

DESCRIPTION
GUIDE SYSTEM

Field

[0001] The present invention relates to a guide system.

5 Background

[0002] As a conventional guide system, for example, Patent Literature 1 discloses an information processing apparatus including detection means, estimation means, and provision means. The detection means detects a people flow.

10 On the basis of the people flow detected by the detection means, the estimation means estimates the attribute of people in the people flow. Then, the provision means provides information, on the basis of the attribute estimated by the estimation means.

15 Citation List

Patent Literature

[0003] Patent Literature 1: Japanese Patent Application Laid-open No. 2017-146380 A

Summary

20 Technical Problem

[0004] The guide system described above has room for further improvement, for example, in that a guide meeting a more particular individual is provided.

[0005] The present invention has been made in
25 consideration of the situation above, and an objective of the present invention is to provide a guide system enabling provision of a guide meeting a particular individual.

Solution to Problem

[0006] In order to achieve the above object, a guide
30 system according to the present invention includes a collection device configured to collect data for analysis including image data indicating an image including a person and positional data indicating a position at which the

image is captured; a plurality of content output devices each capable of outputting a plurality of pieces of content; a data analysis unit configured to analyze an attribute of the person included in the image indicated by
5 the image data and a people flow of the person of which the attribute is specified, based on the data for analysis collected by the collection device; a behavior prediction unit configured to predict behavior of the person of which the attribute is specified, based on the people flow of the
10 person analyzed by the data analysis unit; a content selection unit configured to select content to be output by the content output devices, from the plurality of pieces of content, based on the attribute of the person analyzed by the data analysis unit; and an output-destination
15 determination unit configured to determine a content output device that outputs the content selected by the content selection unit, from the plurality of content output devices, based on the behavior of the person predicted by the behavior prediction unit, wherein the content output
20 device determined by the output-destination determination unit outputs the content selected by the content selection unit to the person of which the attribute is specified by the data analysis unit, with timing corresponding to the behavior of the person predicted by the behavior prediction
25 unit.

[0007] Further, in the guide system, it is capable that a plurality of the collection devices each is provided at a fixed object fixed on a street or to a building or a mobile object capable of moving.

30 [0008] Further, in the guide system, it is capable that the plurality of content output devices each is provided at a fixed object fixed on a street or to a building or a mobile object capable of moving.

[0009] Further, in the guide system, it is capable that it is capable that the plurality of content output devices each is provided at a fixed object fixed on a street or to a building or a mobile object moving on a road surface.

5 Advantageous Effects of Invention

[0010] In a guide system according to the present invention, on the basis of data for analysis collected by a collection device, a data analysis unit analyzes the attribute and people flow of a person included in an image indicated by image data. Then, in the guide system, a content output device determined by an output-destination determination unit outputs content selected by a content selection unit in accordance with the attribute of the person, with timing corresponding to the behavior of the person predicted by a behavior prediction unit. As a result, the guide system has an effect enabling provision of a guide meeting a particular individual.

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Brief Description of Drawings

[0011] FIG. 1 is a block diagram of a schematic configuration of a guide system according to a first embodiment.

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FIG. 2 is a flowchart of exemplary processing in the guide system according to the first embodiment.

FIG. 3 is a schematic view of an exemplary operation of the guide system according to the first embodiment.

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FIG. 4 is a schematic view of an exemplary operation of the guide system according to the first embodiment.

FIG. 5 is a schematic view of an exemplary operation of the guide system according to the first embodiment.

FIG. 6 is a block diagram of a schematic configuration of a guide system according to a second embodiment.

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Description of Embodiments

[0012] Embodiments according to the present invention

will be described in detail below, on the basis of the drawings. Note that the invention is not limited to the embodiments. The constituent elements in the following embodiments include constituent elements that persons
5 skilled in the art can replace easily and substantially the same constituent elements.

[0013] First Embodiment

A guide system 1 of the present embodiment illustrated in FIG. 1 is a real-time signage system including a
10 collection device 10, an analysis device 20, a content service device 30, and a plurality of content output devices 40, in which content meeting a particular individual is output with cooperation between the devices. The plurality of content output devices 40 each is capable
15 of outputting a plurality of pieces of content. In the guide system 1 of the present embodiment, the attribute of a particular person (individual) included in a captured image and the people flow of the person of which the attribute is specified are analyzed, content corresponding
20 to the attribute of the person is selected in accordance with an analysis result, and a content output device 40 proactively outputs the selected content. The configuration of the guide system 1 will be described in detail below with reference to each figure.

25 [0014] The collection device 10 collects data for analysis for use in specification and analysis of a person to be provided with content. The data for analysis includes image data indicating an image including a person and positional data indicating the position at which the
30 image is captured. The data for analysis is used in analysis of the attribute of the person and the people flow of the person with the analysis device 20. The collection device 10 is typically provided at a fixed object F or a

mobile object V. The fixed object F on which the collection device 10 is mounted, is typically installed and fixed on a street or to a building. The fixed object F may be a structure, such as a bus stop, digital signage, a vending machine, a sign, or a utility pole, provided on a street, or a dedicated structure provided for installation of the collection device 10. The fixed object F on which the collection device 10 is mounted, may be a structure provided at a gateway, an interior, or a rooftop of a building, such as a department store, a condominium, an office building, or a hotel. The mobile object V on which the collection device 10 is mounted, is typically a movable object. Herein, the mobile object V is typically a vehicle that travels on roads, and may be, for example, any of a private car, a rental car, a sharing car, a ride-sharing car, a bus, a taxi, a truck, a transport vehicle, and a maintenance vehicle. Note that the mobile object V is not limited to this, and thus may be a flight vehicle that flies in the air, such as a flying car or a drone. The collection device 10 is typically mounted on each of a plurality of fixed objects F and a plurality of mobile objects V. That is the guide system 1 of the present embodiment includes a plurality of collection devices 10 mounted one-to-one on the plurality of fixed objects F and the plurality of mobile objects V, and is capable of collecting the data for analysis from the plurality of collection devices 10. At least part of the plurality of collection devices 10 may be mounted on vehicles that repeatedly travel a previously determined route, such as a regular-route bus or a truck for long-haul transportation. At least part of the plurality of collection devices 10 may be mounted on vehicles for business use managed by a business entity, such as a sharing car, a ride-sharing car,

or a taxi. For the collection device 10 with which the mobile object V is equipped, an in-vehicle device, such as a so-called dashboard camera, with which the mobile object V is equipped, can be used, but is not limitative.

5 [0015] Specifically, the collection device 10 includes a camera 11, a positional-information measuring instrument 12, a communication unit (collection-device communication unit) 13, and a controller 14.

[0016] The camera 11 is an image capturing device that
10 captures an image including a person. The camera 11 typically captures a moving image including the person to be provided with content in the guide system 1. The camera 11 is set so as to have an angle of view enabling capturing of a person. In a case where the collection device 10 is
15 provided at a fixed object F on a street, the camera 11 typically captures an image outside the fixed object F. In this case, for example, the camera 11 is installed in the fixed object F such that the camera 11 has an angle of view enabling capturing of a person on the street outside the
20 fixed object F. The camera 11 captures an image including a person on the street. In a case where the collection device 10 is provided at a fixed object F of a building, the camera 11 typically captures an image inside the building at which the fixed object F is provided and
25 outside the building. In this case, for example, the camera 11 is installed in the fixed object F such that the camera 11 has an angle of view enabling capturing of a person outside the building and a person inside the building. The camera 11 captures an image including a
30 person outside the building and a person inside the building. In a case where the collection device 10 is provided at a mobile object V, the camera 11 typically captures an image inside the mobile object V and outside

the mobile object V. In this case, for example, the camera 11 is installed in the mobile object V such that the camera 11 has an angle of view enabling capturing of a person inside the mobile object V and a person located on a street outside the mobile object V. The camera 11 captures an image including a person inside the mobile object V and a person outside the mobile object V. In this case, the camera 11 is capable of capturing an image outside the mobile object V along with movement of the mobile object V.

A plurality of cameras 11 may be provided at each of the fixed object F and the mobile object V such that a person located at each can be captured more preferably. The camera 11 may be a single-eye camera or a stereo camera. An image that the camera 11 captures may be in monochrome or in color. The camera 11 captures an image as above and collects image data indicating the image. The camera 11 communicably in connection with the controller 14, outputs the collected image data to the controller 14.

[0017] The positional-information measuring instrument 12 is a positioning instrument that measures the current position of the collection device 10. For the positional-information measuring instrument 12, for example, a global positioning system (GPS) receiver that receives a radio wave transmitted from a GPS satellite, can be used. The positional-information measuring instrument 12 receives a radio wave transmitted from a GPS satellite, acquires GPS information (latitude and longitude coordinates) as information indicating the current position of the collection device 10, and collects positional data indicating the position at which the image is captured by the camera 11. The positional-information measuring instrument 12 communicably in connection with the controller 14, outputs the collected positional data to the

controller 14.

[0018] The communication unit 13 performs communication of various types of data between a device different from the collection device 10 and the collection device 10. The
5 communication unit 13 of the present embodiment is capable of transmitting (outputting) the data for analysis to the analysis device 20 that is a device different from the collection device 10. The communication unit 13 transmits and receives data between the collection device 10 and a
10 device different from the collection device 10, by communication through a network regardless of wired or wireless.

[0019] The controller 14 controls each unit in the collection device 10 in a centralized manner. The
15 controller 14 performs various pieces of arithmetic processing of collecting the data for analysis. The controller 14 includes an electronic circuit mainly including a well-known microcomputer including a central arithmetic processing unit, such as a central processing
20 unit (CPU) or a graphics processing unit (GPU), a read only memory (ROM), a random access memory (RAM), and an interface. The controller 14 communicably in connection with each unit, such as the camera 11, the positional-information measuring instrument 12, and the communication
25 unit 13, is capable of transmitting and receiving various types of signals or data mutually with each unit.

[0020] More specifically, the controller 14 includes a storage unit 14A and a processing unit 14B. The storage unit 14A and the processing unit 14B are capable of
30 transmitting and receiving various types of signals or data mutually with each unit. The storage unit 14A stores, for example, conditions and information necessary for various types of processing in the processing unit 14B, various

types of programs and applications to be executed by the controller 14, and control data. The storage unit 14A is capable of storing the data for analysis together with, for example, the time at which the data for analysis is collected. In other words, the data for analysis includes time data indicating the time at which the data is collected and other data. For example, the storage unit 14A is capable of temporarily storing various types of data generated in a flow of processing of the processing unit 14B. As necessary, such data is read from the storage unit 14A by, for example, the processing unit 14B and the communication unit 13. The storage unit 14A may be a comparatively large-capacity storage medium, such as a hard disk, a solid state drive (SSD), or an optical disc, or may be a data-rewritable semiconductor memory, such as a RAM, a flash memory, or a non volatile static random access memory (NVS RAM). The processing unit 14B executes the various types of programs stored in the storage unit 14A, on the basis of, for example, various types of input signals. Due to an operation of each program, the processing unit 14B outputs an output signal to each unit, to perform various pieces of processing of achieving various types of functions. The processing unit 14B performs processing of controlling the operations of the camera 11 and the positional-information measuring instrument 12 to collect the data for analysis including the image data and the positional data. The processing unit 14B performs processing related to transmission and reception of data through the communication unit 13. For example, the processing unit 14B performs processing of transmitting the data for analysis to the analysis device 20 through the communication unit 13.

[0021] The analysis device 20 analyzes the data for

analysis collected by the collection device 10, and provides the content service device 30 with analysis result data indicating an analysis result. The analysis device 20 and the content service device 30 are included in a so-called cloud-service device (cloud server) implemented on a network. On the basis of the data for analysis collected by the collection device 10, the analysis device 20 analyzes the attribute of a person included in the image indicated by the image data included in the data for analysis and the people flow of the person of which the attribute is specified. The analysis device 20 generates person attribute data indicating the attribute of the person and attribute-classified people-flow data indicating the people flow of the person of which the attribute is specified. Furthermore, on the basis of the attribute-classified people-flow data indicating the people flow of the person of which the attribute is specified, the analysis device 20 predicts the behavior of the person of which the attribute is specified, and generates behavior prediction data indicating the predicted behavior of the person. Then, the analysis device 20 provides the content service device 30 with the analysis result data including the person attribute data, the attribute-classified people-flow data, and the behavior prediction data.

[0022] The analysis device 20 performs various pieces of arithmetic process of analyzing the attribute of the person and the people flow of the person, on the basis of the data for analysis. The analysis device 20 performs various pieces of arithmetic processing of predicting the behavior of the person of which the attribute is specified, on the basis of the attribute-classified people-flow data. The analysis device 20 includes an electronic circuit mainly including a well-known microcomputer including a central

arithmetic processing unit, such as a CPU or a GPU, a ROM, a RAM, and an interface. The analysis device 20 can be also achieved by installation of an application of achieving various pieces of processing to be described
5 below, onto a computer system, such as an already known PC or workstation. Note that the analysis device 20 is not necessarily included in the cloud-service device and thus may include a plurality of PCs combined mutually communicably.

10 [0023] Specifically, the analysis device 20 includes a communication unit (analysis-device communication unit) 21, a storage unit 22, and a processing unit 23. The communication unit 21, the storage unit 22, and the processing unit 23 are capable of transmitting and
15 receiving various types of signals or data mutually with each unit.

[0024] The communication unit 21 performs communication of various types of data between a device different from the analysis device 20 and the analysis device 20. The
20 communication unit 21 of the present embodiment is capable of receiving (inputting) the data for analysis from the collection device 10 that is a device different from the analysis device 20. Furthermore, the communication unit 21 of the present embodiment is capable of transmitting
25 (outputting) the analysis result data to the content service device 30 that is a device different from the analysis device 20. Similarly to the communication unit 13, the communication unit 21 transmits and receives data between the analysis device 20 and a device different from
30 the analysis device 20, by communication through a network regardless of wired or wireless.

[0025] The storage unit 22 stores, for example, conditions and information necessary for various types of

processing in the processing unit 23, various types of programs and applications to be executed by the processing unit 23, and control data. The storage unit 22 is capable of storing the data for analysis received by the communication unit 21. For example, the storage unit 22 is capable of temporarily storing various types of data generated in a flow of processing of the processing unit 23. As necessary, such data is read from the storage unit 22 by, for example, the communication unit 21 and the processing unit 23. The storage unit 22 may be a comparatively large-capacity storage medium, such as a hard disk, a SSD, or an optical disc, or may be a data-rewritable semiconductor memory, such as a RAM, a flash memory, or a NVSRAM.

[0026] More specifically, the storage unit 22 functionally conceptually includes an analysis target database (hereinafter, referred to as an "analysis target DB") 22A, an analysis reference database (hereinafter, referred to as an "analysis reference DB") 22B, and an analysis result database (hereinafter, referred to as an "analysis result DB") 22C.

[0027] The analysis target DB 22A accumulates, databases, and stores the data for analysis that is analysis target data to the processing unit 23 (e.g., image data, positional data, and time data). The data for analysis input from the collection device 10 to the communication unit 21, is stored in the analysis target DB 22A.

[0028] The analysis reference DB 22B accumulates, databases, and stores analysis reference data for reference at the time of analysis of the data for analysis by the processing unit 23. The analysis reference data includes, for example, map reference data and attribute prediction reference data. The map reference data indicates a map for reference at the time of specification of the position of

the collection device 10, namely, the position at which the image including a person is captured, based on, for example, the positional data. The attribute prediction reference data is referenced, for example, for estimation of the attribute of a person included in the image indicated by the image data. The attribute prediction reference data will be described in detail below. The analysis reference data is referenced at the time of analysis of the data for analysis by the processing unit 23.

10 [0029] The analysis result DB 22C accumulates, databases, and stores the analysis result data indicating an analysis result of the data for analysis by the processing unit 23. The analysis result data includes, for example, the person attribute data indicating the attribute of a person
15 included in the image indicated by the image data, the attribute-classified people-flow data indicating the people flow of the person of which the attribute is specified, and the behavior prediction data indicating the behavior of the person predicted for the person of which the attribute is
20 specified. The analysis result data is transmitted and provided from the communication unit 21 to the content service device 30.

[0030] Note that the various types of data stored in the analysis target DB 22A, the analysis reference DB 22B, and
25 the analysis result DB 22C can be practically used as so-called big data.

[0031] The processing unit 23 executes the various types of programs stored in the storage unit 22, on the basis of, for example, various types of input signals. Due to an
30 operation of each program, the processing unit 23 performs various pieces of processing of analyzing the data for analysis. The processing unit 23 performs various pieces of processing of predicting the behavior of the person of

which the attribute is specified, on the basis of the attribute-classified people-flow data. The processing unit 23 performs processing related to transmission and reception of data through the communication unit 21. For example, the processing unit 23 performs processing of transmitting the analysis result data to the content service device 30 through the communication unit 21.

[0032] More specifically, the processing unit 23 function-conceptually includes a data preprocessing unit 23A, a data analysis processing unit 23B as a data analysis unit, and a behavior prediction processing unit 23C as a behavior prediction unit.

[0033] The data preprocessing unit 23A performs various pieces of preprocessing to the data for analysis that is the analysis target data. The data preprocessing unit 23A performs, as preprocessing, for example, processing of reading the data for analysis that is the analysis target data from the analysis target DB 22A and clipping a still image from a moving image indicated by the image data included in the data for analysis. The data preprocessing unit 23A performs, as preprocessing, for example, processing of linking the clipped still image with the position indicated by the positional data included in the data for analysis that is the analysis target data.

[0034] On the basis of the data for analysis subjected to the preprocessing by the data preprocessing unit 23A, the data analysis processing unit 23B analyzes the attribute of a person included in the image indicated by the image data and the people flow of the person of which the attribute is specified. Herein, the data analysis processing unit 23B is capable of performing processing of analyzing the attribute of a person included in the image indicated by the image data and the people flow of the

person of which the attribute is specified, with an artificial intelligence technology or a deep learning technology in various publicly known technologies.

[0035] The data analysis processing unit 23B of the present embodiment performs processing of detecting and extracting a person from the still image clipped by the data preprocessing unit 23A, with various publicly known image processing technologies. Herein, the data analysis processing unit 23B performs processing of extracting an image including the feature points of the person from the image indicated by the image data. Here, the feature points of the person are parts enabling specification of the attribute of the person in the person included in the image. The feature points of the person include, for example, the face on which the person shows expression, the hands and legs with which an action or gesture is shown, and the part at a position at which an accessory is likely to be worn. The data analysis processing unit 23B extracts an image including the feature points of the person available to specification of the attribute of the person, from a large number of images captured at different angles.

[0036] Then, the data analysis processing unit 23B performs processing of analyzing, on the basis of the image including the feature points of the person extracted from the image data, the attribute of the person included in the image. For example, on the basis of the attribute prediction reference data (analysis reference data) stored in the analysis reference DB 22B and the feature points of the person including the image extracted from the image data by the data preprocessing unit 23A, the data analysis processing unit 23B analyzes the attribute of the person. Here, the attribute prediction reference data is information to be reflected with a result of learning of

the attribute of a person that can be estimated in accordance with, for example, the feature points of the person included in the image, by various techniques including the artificial intelligence technology and the deep learning technology. In other words, for estimation of the attribute of a person based on, for example, the feature points of the person included in the image, the attribute prediction reference data is databased with various techniques including the artificial intelligence technology and the deep learning technology. The attribute prediction reference data is updatable successively. For the attribute prediction reference data, for example, the analysis result data indicating an analysis result by the data analysis processing unit 23B (person attribute data) itself can be made data for learning.

[0037] The attribute of the person to be analyzed by the data analysis processing unit 23B includes, typically, items analyzable from the feature points of the appearance of the person, such as the gender, age, build, social status, taste, and behavioral trend of the person. Here, the gender is an attribute indicating the distinction between male and female. The age is an attribute indicating the length in time from birth until now. The build is an attribute indicating, for example, height, weight, or various types of measurements. The social status is an attribute indicating, for example, occupation (self-employed person, businessperson, police officer, student, unemployed person, or part-time worker), annual income, rank, or companion. The taste is an attribute indicating, for example, the tendency of clothing, belongings, or fashion (casual trend, elegant trend, brand trend, luxury trend or fast fashion trend) or hobby (e.g., sport, subculture, outdoor activity, or beauty). The

behavioral trend is an attribute indicating, for example, mood or interest (what the person wants to do or where the person wants to go) at that time. That is, herein, the data analysis processing unit 23B estimates, as the attribute of the person, for example, the gender, age, build, social status, taste, or behavioral trend.

[0038] With reference to the attribute prediction reference data, the data analysis processing unit 23B extracts an attribute (gender, age, build, social status, taste, or behavioral trend) corresponding to the feature points of the person included in the image, and then estimates the extracted attribute as the attribute of the person on the image. In accordance with, for example, the expression of the face, the action or gesture of the hands and legs, or the accessories or clothes being worn included in the feature points of the person included in the image, the data analysis processing unit 23B matches the attribute meeting the feature points with reference to the attribute prediction reference data, and estimates the attribute of the person, such as the gender, age, build, social status, taste, or behavioral trend of the person.

[0039] Then, furthermore, the data analysis processing unit 23B performs processing of analyzing the people flow of the person of which the attribute is specified as above, on the basis of the positional data linked with the image data from which the attribute of the person is specified. For example, the data analysis processing unit 23B reads the positional data linked with the image data from which the attribute of the person is specified, from the analysis target DB 22A. Then, on the map reference data (analysis reference data) stored in the analysis reference DB 22B and the read positional data, the data analysis processing unit 23B analyzes the people flow of the person of which the

attribute is specified. For example, with reference to the map reference data, the data analysis processing unit 23B specifies the position at which the image is captured, on the basis of the positional data. Then, on the basis of
5 the position indicated by the positional data, the data analysis processing unit 23B specifies the position of the person of which the attribute is specified and arranges the position on a time-series basis, to specify a people flow. The people flow of the person that the data analysis
10 processing unit 23B analyzes is typically indicated by, for example, the distribution in each time zone, direction of movement, speed of movement, or start point and end point of behavior of the person. That is, herein, the data analysis processing unit 23B estimates, as the people flow
15 of the person of which the attribute is specified, for example, the distribution in each time zone, direction of movement, speed of movement, or start point and end point of behavior of the person.

[0040] The data analysis processing unit 23B generates,
20 as the analysis result data in which the data for analysis is analyzed, the person attribute data indicating the attribute of the person analyzed as above and the attribute-classified people-flow data indicating the people flow of the person of which the attribute is specified,
25 analyzed as above. Then, the data analysis processing unit 23B accumulates, databases, and stores the analysis result data including the generated person attribute data and attribute-classified people-flow data, into the analysis result DB 22C.

30 [0041] On the basis of the attribute-classified people-flow data analyzed by the data analysis processing unit 23B, the behavior prediction processing unit 23C predicts the behavior of the person of which the attribute is specified.

The behavior prediction processing unit 23C performs processing of predicting the behavior of the person of which the attribute is specified, on the basis of the attribute-classified people-flow data indicating the people flow of the person of which the attribute is specified. In accordance with the people flow of the person, such as the distribution in each time zone, direction of movement, speed of movement, or start point and end point of behavior of the person, indicated by the attribute-classified people-flow data, the behavior prediction processing unit 23C predicts the behavior of the person of which the attribute is specified, with various publicly known technologies. For example, the behavior prediction processing unit 23C generates, as the behavior of the person, a predicted locus of the person with elapse. For example, the behavior prediction processing unit 23C may predict the behavior of the person of which the attribute is specified, with a combination of a plurality of pieces of attribute-classified people-flow data.

[0042] The behavior prediction processing unit 23C generates, as the analysis result data in which the data for analysis is analyzed, the behavior prediction data indicating the behavior of the person predicted as above. Then, the behavior prediction processing unit 23C accumulates, databases, and stores, as the analysis result data, the generated behavior prediction data together with the person attribute data and the attribute-classified people-flow data described above, into the analysis result DB 22C.

[0043] Then, the processing unit 23 performs processing of transmitting the analysis result data including the person attribute data and the attribute-classified people-flow data analyzed by the data analysis processing unit 23B

and the behavior prediction data predicted by the behavior prediction processing unit 23C as above, to the content service device 30 through the communication unit 21.

[0044] On the basis of the analysis result data analyzed and predicted by the analysis device 20, the content service device 30 selects content corresponding to the person to be provided with content, and causes the selected content to be output by a predetermined content output device 40. The content service device 30 is included in the so-called cloud-service device implemented on a network, as described above. The content service device 30 selects content to be provided to the person of which the attribute is specified, on the basis of the analysis result data transmitted and provided from the analysis device 20. The content service device 30 determines a content output device 40 that outputs the selected content, on the basis of the analysis result data transmitted and provided from the analysis device 20. The content service device 30 generates various pieces of data related to the selected content, and transmits the data to the content output device 40 that displays the content.

[0045] The content service device 30 performs various pieces of arithmetic processing of selecting content corresponding to the specified attribute of the person, on the basis of the analysis result data. The content service device 30 performs various pieces of arithmetic processing of determining a content output device 40 that outputs the selected content, on the basis of the analysis result data. The content service device 30 includes an electronic circuit mainly including a well-known microcomputer including a central arithmetic processing unit, such as a CPU or a GPU, a ROM, a RAM, and an interface. The content service device 30 can be also achieved by installation of

an application of achieving various pieces of processing to be described below, onto a computer system, such as an already known PC or workstation. Note that the content service device 30 is not necessarily included in the cloud-service device and thus may include a plurality of PCs combined mutually communicably.

[0046] Specifically, the content service device 30 includes a communication unit (content-service-device communication unit) 31, a storage unit 32, and a processing unit 33. The communication unit 31, the storage unit 32, and the processing unit 33 are capable of transmitting and receiving various types of signals or data mutually with each unit.

[0047] The communication unit 31 performs communication of various types of data between a device different from the content service device 30 and the content service device 30. The communication unit 31 of the present embodiment is capable of receiving (inputting) the analysis result data from the analysis device 20 that is a device different from the content service device 30. Furthermore, the communication unit 31 of the present embodiment is capable of transmitting (outputting) the various pieces of data related to the collected content, to the content output device 40 that is a device different from the content service device 30. Similarly to the communication units 13 and 21, the communication unit 31 transmits and receives data between the content service device 30 and a device different from the content service device 30, by communication through a network regardless of wired or wireless.

[0048] The storage unit 32 stores, for example, conditions and information necessary for various types of processing in the processing unit 33, various types of

programs and applications to be executed by the processing unit 33, and control data. The storage unit 32 is capable of storing the analysis result data received by the communication unit 31. For example, the storage unit 32 is
5 capable of temporarily storing various types of data generated in a flow of processing of the processing unit 33. As necessary, such data is read from the storage unit 32 by, for example, the communication unit 31 and the processing unit 33. The storage unit 32 may be a comparatively large-
10 capacity storage medium, such as a hard disk, a SSD, or an optical disc, or may be a data-rewritable semiconductor memory, such as a RAM, a flash memory, or a NVSRAM.

[0049] More specifically, the storage unit 32 function-
conceptually includes a content database (hereinafter,
15 referred to as a "content DB") 32A.

[0050] The content DB 32A accumulates, databases, and stores content data indicating the content to be output by the content output device 40. Here, examples of the content to be output by the content output device 40 may
20 include various pieces of guide information, such as regional information, route information regarding predetermined facilities, and evacuation route/safety support information at the time of disaster, in addition to advertisements and coupons. For the content data
25 indicating content as candidates likely to be output by the content output device 40, a plurality of different types of content depending on, for example, the attribute of the person, is stored in the content DB 32A. The content data stored in the content DB 32A is updatable successively.
30 For the content data stored in the content DB 32A, every time a particular content output device 40 outputs content selected from the plurality of pieces of content, the content data corresponding to the content to be output may

be transmitted and downloaded from the communication unit 31 to the particular content output device 40. For the content data stored in the content DB 32A, the content data corresponding to all content as candidates likely to be
5 output by the content output device 40, may be collectively transmitted and downloaded from the communication unit 31 to each content output device 40 in a time zone in which the traffic of a network is relatively small, such as night time.

10 [0051] The processing unit 33 executes the various types of programs stored in the storage unit 32, on the basis of, for example, various types of input signals. Due to an operation of each program, the processing unit 33 performs various pieces of processing of selecting content. The
15 processing unit 33 performs various pieces of processing of determining a content output device 40 that outputs content. The processing unit 33 performs processing related to transmission and reception of data through the communication unit 31. For example, the processing unit 33
20 performs processing of transmitting the various pieces of data related to the selected content, to the content output device 40 that outputs the content, through the communication unit 31.

[0052] More specifically, the processing unit 33
25 function-conceptually includes a content selection processing unit 33A as a content selection unit and an output-destination determination processing unit 33B as an output-destination determination unit.

[0053] On the basis of the attribute of the person
30 analyzed by the data analysis processing unit 23B, the content selection processing unit 33A selects content to be output by the content output device 40, from the plurality of pieces of content stored in the content DB 32A. The

content selection processing unit 33A performs processing of selecting, on the basis of the person attribute data included in the analysis result data received by the communication unit 31 after transmission from the analysis device 20, content corresponding to the attribute of the person indicated by the person attribute data, from the plurality of pieces of content stored in the content DB 32A. In a case where the attribute of the person indicated by the person attribute data includes, for example, female, young person, and casual trend, the content selection processing unit 33A may select the content indicating advertisements and coupons for casual clothing and accessories for females and young people. In a case where the attribute of the person indicated by the person attribute data includes, for example, male, middle age, and luxury trend, the content selection processing unit 33A may select the content indicating advertisements for luxury watches. In a case where the attribute of the person indicated by the person attribute data includes, for example, hobby of sport, the content selection processing unit 33A may select the content indicating information regarding sport events and tickets at the nearest stadium. In a case where the attribute of the person indicated by the person attribute data includes, for example, hobby of art and interest on fine art, the content selection processing unit 33A may select the content indicating routes to the nearest art museum. In a case where the attribute of the person indicated by the person attribute data includes, for example, requirements of evacuation and rescue from disaster, the content selection processing unit 33A may select the content indicating evacuation routes to shelters and safety support. At the time of selection of content, the content selection processing unit 33A may

further take account of the current time, calendar, or season, to select content corresponding to the attribute of the person indicated by the person attribute data.

[0054] On the basis of the behavior of the person
5 predicted by the behavior prediction processing unit 23C, the output-destination determination processing unit 33B determines a content output device 40 that outputs the content selected by the output-destination determination processing unit 33B, from the plurality of content output
10 devices 40. The output-destination determination processing unit 33B performs processing of determining a content output device 40 that outputs the selected content to the person of which the attribute is specified, from the plurality of content output devices 40, on the basis of the
15 attribute-classified people-flow data and the behavior prediction data included in the analysis result data received by the communication unit 31 after transmission from the analysis device 20. For example, on the basis of the distribution in each time zone, direction of movement,
20 speed of movement, or start point and end point of behavior of the person indicated by the attribute-classified people-flow data, and the predicted behavior of the person or the predicted locus of the person with elapse indicated by the behavior prediction data, the content selection processing
25 unit 33A determines a content output device 40 that can proactively output the above selected content and enables the person to recognize the selected content, from the plurality of content output devices 40.

[0055] Then, the processing unit 33 performs processing
30 of transmitting the various pieces of data related to the content selected by the content selection processing unit 33A, to the content output device 40 determined by the output-destination determination processing unit 33B as

above, through the communication unit 31. For example, in a case where the content data stored in the content DB 32A is as necessary transmitted to the content output device 40, the processing unit 33 transmits, as data related to

5 content, the content data indicating the content selected by the content selection processing unit 33A, itself to the content output device 40. Meanwhile, for example, in a case where a plurality of pieces of content data stored in the content DB 32A is previously collectively transmitted
10 to the content output device 40 in a predetermined time zone, the processing unit 33 transmits, as data related to content, identification data enabling specification of the selected content from the plurality of pieces of content, to the content output device 40.

15 [0056] Note that, for the content service device 30 described above, the guide system 1 may include a plurality of content service devices 30.

[0057] The plurality of content output devices 40 each is capable of outputting the plurality of pieces of content,
20 as described above. The plurality of content output devices 40 each may be provided at a fixed object F or a mobile object V, similarly to the collection device 10. At least part of the plurality of content output devices 40 may be integrally formed with the collection device 10
25 described above.

[0058] Specifically, the content output device 40 includes an output device 41, a communication unit (content-output-device communication unit) 42, and a controller 43.

30 [0059] The output device 41 outputs content. The output device 41 includes, for example, a display 41A capable of displaying an image corresponding to the content, and a speaker 41B capable of outputting sound or voice

corresponding to the content.

[0060] The communication unit 42 performs communication of various types of data between a device different from the content output device 40 and the content output device 5 40. The communication unit 42 of the present embodiment is capable of receiving (inputting) the various pieces of data related to the content to be output by the output device 41, from the content output device 40 that is a device different from the content output device 40. Furthermore, 10 the communication unit 42 of the present embodiment is capable of transmitting (outputting) feedback data corresponding to an output result of the content, to the content service device 30 that is a device different from the content output device 40. Similarly to the 15 communication units 13, 21, and 31, the communication unit 42 transmits and receives data between the content service device 30 and a device different from the content service device 30, by communication through a network regardless of wired or wireless.

20 [0061] The controller 43 controls each unit in the content output device 40 in a centralized manner. The controller 43 performs various pieces of arithmetic processing of outputting the content. The controller 43 includes an electronic circuit mainly including a well- 25 known microcomputer including a central arithmetic processing unit, such as a CPU or a GPU, a ROM, a RAM, and an interface. The controller 43 communicably in connection with each unit, such as the output device 41 and the communication unit 42, is capable of transmitting and 30 receiving various types of signals or data mutually with each unit.

[0062] The controller 43 includes a storage unit 43A and a processing unit 43B. The storage unit 43A and the

processing unit 43B are capable of transmitting and receiving various types of signals or data mutually with each unit. The storage unit 43A stores, for example, conditions and information necessary for various types of processing in the processing unit 43B, various types of programs and applications to be executed by the processing unit 43B, and control data. The storage unit 43A is capable of storing the various pieces of data related to the content received by the communication unit 42. For example, the storage unit 43A is capable of temporarily storing various types of data generated in a flow of processing of the processing unit 43B. As necessary, such data is read from the storage unit 43A by, for example, the communication unit 42 and the processing unit 43B. The storage unit 43A may be a comparatively large-capacity storage medium, such as a hard disk, a SSD, or an optical disc, or may be a data-rewritable semiconductor memory, such as a RAM, a flash memory, or a NVSRAM. The processing unit 43B executes the various types of programs stored in the storage unit 43A, on the basis of, for example, various types of input signals. Due to an operation of each program, the processing unit 43B outputs an output signal to each unit, to perform various pieces of processing of achieving various types of functions. The processing unit 43B performs processing of controlling the operation of the output device 41 to output the content. The processing unit 43B performs processing related to transmission and reception of data through the communication unit 42. For example, the processing unit 43B performs processing of receiving the various pieces of data related to the content to be output by the output device 41, from the content service device 30 through the communication unit 42. For example, the processing unit 43B performs processing of

transmitting feedback data corresponding to an output result of the content, to the content service device 30 through the communication unit 42.

[0063] More specifically, the storage unit 43A function-
5 conceptually includes a content database (hereinafter, referred to as a "content DB") 43Aa. The processing unit 43B function-conceptually includes an output processing unit 43Ba and a feedback unit 43Bb.

[0064] The content DB 43Aa accumulates, databases, and
10 stores the content data indicating the content to be output by the content output device 40. The content data input from the content service device 30 to the communication unit 42 is stored in the content DB 43Aa. For the content data to be stored in the content DB 43Aa, as described
15 above, every time the output device 41 outputs the content, the content data may be received from the content service device 30, or a plurality of pieces of content data may be previously collectively received in a predetermined time zone.

[0065] The output processing unit 43Ba controls the
20 operation of the output device 41, to output the content. The output processing unit 43Ba performs processing of causing the output device 41 to output the content corresponding to the attribute of the person of which the
25 attribute is specified, on the basis of the various pieces of data related to the content received by the communication unit 42 after transmission from the content service device 30. The output processing unit 43Ba controls the display 41A in the output device 41, to
30 display the image corresponding to the content. The output processing unit 43Ba controls the speaker 41B in the output device 41, to output the sound or voice corresponding to the content. In a case where the content data stored in

the content DB 32A is as necessary transmitted to the content DB 43Aa of the content output device 40, on the basis of the content data itself transmitted from the content service device 30, the output processing unit 43Ba
5 causes the output device 41 to output the content. In a case where a plurality of pieces of content data stored in the content DB 32A is previously collectively transmitted to the content DB 43Aa of the content output device 40 in a predetermined time zone, the output processing unit 43Ba
10 reads the content data corresponding to the identification data transmitted from the content service device 30, from the content DB 43Aa. Then, the output processing unit 43Ba causes the output device 41 to output the content corresponding to the read content data. Then, the content
15 output device 40 determined by the output-destination determination processing unit 33B outputs the content selected by the content selection processing unit 33A, to the person of which the attribute is specified by the data analysis processing unit 23B, with timing corresponding to
20 the behavior of the person predicted by the behavior prediction processing unit 23C.

[0066] Note that the output processing unit 43Ba may detect, with, for example, a camera, the line of sight of the person to be provided with content, to adjust the
25 amount of information of the content to be displayed by the output device 41, on the basis of the detected line of sight. For example, in a case where the line of sight of the person to be provided with content is directed toward the output device 41, the output processing unit 43Ba
30 increases relatively the amount of information of the content to be output by the output device 41. Meanwhile, for example, in a case where the line of sight of the person to be provided with content is not directed toward

the output device 41, the output processing unit 43Ba decreases relatively the amount of information of the content to be output by the output device 41. For example, in a case where the line of sight of the person to be
5 provided with content is not directed toward the output device 41, the output processing unit 43Ba may cause the output device 41 to output an image, a voice, or the like for guiding the line of sight toward the output device 41. This arrangement enables the content output device 40 to
10 output the content more properly in accordance with the state of the line of sight of the person to be provided with content.

[0067] The feedback unit 43Bb feeds back an output result of the content of the output device 41, to the
15 content service device 30. The feedback unit 43Bb performs processing of transmitting the feedback data corresponding to the output result of the content of the output device 41, to the content service device 30 through the communication unit 42. Examples of the feedback data corresponding to
20 the output result of the content of the output device 41 may include information regarding the detail of the content selected in accordance with the attribute of the person to be provided with content and information regarding whether the content has already been output. Note that the
25 feedback unit 43Bb may further transmit the feedback data to, for example, a management device that divides the plurality of content output devices 40 into groups and manages the content output devices 40 in each group in a centralized manner, in addition to the content service
30 device 30.

[0068] Next, exemplary processing in the guide system 1 will be described with reference to a flowchart of FIG. 2.

[0069] First, the collection device 10 collects data for

analysis including image data and positional data (Step S1).

[0070] Next, the collection device 10 outputs the collected data for analysis through the communication unit 13, so that the collected data for analysis is input into the analysis device 20 through the communication unit 21 (Step S2). The data for analysis input to the analysis device 20 is stored in the analysis target DB 22A.

[0071] Next, the data preprocessing unit 23A of the analysis device 20 performs the various pieces of preprocessing described above to the data for analysis stored in the analysis target DB 22A (Step S3).

[0072] Next, on the basis of the data for analysis subjected to the preprocessing by the data preprocessing unit 23A, the data analysis processing unit 23B of the analysis device 20 analyzes the attribute of a person included in the image indicated by the image data and the people flow of the person of which the attribute is specified (Step S4).

[0073] Then, the data analysis processing unit 23B generates, as analysis result data, person attribute data and attribute-classified people-flow data, and then accumulates, databases, and stores the person attribute data and the attribute-classified people-flow data into the analysis result DB 22C (Step S5).

[0074] Next, the behavior prediction processing unit 23C of the analysis device 20 predicts the behavior of the person of which the attribute is specified, on the basis of the attribute-classified people-flow data indicating the people flow of the person of which the attribute is specified by the data analysis processing unit 23B. Then, the behavior prediction processing unit 23C generates, as the analysis result data, behavior prediction data, and accumulates, databases, and stores the behavior prediction

data together with the person attribute data and the attribute-classified people-flow data into the analysis result DB 22C (Step S6).

[0075] Next, the analysis device 20 outputs the analyzed analysis result data (person attribute data, attribute-classified people-flow data, and behavior prediction data) through the communication unit 21, so that the analyzed analysis result data is input into the content service device 30 through the communication unit 31 (Step S7).

10 [0076] Next, on the basis of the person attribute data included in the analysis result data, the content selection processing unit 33A of the content service device 30 selects content corresponding to the attribute of the person indicated by the person attribute data, from the plurality of pieces of content stored in the content DB 32A
15 (Step S8).

[0077] Next, the output-destination determination processing unit 33B of the content service device 30 determines a content output device 40 that outputs the selected content to the person of which the attribute is
20 specified, from the plurality of content output devices 40, on the basis of the attribute-classified people-flow data and the behavior prediction data included in the analysis result data (Step S9).

25 [0078] Next, the output processing unit 43Ba of the content output device 40 determined by the processing of Step S9 controls the output device 41 to output the content selected by the processing of Step S8 to the person of which the attribute is specified by the processing of Step
30 S4, with timing corresponding to the behavior of the person predicted by the processing of Step S6 (Step S10).

[0079] Next, the feedback unit 43Bb of the content output device 40 from which the content is output by the

processing of Step S10, feeds back feedback data corresponding to an output result of the content of the output device 41, to the content service device 30 (Step S11), and then a flow of processing finishes.

5 [0080] Next, exemplary operations of the guide system 1 will be described with reference to schematic views of FIGS. 3, 4, and 5.

[0081] For example, in the guide system 1 in the example illustrated in FIG. 3, the collection device 10 provided at
10 a fixed object F, such as a bus stop, collects data for analysis including image data and positional data. Then, in the guide system 1, the data for analysis collected by the collection device 10 is transmitted to the analysis device 20, and the analysis device 20 analyzes the data for
15 analysis. Then, in the guide system 1, analysis result data analyzed by the analysis device 20 is transmitted to the content service device 30, and the content service device 30 selects content corresponding to the attribute of the person and additionally determines an output
20 destination for the selected content. Then, in the guide system 1, the content output device 40 provided at a fixed object F, such as a bus stop, located apart from the fixed object F provided with the collection device 10 proactively outputs the selected content with timing corresponding to
25 the predicted behavior of the person. After that, in the guide system 1, feedback data corresponding to an output result of the content is transmitted from the content output device 40 to the content service device 30.

[0082] For example, in the guide system 1 in the example
30 illustrated in FIG. 4, the collection device 10 provided at a mobile object V, such as a bus, collects data for analysis including image data and positional data. Then, in the guide system 1, the data for analysis collected by

the collection device 10 is transmitted to the analysis device 20, and the analysis device 20 analyzes the data for analysis. Then, in the guide system 1, analysis result data analyzed by the analysis device 20 is transmitted to the content service device 30, and the content service device 30 selects content corresponding to the attribute of the person and additionally determines an output destination for the selected content. Then, in the guide system 1, the content output device 40 provided at the mobile object V provided with the collection device 10 proactively outputs the selected content with timing corresponding to the predicted behavior of the person. After that, in the guide system 1, feedback data corresponding to an output result of the content is transmitted from the content output device 40 to the content service device 30.

[0083] For example, in the guide system 1 in the example illustrated in FIG. 5, the collection device 10 provided at a mobile object V, such as a bus, collects data for analysis including image data and positional data. Then, in the guide system 1, the data for analysis collected by the collection device 10 is transmitted to the analysis device 20, and the analysis device 20 analyzes the data for analysis. Then, in the guide system 1, analysis result data analyzed by the analysis device 20 is transmitted to the content service device 30, and the content service device 30 selects content corresponding to the attribute of the person and additionally determines an output destination for the selected content. Then, in the guide system 1, the content output device 40 provided at a fixed object F, such as a rooftop of a building, proactively outputs the selected content with timing corresponding to the predicted behavior of the person. After that, in the

guide system 1, feedback data corresponding to an output result of the content is transmitted from the content output device 40 to the content service device 30.

[0084] In addition, the guide system 1 enables

5 consecutive content output corresponding to the behavior of the person of which the attribute is specified, with a combination of the examples illustrated in FIGS. 3, 4, and 5 by cooperation between the plurality of collection devices 10 and the plurality of content output devices 40.

10 Note that the content output device 40 may further communicate with a mobile terminal (smartphone) possessed by the person to be provided with content, as a device different from the content output device 40, through the communication unit 42, to transmit the various pieces of

15 data related to the content to be output by the output device 41. In this case, the processing unit 43B may perform processing of transmitting the various pieces of data related to the content to the mobile terminal possessed by the person to be provided with content by, for

20 example, near field communication limited in communication target, through the communication unit 42. In this case, in the guide system 1, for example, a coupon corresponding to the content output by the content output device 40 provided at a fixed object F, such as a bus stop, may be

25 transmitted to the mobile terminal or the display 41A may display, for example, QR code (registered trademark) corresponding to the coupon, for reading with the mobile terminal. For example, in a case where a student group including the person to be provided with content passes

30 near the content output device 40, in the guide system 1, the speaker 41B may output a voice, such as "Would you like taking a picture?", for guiding toward the content output device 40. A built-in camera in the content output device

40 may take a picture, and then the picture may be transferred to the mobile terminal of the person to be provided with content. In addition, an advertising strip appended to the picture at the time of the transfer, may be transmitted to the mobile terminal.

[0085] In the guide system 1 described above, on the basis of the data for analysis collected by the collection device 10, the data analysis processing unit 23B analyzes the attribute and people flow of a person included in the image indicated by the image data. Then, in the guide system 1, the content output device 40 determined by the output-destination determination processing unit 33B, outputs the content selected by the content selection processing unit 33A in accordance with the attribute of the person, with timing corresponding to the behavior of the person predicted by the behavior prediction processing unit 23C. As a result, for a particular person, the guide system 1 enables proactive output of the content corresponding to the attribute of the person, with timing corresponding to the behavior of the person, so that a guide meeting a particular individual can be provided. That is the guide system 1 enables prediction as to where the particular person of which the attribute is analyzed heads (inclusive of staying), real-time selection of the content corresponding to the attribute, and output meeting the behavior of the person.

[0086] Because of the plurality of collection devices 10 each provided at the fixed object F or the mobile object V, the guide system 1 described above enables dynamically consecutive guiding with the plurality of content output devices 40, based on the data for analysis collected by the plurality of collection devices 10.

[0087] Because of the plurality of content output

devices 40 each provided at the fixed object F or the mobile object V, the guide system 1 described above enables content output guiding with proper timing corresponding to the behavior of the person of which the attribute is specified.

[0088] As one example, in the guide system 1 described above, gender, age, build, social status, taste, behavioral trend, or the like is estimated as the attribute of a person included in the image indicated by the image data.

10 As a result, the guide system 1 enables guiding reflected with gender, age, build, social status, taste, behavioral trend, or the like, for a particular individual.

[0089] Second Embodiment

A guide system according to a second embodiment is different from that according to the first embodiment in terms of the configurations of a collection device and an analysis device. In the following, constituent elements similar to those of the embodiment described above are denoted with the same reference signs, and the duplicate descriptions of the same configurations, functions, and effects will be omitted as much as possible.

[0090] A guide system 201 according to the present embodiment illustrated in FIG. 6 is different from the guide system 1 described above in that a collection device 210 is provided instead of the collection device 10 and an analysis device 220 is provided instead of the analysis device 20. The other configurations in the guide system 201 are substantially similar to those in the guide system 1.

30 [0091] In the guide system 201 of the present embodiment, part of the function of the analysis device 20 described above is implemented on the side on which the collection device 210 is located, and the remaining function of the

analysis device 20 is included in the analysis device 220. More specifically, the guide system 201 has accepted a so-called edge computing system, in which the data preprocessing unit 23A and the data analysis processing unit 23B of the analysis device 20 described above are implemented on the side on which the collection device 210 is located.

[0092] The collection device 210 of the present embodiment is different from the collection device 10 described above in that a processing unit 214B is provided instead of the processing unit 14B. The other configurations in the collection device 210 are substantially similar to those in the collection device 10. The processing unit 214B function-conceptually includes a data collection processing unit 214Ba, a data preprocessing unit 214Bb, and a data analysis processing unit 214Bc as a data analysis unit.

[0093] The data collection processing unit 214Ba controls a camera 11 and a positional-information measuring instrument 12, to collect data for analysis including image data and positional data. The data collection processing unit 214Ba performs processing of controlling the operations of the camera 11 and the positional-information measuring instrument 12 to collect the data for analysis including the image data and the positional data.

[0094] The data preprocessing unit 214Bb performs various pieces of preprocessing to the data for analysis that is analysis target data, similarly to the data preprocessing unit 23A described above. The data preprocessing unit 214Bb performs, as preprocessing, for example, processing of clipping a still image from a moving image indicated by the image data included in the data for analysis collected by the data collection processing unit

214Ba. The data preprocessing unit 214Bb performs, as preprocessing, for example, processing of linking the clipped still image with the position indicated by the positional data included in the data for analysis collected
5 by the data collection processing unit 214Ba.

[0095] Similarly to the data analysis processing unit 23B described above, on the basis of the data for analysis subjected to the preprocessing by the data preprocessing unit 214Bb, the data analysis processing unit 214Bc
10 analyzes the attribute of a person included in the image indicated by the image data and the people flow of the person of which the attribute is specified. The data analysis processing unit 214Bc performs processing of detecting and extracting a person from the still image
15 clipped by the data preprocessing unit 214Bb. The data analysis processing unit 214Bc performs processing of extracting an image including the feature points of the person, from the image indicated by the image data. The data analysis processing unit 214Bc performs processing of
20 analyzing, on the basis of the image including the feature points of the person extracted from the image data, the attribute of the person included in the image. The data analysis processing unit 214Bc performs processing of analyzing the people flow of the person of which the
25 attribute is specified, on the basis of the positional data linked with the image data from which the attribute of the person is specified. The data analysis processing unit 214Bc of the present embodiment appropriately references analysis reference data (map reference data and attribute
30 prediction reference data) stored in an analysis reference DB 22B, through a communication unit 13, at the time of analysis of the attribute of the person and the people flow of the person.

[0096] The data analysis processing unit 214Bc generates, as analysis result data in which the data for analysis is analyzed, person attribute data indicating the attribute of the person analyzed as above and attribute-classified
5 people-flow data indicating the people flow of the person of which the attribute is specified, analyzed as above. Then, the processing unit 214B of the present embodiment performs processing of transmitting the analysis result data including the person attribute data and the attribute-
10 classified people-flow data, together with the data for analysis, to the analysis device 220 through the communication unit 13.

[0097] The analysis device 220 of the present embodiment is different from the analysis device 20 described above in
15 that a processing unit 223 is provided instead of the processing unit 23. The other configurations in the analysis device 220 are substantially similar to those in the analysis device 20. The processing unit 223 of the present embodiment function-conceptually includes a
20 behavior prediction processing unit 23C as a behavior prediction unit, similarly to the processing unit 23 described above, but does not include the data preprocessing unit 23A and the data analysis processing unit 23B described above, differently from the processing
25 unit 23 described above. In other words, the analysis device 220 of the present embodiment is a behavior prediction device mainly including the behavior prediction processing unit 23C.

[0098] A communication unit 21 of the present embodiment
30 is capable of receiving (inputting) the data for analysis and the analysis result data (person attribute data and attribute-classified people-flow data) from the collection device 210 that is a device different from the analysis

device 220. The data for analysis input from the collection device 210 to the communication unit 21 is stored in an analysis target DB 22A. Similarly, the analysis result data (person attribute data and attribute-classified people-flow data) input from the collection device 210 to the communication unit 21 is stored in an analysis result DB 22C.

[0099] Then, the behavior prediction processing unit 23C generates behavior prediction data indicating the predicted behavior of the person, and then accumulates, databases, and stores, as the analysis result data, the generated behavior prediction data together with the person attribute data and the attribute-classified people-flow data described above into the analysis result DB 22C. Then, the processing unit 223 performs processing of transmitting the analysis result data including the person attribute data, the attribute-classified people-flow data, and the behavior prediction data, stored in the analysis result DB 22C, to a content service device 30 through the communication unit 21.

[0100] The guide system 201 described above enables provision of a guide meeting a particular individual, similarly to the guide system 1. Moreover, the guide system 201 enables inhibition of arithmetic load in the analysis device 220 and dispersion of the arithmetic load onto the side on which the collection device 210 is located.

[0101] Note that a guide system according to an embodiment of the present invention described above is not limited to the embodiments described above and thus various alternations can be made without departing from the scope of the claims. The guide system according to the present embodiment may be achieved by any appropriate combination of the constituent elements of the embodiments and modifications described above.

[0102] The guide system 1 described above may include one device in which the analysis device 20 and the content service device 30 are integrally formed, and the guide system 201 described above may include one device in which the analysis device 220 and the content service device 30 are integrally formed. For example, the behavior prediction processing unit 23C may be provided on the side on which the content service device 30 is located.

[0103] Each of the guide systems 1 and 201 described above may have, for example, a plurality of content service devices 30 managed by different business entities in mutual cooperation, and may have, for example, the plurality of content service devices 30 and the plurality of content output devices 40 in a mutual network.

[0104] For each of the controllers 14 and 43, the analysis devices 20 and 220, and the content service device 30 described above, each unit may be separately provided such that each unit is connected so as to mutually transmit and receive various types of electric signals, and the function may be partially achieved by a different control device. The programs, applications, various pieces of data, or the like described above may be appropriately updated, or may be stored in a server connected to the guide system 1 or 201 through an arbitrary network. The programs, applications, various pieces of data, or the like described above can be, for example, entirely or partially downloaded as necessary. For example, the processing function of each of the controllers 14 and 43, the analysis devices 20 and 220, and the content service device 30 may be entirely or arbitrarily partially achieved by, for example, a CPU and a program to be interpretively executed by the CPU, or may be achieved as hardware, such as wired logic.

Reference Signs List

[0105] 1, 201 guide system
10, 210 collection device
20, 220 analysis device
23B, 214Bc data analysis processing unit (data analysis
5 unit)
23C behavior prediction processing unit (behavior
prediction unit)
30 content service device
33A content selection processing unit (content selection
10 unit)
33B output-destination determination processing unit
(output-destination determination unit)
40 content output device
F fixed object
15 V mobile object

CLAIMS

1. A guide system comprising:

a collection device configured to collect data for analysis including image data indicating an image including a person and positional data indicating a position at which the image is captured;

a plurality of content output devices each capable of outputting a plurality of pieces of content;

a data analysis unit configured to analyze an attribute of the person included in the image indicated by the image data and a people flow of the person of which the attribute is specified, based on the data for analysis collected by the collection device;

a behavior prediction unit configured to predict behavior of the person of which the attribute is specified, based on the people flow of the person analyzed by the data analysis unit;

a content selection unit configured to select content to be output by the content output devices, from the plurality of pieces of content, based on the attribute of the person analyzed by the data analysis unit; and

an output-destination determination unit configured to determine a content output device that outputs the content selected by the content selection unit, from the plurality of content output devices, based on the behavior of the person predicted by the behavior prediction unit, wherein

the content output device determined by the output-destination determination unit outputs the content selected by the content selection unit to the person of which the attribute is specified by the data analysis unit, with timing corresponding to the behavior of the person predicted by the behavior prediction unit.

2. The guide system according to claim 1, wherein
a plurality of the collection devices each is provided
at a fixed object fixed on a street or to a building or a
mobile object capable of moving.

5

3. The guide system according to claim 1 or 2, wherein
the plurality of content output devices each is
provided at a fixed object fixed on a street or to a
building or a mobile object capable of moving.

10

4. The guide system according to any one of claims 1 to 3,
wherein
the attribute of the person to be analyzed by the data
analysis unit includes gender, age, build, social status,
15 taste, or behavioral trend.