictionary, when the map display process or the facility search process is performed, the information processing apparatus **300** transfers to the memory, the name dictionary for the integrated regions including the target region of the process and uses the common name dictionary stored in the memory and the name dictionary to display names in the process. Therefore, performance can be improved by setting the common name dictionary, which has a high appearance frequency, to reside in the memory. Further, since name data common to multiple regions is stored only once in the common name dictionary, the data size of the dictionary overall can be suppressed.

First Example

[0078] Herein, a first example of the present invention will be described. In the first example, the data generating apparatus of the invention is implemented by a data generating server. Further, in a second example described hereinafter, the information processing apparatus of the invention is implemented by a navigation apparatus.

(Hardware Configuration of Data Generating Server)

[0079] With reference to FIG. **5**, a hardware configuration of a data generating server according to the first example will be described. FIG. **5** is a block diagram of one example of a hardware configuration of a data generating server according to the first example.

[0080] As depicted in FIG. **5**, the data generating server **500** includes a CPU **501**, a ROM **502**, a RAM **503**, a magnetic disk drive **504**, a magnetic disk **505**, an optical disk drive **506**, an

optical disk **507**, an input device **508**, a video interface (I/F) **509**, a display **510**, and a communication I/F **511**, respectively connected by a bus **520**.

[0081] The CPU **501** governs overall control of the data generating server **500**. The ROM **502** and a re-writable, non-volatile memory such as a flash ROM store therein various types of programs such as a boot program, a data generating program, etc. The RAM **503** is used as a work area by the CPU **501**.

[0082] The data generating program uses position information associated with text data (hereinafter, "name data") related to names; classifies the name data according to given regions; integrates regions such that the total data size of the name data included in the integrated regions (hereinafter, "integrated regions") does not exceed a given data size preliminarily set; and generates name dictionaries that are respectively constituted by the name data grouped according to integrated regions and that are used in both the facility search process and the map display process. Name data is primarily text data related to road names (hereinafter, "road name data").

[0083] The data generating program does not integrate a region (hereinafter, "special region") having name data that is equal to or exceeds a given data size or for which the total data size when integrated with a neighboring region equals or exceeds the given data size.

[0084] The data generating program extracts name data common to a given number of regions or more (hereinafter, "common name data"); and generates a common name dictionary that is constituted by the common name data and is different from the name dictionaries. The generated name dictionaries and common name dictionary are stored to the magnetic disk **505**. The name dictionaries and the common name dictionary will be described in detail hereinafter with reference to FIGS. **7** to **10**.

[0085] The classifying unit **102**, the integrating unit **103**, and the extracting unit **105** of the first embodiment are implemented by the CPU **501**, i.e., functions of the classifying unit **102**, the integrating unit **103**, and the extracting unit **105** are implemented by an execution of the data generating program by the CPU **501**.

[0086] The magnetic disk drive **504**, under the control of the CPU **501**, controls the reading and the writing of data with respect to the magnetic disk **505**. The magnetic disk **505** stores data written thereto under the control of the magnetic disk drive **504**. A hard disk (HD) or flexible disk (FD) can be used as the magnetic disk **505**. The magnetic disk **505** stores therein the name dictionaries and the common name dictionary output under the CPU **501**. The storage unit **104** of the first embodiment is implemented by the magnetic disk **505**.

[0087] The optical disk drive **506**, under the control of the CPU **501**, controls the reading and the writing of data with respect to the optical disk **507**. The optical disk **507** is a removable recording medium from which data is read out under the control of the optical disk drive **506**. The optical disk **507** may further be used as a removable, writable recording medium. Besides the optical disk **507**, an MO, memory card, etc. may be employed as a removable recording medium. Under the control of the optical disk drive **506**, the name dictionaries and the common name dictionary stored in the magnetic disk **505** may be recorded to the optical disk **507** for distribution.

[0088] The input device **508** may be a remote controller having keys for inputting letters, numerals, and various instructions, a keyboard, a mouse, a touch panel, etc. Through user operation, the input device **508** receives input of name data associated with position information. The acquiring unit **101** of the first embodiment is implemented by the input device **508**.

[0089] The video I/F **509** is connected to the display **510**. The video I/F **509**, specifically, for example, includes a graphic controller that governs overall control of the display **510**, a buffer memory such as VRAM (Video RAM) that temporarily stores immediately displayable image information, and a control IC that controls the display **510**.

[0090] The communication I/F **511** is wirelessly connected to a communication network and functions as an interface between the communication network and the CPU **501**. Although in the present example, name data is acquired via input to the input device **508**, transmission from an external device may be received via the communication I/F **511** to acquire the name data, or the name data may be read out from the optical disk **507**. Furthermore, under the control of the CPU **501**, the communication I/F **511** may transmit the name dictionary and the common name dictionary stored in the magnetic disk **505** to an information processing apparatus such as the navigation apparatus described hereinafter.

[0091] Functions of the acquiring unit **101**, the classifying unit **102**, the integrating unit **103**, the storage unit **104**, and the extracting unit **105** of the data generating apparatus **100** depicted in FIG. **1** are implemented by an execution of a given program by the CPU **501** to control components of the data generating server **500**, the programs used by the CPU **501** being stored in the ROM **502**, the RAM **503**, the magnetic disk **505**, the optical disk **507**, etc. of the data generating server **500**.

[0092] In other words, by the CPU **501** executing the data generating program stored on a recording medium such as the ROM **502**, the data generating server **500** of the present example executes, according to the data generating process depicted in FIG. **2**, the functions of the data generating apparatus **100** depicted in FIG. **1**.

(Data Generating Process Performed by Data Generating Server)

[0093] With reference to FIG. **6**, an example of a data generating process performed by the data generating server **500** according to the first example will be described. FIG. **6** is a flowchart of an example of a data generating process performed by the data generating server **500** according to the first example.

[0094] As depicted in FIG. **6**, the CPU **501** of the data generating server **500** determines whether name data has been acquired by, for example, input to the input device **508** (step S**601**). The CPU **501** remains in a standby state until name data is acquired (step S**601**: NO). When name data has been acquired (step S**601**: YES), the CPU **501** classifies the name data according to city (step S**602**).

[0095] From among the classified name data, the CPU **501** determines whether common name data that is common to regions of a given number or more is present (step S**603**). If common name data is present (step S**603**: YES), the CPU **501** extracts the common name data (step S**604**). Subsequently, the CPU **501** respectively appends common name IDs to the common name data (step S**605**). The common name data is described in detail hereinafter with reference to FIGS. **7** and **8**.

[0096] Under the control of the CPU **501**, the common name data is collectively stored to the magnetic disk **505** as a common name dictionary (step S**606**). The CPU **501** determines whether other name data has been acquired (step S**607**). If other name data has not been acquired (step S**607**: NO), a series of processes ends. On the other hand, if other name data has been acquired (step S**607**: YES), the flow returns to step S**603**.

[0097] At step S**603**, if the CPU **501** determines that common name data is not present (step S**603**: NO), the CPU **501** determines whether a special region is present (step S**608**). Although detailed description will be given with reference to FIGS. **7** and **9**, a special region is a region having name data that is equal to or exceeds a given data size (e.g., 30 KB) or a region that when integrated with a neighboring region, the total data size of the name data equals or exceeds the given data size.

[0098] If a special region is not present (step S**608**: NO), the CPU **501** integrates neighboring cities (step S**609**). The CPU **501** determines whether a road straddled by the cities is present (step S**610**). If a road straddled by the cities is present (step S**610**: YES), the CPU **501** stores the name data of the road only once (step S**611**).

[0099] The name data for a road straddled by multiple cities being stored only once means that road name data for a road straddled by multiple cities is not stored multiple times according to city. In other words, for example, if a first city and a second city are integrated and a road straddled by the first city and the second city (e.g., road X) is present, the road name data "road X" is not stored for each of the cities A and B, but rather "road X" text data is stored once to suppress data size.

[0100] After step S**611**, under the control of the CPU **501**, name data is grouped according to integrated regions and stored to the magnetic disk **505** as name dictionaries (step S**612**), and the flow proceeds to step S**607**. At step S**610**, if it is determined that a road straddled by the cities is not present (step S**610**: NO), storage of the name dictionaries at step S**612** is performed.

[0101] Further, at step S**608**, if it is determined that a special region is present (step S**608**: YES), name data for the special region is grouped and stored as a name dictionary without integration of the cities (step S**613**), and the flow proceeds to step S**607**.

(Example of Special Region and Integrated Regions)

[0102] With reference to FIG. **7**, an example of a special region and integrated regions will be described. FIG. **7** depicts an example of a special region and integrated regions.

[0103] In FIG. **7**, reference numeral **710** depicts map data for multiple cities. Reference numeral **720** depicts separated data, which is the map data **710** separated according to city. The map data **710** includes, for example, a road named "Heiwa Road", 3 different roads each named "Chuo Road", a highway name "Asahi Highway", and facilities named "market B" and "gasoline C". The map data **710** is configured by gridded blocks (mesh).

[0104] The separated data **720** depicts the map data **710** separated according to city A to E. The size of the name data for the cities A to E respectively is 28 KB, 43 KB, 10 KB, 10 KB, and 9 KB. In the present example, the upper limit of the name dictionary to be stored for each of the cities is 30 KB. Cities that exceed this 30 KB limit (city B) and regions that when combined with other regions, exceed the KB limit (city A) are special regions that are not to be integrated and an independent name dictionary is stored for each special region.

[0105] In other words for city A, name data is stored as a city_A name dictionary **731** and name data is stored as a city_B name dictionary **732**. In the present example, although the upper limit of the name dictionaries to be stored is 30 KB, the value may be changed according to, for example, the storage capacity of the magnetic disk **505** or the storage capacity of the storage unit such as a magnetic disk furnished in an information processing apparatus such as the navigation apparatus described hereinafter.

[0106] Meanwhile, if cities C to E are integrated, the total data size is 29 KB and thus, these cities have the potential to be integrated regions. Other words, for cities C to E, a city_C-D-E name dictionary **733** is stored.

[0107] For cities A, B, and D, "Chuo Road" is common name data, i.e., name data common to regions of a given number or more. The common name data "Chuo Road" is stored in a common name dictionary **740** different from the city_A name dictionary **731**, the city_B name dictionary **732**, and the city_C-D-E name dictionary **733**. The common name dictionary **740** is appended with dictionary number "0"; the city_A name dictionary **731** is appended with dictionary number "1"; the city_B name dictionary **732** is appended with dictionary number "2"; and the city_C-D-E name dictionary **733** is appended with dictionary number "3".

[0108] To each of the "Chuo Road" links in the drawing data (parcel data) for cities A, B, and D, the dictionary number "0" of the common name dictionary **740** and the name ID "1" are set, whereby it becomes possible to the read in text data for "Chuo Road" appearing when a map is displayed or during a facility search.

[0109] Further, name data is present for "Asahi Highway", which is straddled by cities C, D, and E. As also described with reference to FIG. **6**, in the present embodiment, the name data for "Asahi Highway" is not stored for each of the cities C, D, and E, i.e., is not stored in the city_C-D-E name dictionary **733** three times nor stored a number of times corresponding to the number of mesh portions in which "Asahi Highway" is depicted. In other words, the name data for "Asahi Highway" is stored once for cities C, D, and E collectively.

[0110] In this case, to each of the "Asahi Highway" links in the drawing data for the cities C, D, and E, the dictionary number "3" of the city_C-D-E name dictionary **733** and the name ID "1" in the city_C-D-E name dictionary **733** are set, whereby it becomes possible to the read in text data for "Asahi Highway" appearing when a map is displayed or during a facility search.

[0111] Similarly, without limitation to a road such as "Asahi Highway" straddled by the cities C, D, and E, for the name of a geographical feature such as a beach or mountain straddled by the cities C, D, and E, only the name data is stored and to the geographical feature in drawing data for the cities C, D, and E, the dictionary number and the name ID can be set.

(Data Structure of Common Name Dictionary)

[0112] With reference to FIG. **8**, a data structure of the common name dictionary **740** will be described. FIG. **8** depicts a data structure of the common name dictionary **740**. As depicted in FIG. **8**, the common name dictionary **740** stores therein name IDs and common name data. Specifically, the common name dictionary **740** stores common name data correlated respectively with name IDs. For example, the com-

mon name ID "1" is correlated with the common name data "Chuo Road" depicted in FIG. **7**.

(Data Structure of City a Name Dictionary)

[0113] With reference to FIG. **9**, a data structure of the city_A name dictionary **731** will be described. FIG. **9** depicts a data structure of the city_A name dictionary **731**. As depicted in FIG. **9**, the city_A name dictionary **731** stores therein name IDs and name data. Name data is text data for names, such as "Heiwa Road" and "market B" depicted in FIG. **7**.

[0114] A name ID is information for identifying name data in city A. The city_A name dictionary **731** does not store therein text data for "Chuo Road". As described above, to the "Chuo Road" link in the drawing data for city A, the dictionary number "0" of the common name dictionary **740** and the name ID "1" in the common name dictionary **740** are set, whereby it becomes possible to the read in text data for "Chuo Road" appearing when a map is displayed or during a facility search.

[0115] Although graphical depiction is omitted concerning the data structure of the city_B name dictionary **732**, the data structure of the city_B name dictionary **732** is the same as the data structure of the city_A name dictionary **731**, i.e., is constituted by name IDs and name data.

(Data Structure of City C-D-E Name Dictionary)

[0116] With reference to FIG. **10-1**, a data structure of the city_C-D-E name dictionary **733** will be described. FIG. **10-1** depicts a data structure of the city_C-D-E name dictionary **733**. As depicted in FIG. **10-1**, the city_C-D-E name dictionary **733** includes name IDs and name data. Name data is text data for names, such as "Asahi Highway" and "gasoline C" depicted in FIG. **7**.

[0117] A name ID is information to identify name data in cities C, D, and E. The city_C-D-E name dictionary **733** stores therein text data for "Asahi Highway" only once. As described above, to the "Asahi Highway" link in the drawing data for the cities C, D, and E, the dictionary number "3" of the city_C-D-E name dictionary **733** and the name ID "1" in the city_C-D-E name dictionary **733** are set, whereby it becomes possible to the read in text data for "Asahi Highway" appearing when a map is displayed or during a facility search.

[0118] Similarly to the city_A name dictionary **731**, the city_C-D-E name dictionary **733** does not store therein text data for "Chuo Road". As described above, to the "Chuo Road" link in the drawing data for city D, the dictionary number "0" of the common name dictionary **740** and the name ID "1" in the common name dictionary **740** are set, whereby it becomes possible to the read in text data for "Chuo Road" appearing when a map is displayed or during a facility search.

(Another Example of Data Structure of Common Name Dictionary)

[0119] With reference to FIGS. **10-2** to **10-4**, other examples of data structures of the dictionaries will be described. FIG. **10-2** depicts another example of a data structure of the common name dictionary **740**. As depicted in FIG. **10-2**, the common name dictionary **740** stores therein name IDs, common name data, and common name IDs. For example, the common name ID "1" is correlated with the common name data "Chuo Road" depicted in FIG. **7**.

(Another Example of Data Structure of City_A Name Dictionary)

[0120] FIG. **10-3** depicts another example of a data structure of the city_A name dictionary **731**. As depicted in FIG. **10-3**, the city_A name dictionary **731** stores therein name IDs, name data, and common name IDs. Name data is text data for names, such as "Heiwa Road" and "market B" depicted in FIG. **7**.

[0121] A name ID is information for identifying name data in city A. Common name IDs correspond to the name IDs in the common name dictionary **740**. The common name ID stored corresponding to the name ID "3" is "1", which corresponds to the name ID stored in the common name dictionary **740** for "Chuo Road". In other words, the city_A name dictionary **731** does not store therein text data for "Chuo Road", but rather stores a number as a common name ID.

[0122] In this case, to the "Chuo Road" link in the drawing data for city A, the dictionary number "1" of the city_A name dictionary **731** and the name ID "3" (corresponding to the common name ID "1") in the city_A name dictionary **731** are set, whereby it becomes possible to the read in text data for "Chuo Road" appearing when a map is displayed or during a facility search.

[0123] Concerning the data structure of the city_B name dictionary **732**, a similar structure is possible, i.e., the data structure includes name IDs, name data, and common name IDs.

(Another Example of Data Structure of City_C-D-E Name Dictionary)

[0124] FIG. **10-4** depicts a data structure of the city_C-D-E name dictionary **733**. As depicted in FIG. **10-4**, the city_C-D-E name dictionary **733** includes name IDs, name data, and common name IDs. Name data is text data for names, such as "Asahi Highway" and "gasoline C" depicted in FIG. **7**.

[0125] A name ID is information for identifying name data in cities C, D, and E. Common name IDs correspond to the name IDs in the common name dictionary **740**. The common name ID stored corresponding to the name ID "3" is "1", which corresponds to the name ID stored in the common name dictionary **740** for "Chuo Road". In other words, the city_C-D-E name dictionary **733** does not store therein text data for "Chuo Road", but rather stores a number as a common name ID.

[0126] In this case, to the "Chuo Road" link in the drawing data for city D, the dictionary number "3" of the city_C-D-E name dictionary **733** and the name ID "3" (corresponding to the common name ID "1") in the city_C-D-E name dictionary **733** are set, whereby it becomes possible to the read in text data for "Chuo Road" appearing when a map is displayed or during a facility search.

[0127] Further, the city_C-D-E name dictionary **733** stores therein text data for "Asahi Highway" only once. In this case, to the "Asahi Highway" link in the drawing data for city D, the dictionary number "3" of the city_C-D-E name dictionary **733** and name ID "1" in the city_C-D-E name dictionary **733** are set, whereby it becomes possible to read in text data for "Asahi Highway" appearing when a map is displayed or during a facility search.

[0128] Thus, even with the dictionary data structures depicted in FIGS. **10-2** to **10-4**, similarly to the dictionary data structures depicted in FIGS. **8** to **10-1**, common name data can be consolidated and regions can be integrated to store name data. The data structures described herein are mere examples and are not limited hereto.

[0129] As described, the data generating server **500** according to the first example integrates multiple regions such that the total data size of the name data included in the integrated regions does not exceed a preliminarily set data size of 30 KB, groups the name data according to integrated regions, and stores the grouped name data as a name dictionary (city_C-D-E name dictionary) to be used in both the facility search process and the map display process. Therefore, by not storing overlapping name data, the amount of data stored can be suppressed.

[0130] When the map display process is performed in information processing apparatuses such as a navigation apparatus that uses the name dictionary, compared to a case where a name dictionary is stored for each region, the number of processes for referencing the name dictionaries decreases by the number of dictionary divisions removed. Thus, rapid processing becomes possible, enabling improved performance of the information processing apparatus.

[0131] Further, by not integrating special regions, which have name data that is equal to or exceeds a given data size of 30 KB or for which the total data size when integrated with a neighboring region equals or exceeds the given data size and by storing the city_A name dictionary and city_B name dictionary independently, the database can be optimized according to region. Therefore, performance of the information processing apparatus can be optimized.

[0132] Further, with the present example, the 30 KB data size can be changed according to the capacity of the magnetic disk **505** to integrate multiple regions. This enables integration suitable for the storage capacity to be performed, whereby the database is optimized, enabling improved performance of the information processing apparatus.

[0133] Since text data related to road names is used as name data, when a road straddled by multiple regions is displayed by the map display process performed by the information processing apparatus, the troublesome referencing of numerous dictionaries stored for each region can be suppressed, enabling improved performance. In other words, when map display process is performed, compared to a case where a name dictionary is stored for each region, the number of dictionary references decreases by the number of dictionary divisions removed, enabling improved performance.

[0134] By extracting from name data classified according to region, common name data common to a given number of regions or more, grouping the extracted common name data, and storing the grouped common name data as the common name dictionary **740** different from the other name dictionaries, name data common to multiple regions is stored only once in the common name dictionary **740**, enabling the data size of the dictionary overall to be suppressed.

Second Example

[0135] Hereinafter, a second example of the present invention will be described. In the second example, the information processing apparatus of the present invention is implemented by a navigation apparatus. Furthermore, description given with respect to the first example and applicable in the second example will be omitted for simplicity.

(Hardware Configuration of Navigation Apparatus)

[0136] With reference to FIG. **11** a hardware configuration of a navigation apparatus **1100** according to the second example will be described. FIG. **11** is a block diagram of a hardware configuration of the navigation apparatus **1100** according to the second example.

[0137] As depicted in FIG. **11**, the navigation apparatus **1100** includes a CPU **1101**, a ROM **1102**, a RAM **1103**, a magnetic disk drive **1104**, a magnetic disk **1105**, an optical disk drive **1106**, an optical disk **1107**, an audio I/F **1108**, a speaker **1109**, an input device **1110**, a video I/F **1111**, a display **1112**, a communication I/F **1113**, a GPS unit **1114**, and various sensors **1115**, respectively connected by a bus **1120**.

[0138] The CPU **1101** governs overall control of the navigation apparatus **1100**. The ROM **1102** stores therein various programs such as a boot program, a map display program, a facility search program, an information processing program, etc. The RAM **1103** is used as a work area by the CPU **1101** and stores therein a common name dictionary.

[0139] The map displaying program uses map data stored on the magnetic disk **1105** and constituted by drawing data, name data, etc. to, for example, display a map screen for a vicinity of the current position. The facility search program uses name dictionaries and a common name dictionary stored on the magnetic disk **1105** and from the name dictionaries and the common name dictionary, searches for a point that corresponds to a keyword input by a user.

[0140] When the map display process is executed by the map displaying program or when the facility search process is executed by the facility search program, the information processing program reads out from the magnetic disk **1105**, the name dictionaries generated by the data generating server **500** of the first example, transfers the name dictionaries to the RAM **1103** and using the name dictionaries or the common name dictionary stored in the RAM **1103**, outputs the name data in the map display process or the facility search process. The common name dictionary is preliminarily read from the magnetic disk **1105** and stored to the RAM **1103** prior to the execution of the map display process or the facility search process.

[0141] The transferring unit **302** and the display control unit **303** of the second embodiment are implemented by the CPU **1101**. In other words, functions of the transferring unit **302** and the display control unit **303** are implemented by an execution of the information processing program by the CPU **1101**.

[0142] The magnetic disk drive **1104**, under the control of the CPU **1101**, controls the reading and the writing of data with respect to the magnetic disk **1105**. The magnetic disk **1105** stores data written thereto under the control of the magnetic disk drive **1104**. A hard disk (HD) or flexible disk (FD) can be used as the magnetic disk **1105**.

[0143] The magnetic disk **1105** stores therein the name dictionaries and the common name dictionary generated by the data generating server **500** of the first example. Further, the magnetic disk **1105** stores therein drawing data (parcel data) constituted by background data representing features such as buildings, rivers, land surfaces, etc. and road-shape data representing the shape of roads and further stores therein background-screen data representing a background screen

appearing when a search is performed. For a portable navigation device (PND), data stored to the magnetic disk **1105** is stored to flash memory. The storage unit **301** of the second embodiment is implemented by the magnetic disk **1105**.

[0144] In the drawing data, to links such as "Chuo Road" and geographical features and having data for names common to multiple cities, the dictionary number of the common name dictionary and the name ID in the common name dictionary are recorded. To road links straddled by the cities and geographical features in drawing data for cities that have been integrated, the dictionary number of the name dictionary and the name ID in the name dictionary are recorded.

[0145] The optical disk drive **1106**, under the control of the CPU **1101**, controls the reading and the writing of data with respect to the optical disk **1107**. The optical disk **1107** is a removable recording medium from which data is read out under the control of the optical disk drive **1106**. The optical disk **1107** may further be used as a removable, writable recording medium. Besides the optical disk **1107** an MO, memory card, etc. may be employed as a removable recording medium.

[0146] In the present example, the optical disk **1107** storing therein the name dictionaries and the common name dictionary generated by the data generating server **500** is used, and by reading out the name dictionaries and the common name dictionary from the optical disk **1107**, the name dictionaries and the common name dictionary are stored to the magnetic disk **1105**.

[0147] The audio I/F **1108** is connected to the speaker **1109** for audio output. The speaker **1109** outputs audio. The input device **1110** may be a remote controller having keys for inputting letters, numerals, and various instructions, a keyboard, a mouse, a touch panel, etc. The input device **1110** may be implemented by any one or combination of the remote controller, keyboard, mouse and touch panel.

[0148] The video I/F **1111** is connected to the display **1112**. The video I/F **1111**, specifically, for example, includes a graphic controller that governs overall control of the display **1112**, a buffer memory such as VRAM (Video RAM) that temporarily stores immediately displayable image information, and, and a control IC that controls the display **1112** based on image data output from the graphic controller. The display unit **304** of the second embodiment is implemented by the display **1112**.

[0149] The communication I/F **1113** is wirelessly connected to a network and functions as an interface between the navigation apparatus **1100** and the CPU **1101**. The communication I/F **1113** may receive transmission of the name dictionaries and the common name dictionary generated by the data generating server **500**. Further, the communication I/F **1113**, under the control of the CPU **1101**, may transmit to the data generating server **500**, information requesting transmission of a name dictionary or the common name dictionary when the name dictionary or the common name dictionary is to be updated.

[0150] The GPS unit **1114** receives signals from GPS satellites and outputs information indicative of the current vehicular position. Information output from the GPS unit **1114** includes values that are output from the various sensors **1115** described hereinafter and that are used by the CPU **1101** to compute the current vehicular position. Information indicative of the current position is information specifying one point on map data, such as latitude/longitude and altitude.

[0151] The various sensors **1115** include a vehicular speed sensor, an acceleration sensor, an angular sensor, etc. that output information enabling the behavior of the vehicle to be determined. The values output from the various sensors **1115** are used in the computation of the current vehicular position by the CPU **1101**, to estimate changes in the speed and direction, etc.

[0152] Functions of the storage unit **301**, the transferring unit **302**, the display control unit **303**, and the display unit **304** of the information processing apparatus **300** depicted in FIG. **3** are implemented by controlling components of the navigation apparatus **1100** by an execution of a program by the CPU **1101** using programs and data recorded to the ROM **1102**, the RAM **1103**, the magnetic disk **1105**, the optical disk **1107**, etc. of the navigation apparatus **1100** depicted in FIG. **11**.

[0153] In other words, the navigation apparatus **1100** of the present example can execute, according to the information processing procedure depicted in FIG. **4**, the functions of the information processing apparatus **300** depicted in FIG. **3** through an execution of the information processing program by the CPU **1101**, the information processing program being stored to a recording medium such as the ROM **1102**.

(Overview of Information Processing Performed by Navigation Apparatus)

[0154] With reference to FIG. **12**, an overview of the information processing performed by the navigation apparatus **1100** according to the second example will be described. FIG. **12** is a flowchart outlining the information processing performed by the navigation apparatus **1100** according to the second example.

[0155] As depicted in FIG. **12**, the CPU **1101** of the navigation apparatus **1100** determines if the navigation apparatus **1100** has entered a facility search mode or a map display mode (step S**1201**). The CPU **1101** remains in a standby state until the facility search mode or the map display mode is entered (step S**1201**: NO). When either the facility search mode or the map display mode has been entered (step S**1201**: YES), the CPU **1101** transfers to the RAM **1103**, the common name dictionary stored in the magnetic disk **1105** (step S**1202**).

[0156] Subsequently, the CPU **1101** remains in a standby state until facility search process or map display process is executed (step S**1203**: NO). When either the facility search process or the map display process is executed (step S**1203**: YES), the CPU **1101** transfers to the RAM **1103**, the name dictionary of the integrated regions that include the target region of the process or the name dictionary of a special region (step S**1204**), and uses the common name dictionary and the name dictionary stored to the RAM **1103** to display on the display **1112**, the name appearing in the process (step S**1205**), ending a series of operations.

(Example of Information Processing Performed Under Facility Search)

[0157] With reference to FIG. **13**, one example of information processing performed under a facility search will be described. FIG. **13** is a flowchart of one example of information processing performed under a facility search. In FIG. **13**, the common name dictionary is assumed to be preliminarily stored to the RAM **1103**.

[0158] As depicted in FIG. **13**, the CPU **1101** of the navigation apparatus **1100** determines whether a keyword has

been entered by the user via the input device **1110** and an initiation instruction for the facility search process has been received (step S**1301**). The CPU **1101** remains in a standby state until an initiation instruction for the facility search process is received (step S**1301**: NO). Upon receiving an initiation instruction for the facility search process (step S**1301**: YES), the CPU **1101** transfers to the RAM **1103**, the name dictionary for the region included in the target region (keyword) of the facility search process (step S**1302**).

[0159] Subsequently, the CPU **1101** acquires name data corresponding to the search target data, from the common name dictionary or the name dictionary for the target region (step S**1303**). The CPU **1101** refers to the name data and performs the search (step S**1304**). Using results of the common name dictionary and the name dictionary search, the CPU **1101** superimposes the name data (or common name data) on background-screen data (step S**1305**). Background-screen data is image data for a background when search results are displayed. The CPU **1101** displays the superimposed data as a search result (step S**1306**), ending a series of operations. When a map of an area indicated by the name data corresponding to the keyword is to be displayed, the name data may be superimposed on drawing data and displayed as a search result.

(Example of Information Processing Performed for Display of Map of Specified Region)

[0160] With reference to FIG. **14**, one example of information processing performed when a map of a specified region is to be displayed will be described. FIG. **14** is a flowchart of one example of information processing performed when a map of a specified region is to be displayed. In FIG. **14**, the common name dictionary is assumed to be preliminarily stored to the RAM **1103**. Herein, a specified region includes cities A and B depicted in FIG. **7**, and in the description hereinafter, city A will be taken as an example. The data structure of dictionaries stored on the magnetic disk **1105** is identical to that depicted in FIGS. **8** to **10-1**.

[0161] As depicted in FIG. **14**, the CPU **1101** of the navigation apparatus **1100** determines whether the map display process for city A has been initiated (step S**1401**); the vehicle, for example, is located in a vicinity of city A. The CPU **1101** remains in a standby state until the map display process for city A is initiated (step S**1401**: NO). When the map display process for city A has been initiated (step S**1401**: YES), the CPU **1101** reads from the magnetic disk **1105**, drawing data for city A (step S**1402**).

[0162] The CPU **1101** transfers the city_A name dictionary (see FIG. **7**) to the RAM **1103** (step S**1403**) and determines whether a feature within a display range covered by the drawing data and set with a name ID and a dictionary number representing the common name dictionary is present (for example, a road such as "Chuo Road" depicted in FIG. **7**) (step S**1404**). If a feature set with a name ID and a dictionary number representing the common name dictionary is present within the display range covered by the drawing data (step S**1404**: YES), the CPU **1101** reads from the common name dictionary preliminarily stored in the RAM **1103**, the common name data corresponding to the name ID (step S**1405**).

[0163] Subsequently, the CPU **1101** reads from the city_A name dictionary, name data within the display range (step S**1406**). If at step S**1404**, the CPU **1101** determines that a feature set with a name ID and a dictionary number representing the common name dictionary is not present within the display range covered by the drawing data (step S**1404**: NO), the flow proceeds to step S**1406**.

[0164] After the process at step S**1406**, the CPU **1101** superimposes the read name data (or common name data) on the drawing data (step S**1407**), and displays the superimposed data as a map screen (step S**1408**), ending a series of operations.

[0165] If name dictionaries having the data structure depicted in FIGS. **10-2** to **10-4** are used, at step S**1404**, "the determination of whether a feature set with a name ID and a dictionary number representing the common name dictionary is present within a display range covered by the drawing data" described is not performed, but rather the CPU **1101** determines "whether a feature set with a dictionary number representing the city_A name dictionary and a name ID having a common name ID is present within the display range covered by the drawing data". In this case, if a feature set with such a dictionary number and name ID is present, the flow proceeds to step S**1405**.

(Example of Information Processing Performed for Display of Map of Integrated Regions)

[0166] With reference to FIG. **15**, one example of information processing performed when a map of integrated regions is to be displayed will be described. FIG. **15** is a flowchart of one example of information processing performed when a map of integrated regions is to be displayed. In FIG. **15**, the common name dictionary is assumed to be preliminarily stored to the RAM **1103**. Herein, the integrated regions are the cities C, D, and E depicted in FIG. **7** and an example where city C is to be displayed will be described.

[0167] As depicted in FIG. **15**, the CPU **1101** of the navigation apparatus **1100** determines whether the map display process for city C has been initiated (step S**1501**); the vehicle, for example, is located in a vicinity of city C. The CPU **1101** remains in a standby state until the map display process for city C is initiated (step S**1501**: NO). When the map display process for city C has been initiated (step S**1501**: YES), the CPU **1101** reads out from the magnetic disk **1105**, drawing data for city C (step S**1502**).

[0168] The CPU **1101** transfers the city_C-D-E name dictionary (see FIG. **7**) to the RAM **1103** (step S**1503**) and determines whether a feature within a display range covered by the drawing data and set with a name ID and a dictionary number representing the common name dictionary is present (for example, a road such as "Chuo Road" depicted in FIG. **7**) (step S**1504**). If a feature set with a name ID and a dictionary number representing the common name dictionary is present within the display range covered by the drawing data (step S**1504**: YES), the CPU **1101** reads from the common name dictionary preliminarily stored in the RAM **1103**, the common name data corresponding to the name ID (step S**1505**).

[0169] Subsequently, the CPU **1101** determines whether a feature within the display range covered by the drawing data and set with a name ID and a dictionary number representing the city_C-D-E name dictionary (see FIG. **7**) is present (for example, a road such as "Asahi Highway" depicted in FIG. **7**) (step S**1506**). If it is determined that a feature set with a name ID and a dictionary number representing the city_C-D-E name dictionary is present within the display range covered by the drawing data (step S**1506**: YES), the CPU **1101** reads from city_C-D-E name dictionary, the name data corresponding to the name ID (step S**1507**).

[0170] The CPU **1101** reads from city_C-D-E name dictionary, name data within the display range (step S**1508**); superimposes the read name data (or common name data) on the drawing data (step S**1509**); and displays the superimposed data as a map screen (step S**1510**), ending a series of operations.

[0171] At step S**1504**, if the CPU **1101** determines that a feature set with a name ID and a dictionary number representing the common name dictionary is not within the display range covered by the drawing data (step S**1504**: NO), the flow proceeds to step S**1506**. Furthermore, at step S**1506**, if the CPU **1101** determines that a feature set with a name ID and a dictionary number representing the city_C-D-E name dictionary is not present within the display range covered by the drawing data (step S**1506**: NO), the reading of name data at step S**1508** is performed.

[0172] If name dictionaries having the data structure depicted in FIGS. **10-2** to **10-4** are used, similar to the explanation given with reference to FIG. **14**, the process at step S**1504** does not include determining "whether a feature set with a name ID and a dictionary number representing the common name dictionary is present within a display range covered by the drawing data", but rather includes determining "whether a feature set with dictionary number representing the city_A name dictionary and a name ID having a common name ID is present within the display range covered by the drawing data. In this case, if a feature set with such a dictionary number and name ID is present, the flow proceeds to step S**1505**.

[0173] As described, when the map display process or the facility search process is executed, the navigation apparatus **1100** according to the second example transfers to the memory, the name dictionary for the integrated regions including the target region of the process and uses the name dictionaries stored to the memory to display the name appearing in the map display process or the facility search process. Therefore, overlapping name data is not stored, enabling the amount of data stored to the magnetic disk **1105** to be suppressed.

[0174] When the map display process is performed, compared to a case where a name dictionary is stored for each region, the number of processes for referencing the name dictionaries decreases by the number of dictionary divisions removed. Thus, rapid processing becomes possible, enabling improved performance of the navigation apparatus **1100**.

[0175] The navigation apparatus **1100** according to the second example stores the common name dictionary to the magnetic disk **1105**, preliminarily transfers the common name dictionary to the RAM **1103** and when the map display process or the facility search process is executed, transfers the name dictionary for the integrated regions including the target region of the process to the RAM **1103** and uses the common name dictionary and the name dictionaries stored to the RAM **1103** to display names appearing in the map display process or the facility search process.

[0176] Therefore, performance can be improved by setting the common name dictionary, which has a high appearance frequency, to reside in the RAM **1103**. Further, since name data common to multiple regions is stored only once in the common name dictionary, the data size of the dictionary overall can be suppressed.

[0177] As described, through the data generating apparatus, the information processing apparatus, data generating method, information processing method, the data generating program, the information processing program and the recording medium of the present invention, data volume can be suppressed and performance of the facility search process and the map display process can be improved.

[0178] The data generating method and the information processing method of the first and the second examples, may be implemented by a computer, such as a personal computer and a workstation, executing a program that is prepared in advance. The program is recorded on a computer-readable recording medium such as a hard disk, a flexible disk, a CD-ROM, an MO, and a DVD, and is executed by being read out from the recording medium by a computer. The program may be distributed through a network such as the Internet.

1-12. (canceled)

13. A data generating apparatus comprising:

an acquiring unit that acquires text data (name data) related to a name associated with position information;

a classifying unit that using the position data associated with the name data acquired by the acquiring unit, classifies the name data according to given regions;

an integrating unit that integrates neighboring regions such that the total data size of the name data included in regions to be integrated (integrated regions) does not exceed a given data size that is preliminarily set;

a storage unit that groups the name data according to integrated regions and stores the grouped name data as a name dictionary to be used in both a facility search process and a map display process; and

an extracting unit that from the name data classified according to the given regions, extracts the name data (common name data) that is common to regions of a given number or more, wherein

the storage unit groups and stores the common name data as a common name dictionary different from the name dictionary.

14. The data generating apparatus according to claim **13**, wherein

the integrating unit does not integrate a region (special region) for which the name data is equal to or exceeds the given data size or for which the total data size when integrated with a neighboring region equals or exceeds the given data size,

the storage unit groups and stores the name data for a special region as a name dictionary to be used in both the facility search process and the map display process.

15. The data generating apparatus according to claim **13**, wherein the integrating unit to integrate regions, changes the given data size according to a storage capacity of the storage unit.

16. The data generating apparatus according to claim **13**, wherein the name data is text data related to a road name.

17. An information processing apparatus executing the map display process and the facility search process and comprising:

a storage unit storing therein the name dictionary generated by the data generating apparatus according to claim **13**;

a transferring unit that when the map display process or the facility search process is executed, reads from the storage unit and transfers to memory, the name dictionary for the integrated regions including a target region of the process executed; and

a display control unit that uses the name dictionary stored to the memory and displays names in the map display process or the facility search process.

18. The information processing apparatus according to claim **17**, wherein

the storage unit stores therein the name dictionary and the common name dictionary generated by the data generating apparatus,

the transferring unit reads from the storage unit and preliminarily transfers to the memory, the common name dictionary and when the map display process or the facility search process is executed, reads from the storage unit and transfers to the memory, the name dictionary for the integrated regions including the target region of the process executed, and

the display control unit uses the name dictionary and the common name dictionary stored to the memory and displays names in the map display process or the facility search process.

19. A data generating method of generating data used in both a map display process and a facility search process, the data generating method comprising:

acquiring acquires text data (name data) related to a name associated with position information;

classifying, using the position data associated with the name data acquired at the acquiring, the name data according to given regions;

integrating neighboring regions such that the total data size of the name data included in regions to be integrated (integrated regions) does not exceed a given data size that is preliminarily set;

grouping the name data according to integrated regions and storing the grouped name data as a name dictionary to be used in both the facility search process and the map display process; and

extracting from the name data classified according to the given regions, the name data (common name data) that is common to regions of a given number or more, wherein

the grouping includes grouping the common name data and the storing includes storing the grouped common name data as a common name dictionary different from the name dictionary.

20. An information processing method of an information processing apparatus that executes the map display process and the facility search process and includes a storage unit storing therein the name dictionary generated by the data generating method according to claim **19**, the information processing method comprising:

reading from the storage unit and transferring to memory when the map display process or the facility search process is executed, the name dictionary for the integrated regions including the target region of the process executed; and

controlling display of names in the map display process or the facility search process, by using the name dictionary stored to the memory.

21. A non-transitory computer-readable recording medium storing therein a data generating program causing a computer to execute the data generating method according to claim **19**.

22. A non-transitory computer-readable recording medium storing therein an information processing program causing a computer to execute the data generating method according to claim **20**.

* * * * *