

DESCRIPTION

Title of the Invention: CONFERENCE SUPPORT DEVICE, CONFERENCE SUPPORT SYSTEM, AND CONFERENCE SUPPORT METHOD

Technical Field

[0001]

The present invention relates to a conference support device, a conference support system, and a conference support method.

Background Art

[0002]

There has been proposed a method of determining the situation of a conference based on how lively the conversation is at the conference, and adjusting the environment of the space where the conference is being held, such as a conference room or a conference space, according to the situation of the conference. Patent Literature 1 discloses a communication support system that changes the environment of the entire space of the conference room according to the situation of the conference, for example. In this communication support system, the state of the conference is set by using an index calculated by analysis of the speech data and image data of the participants, and the environment of the space of the conference room is changed according to the state.

[0003]

In the communication support system disclosed in Patent Literature 1, the state of the conference such as whether the conference is converging or diverging is set by using the index calculated by the analysis of the speech data and the like of the participants, for example. In the communication support system, the environment of the space of the conference room is changed such that the state of the conference is directed toward the purpose of the conference.

Citation List

Patent Literature

[0004]

PTL 1: Japanese Unexamined Patent Application Publication No. 2017-201479

Summary of the Invention

[0005]

However, in an actual conference, a state in which the conference is converging (calm) or a state in which the discussion is diverging may or may not be the appropriate state (the assumed state) in the conference situation, for example. Even at the same conference, there are various conference states, such as a state in which active discussions are made and a state in which calm discussions are made depending on time zones, for example. Therefore, if the environment of the conference room space is changed simply to meet the purpose of the conference, unnecessary control will be performed when the state of the conference is appropriate, or necessary control will not be performed when the state of the conference is not appropriate. In other words, if the environment of the conference room is controlled simply to meet the purpose of the conference, there may be cases in which the environment of the conference room is not controlled appropriately.

[0006]

The present invention has been devised in view of such problems of the prior art. An object of the present invention is to provide a conference support device capable of appropriately controlling the environment of the space in which a conference is held.

[0007]

To solve the above problems, a conference support device according to a first aspect of the present invention includes: a conference information acquisition unit that acquires conference information on a conference to be held; an activity estimation unit that generates estimation information in which an activity level of the conference to be

held is estimated based on the conference information; a storage unit that stores correspondence relationship information indicating a correspondence relationship between the conference information and equipment control information of environment control equipment that controls an environment of a space in which the conference is held; a control information acquisition unit that acquires the equipment control information corresponding to the conference information from the correspondence relationship information stored in the storage unit; an equipment control unit that controls the environmental control equipment and a sound collecting device disposed in the space in which the conference is held, based on the equipment control information; a conversation data acquisition unit that acquires conversation data of a participant of the conference from the sound collecting device; an activity generation unit that generates activity level information indicating the activity level of the conference based on the conversation data; a difference calculation unit that calculates information indicating a difference between the estimation information and the activity level information; and a difference adjustment unit that changes the equipment control information based on the difference information.

[0008]

A conference support system according to a second aspect of the present invention includes: environment control equipment that controls an environment of a space in which a conference is held; a sound collecting device disposed in the space in which the conference is held; and a conference support device that controls the environment control equipment and the sound collecting device. The conference support device in the conference support system includes: a conference information acquisition unit that acquires conference information on the conference to be held; an activity estimation unit that generates estimation information in which an activity level of the conference to be held is estimated based on the conference information; a storage unit that stores correspondence relationship information indicating a correspondence relationship between the conference information and equipment control information of the environmental control equipment; a control information

acquisition unit that acquires the equipment control information corresponding to the conference information from the correspondence relationship information stored in the storage unit; an equipment control unit that controls the environmental control equipment and the sound collecting device based on the equipment control information; a conversation data acquisition unit that acquires conversation data of a participant of the conference from the sound collecting device; an activity generation unit that generates activity level information indicating the activity level of the conference based on the conversation data; a difference calculation unit that calculates information indicating a difference between the estimation information and the activity level information; and a difference adjustment unit that changes the equipment control information based on the difference information.

[0009]

A conference support method according to a third aspect of the present invention is executed by a computer, and the conference support method includes: acquiring conference information on a conference to be held; generating estimation information in which an activity level of the conference to be held is estimated based on the conference information; acquiring the equipment control information corresponding to the conference information from a storage unit that stores correspondence relationship information indicating a correspondence relationship between the conference information and equipment control information of environment control equipment that controls an environment of a space in which the conference is held; controlling the environmental control equipment and a sound collecting device disposed in the space in which the conference is held, based on the equipment control information; acquiring conversation data of a participant of the conference from the sound collecting device; generating activity level information indicating the activity level of the conference based on the conversation data; calculating information indicating a difference between the estimation information and the activity level information; and changing the equipment control information based on the difference information.

[0010]

A conference support program according to a fourth aspect of the present invention causes a computer to execute processing of: acquiring conference information on a conference to be held; generating estimation information in which an activity level of the conference to be held is estimated based on the conference information; acquiring the equipment control information corresponding to the conference information from a storage unit that stores correspondence relationship information indicating a correspondence relationship between the conference information and equipment control information of environment control equipment that controls an environment of a space in which the conference is held; controlling the environmental control equipment and a sound collecting device disposed in the space in which the conference is held, based on the equipment control information; acquiring conversation data of a participant of the conference from the sound collecting device; generating activity level information indicating the activity level of the conference based on the conversation data; calculating information indicating a difference between the estimation information and the activity level information; and changing the equipment control information based on the difference information.

Brief Description of the Drawings

[0011]

[Fig. 1] Fig. 1 is a diagram for showing an example of a conference support system according to a first embodiment.

[Fig. 2] Fig. 2 is a functional block diagram for explaining the functions of a conference support device 100 according to a first embodiment.

[Fig. 3] Fig. 3 is a diagram for showing examples of screen displays for inputting conference information displayed on a user terminal according to a first embodiment.

[Fig. 4] Fig. 4 is a diagram for showing an example of conference information according to a first embodiment.

[Fig. 5] Fig. 5 is a diagram for showing an example of correspondence

relationship information according to a first embodiment.

[Fig. 6] Fig. 6 is a diagram for showing an example of equipment control information according to a first embodiment.

[Fig. 7] Fig. 7 is a diagram for explaining estimation information of an activity level according to a first embodiment.

[Fig. 8] Fig. 8 is a diagram for explaining an activity level estimation pattern according to a first embodiment.

[Fig. 9] Fig. 9 is a diagram for explaining the adjustment of a difference in the activity level according to a first embodiment.

[Fig. 10] Fig. 10 is a flow chart for explaining the processing of a conference support device according to a first embodiment.

[Fig. 11] Fig. 11 is a functional block diagram for explaining some of the functions of a conference support device 100 according to a second embodiment.

Description of Embodiments

[0012]

A conference support system according to the present embodiment will be described in detail below with reference to the drawings. Note that embodiments described below are intended to provide comprehensive or specific examples. The numerical values, shapes, materials, components, locations and connection states of components, steps, and the order of steps shown in the following embodiments are examples and are not intended to be limited to the present disclosure. In addition, among the components described in the embodiments below, components that are not recited in independent claims indicating the most significant concept are described as optional components. Furthermore, the dimensional proportions of the drawings are exaggerated for illustrative purposes and may differ from the actual proportions.

[0013]

(Overview of conference support system)

A conference support system 1 according to the present embodiment

appropriately controls environmental control equipment that controls the environment of a space in which a conference is held and supports the conference such that the conference is held appropriately. The conference support system 1 will be described below by using several specific embodiments.

[0014]

(First embodiment)

Fig. 1 is a schematic diagram of the conference support system 1. The conference support system 1 includes a server 10, a user terminal 30, a network 40, environment control equipment 200, and a sound collecting device 300.

[0015]

In the present embodiment, the server 10 includes a conference support device 100. As shown in Fig. 1, the conference support device 100 includes a control unit 110, a storage unit 120, an input/output interface 130, and a network interface 140. The server 10 exchanges data with the user terminal 30, the environment control equipment 200, and the sound collecting device 300 via the network 40. The configuration example of the conference support device 100 shown in Fig. 1 is merely an example, and the present embodiment is not limited to this. The server 10 can be replaced by one or more computers that can perform each function performed by means of the control unit 110, for example. Details of the control unit 110 and the storage unit 120 will be described later.

[0016]

The input/output interface 130 is a component (an interface) through which the user exchanges data with the server 10, for example, and includes an input unit and an output unit, for example.

[0017]

The input unit has a function as an interface for receiving input of various pieces of information from a user, and information is input from outside the server 10 to the input unit. Information is input to the input unit by the user by using a keyboard, mouse, touch panel, trackball, speech recognition device, and the like connected to the

server 10, for example. The input unit can also receive information as a data input terminal for receiving data from an external storage device (not shown) or the like.

[0018]

The output unit causes a display unit (not shown) connected to the server 10 to display various kinds of pieces of information. Examples of the display unit include a display device, a projector device, and the like. It is also possible to use the user terminal 30 as the display unit to display various kinds of pieces of information thereon. In the above case, the various kinds of pieces of information are transmitted to the user terminal 30 through the network interface 140.

[0019]

The network interface 140 is an interface through which communication is made between the user terminal 30, the environment control equipment 200, and the sound collecting device 300 and the server 10 via a wired and/or wireless network.

[0020]

The user terminal 30 is constituted by a personal computer, for example, and is usually operated by a conference room manager, conference participants, and the like. The user terminal 30 may be constituted by a mobile device such as a tablet or a smartphone. Further, the user terminal 30 can communicate with the server 10 via the network 40. In addition, since Fig. 1 is a schematic diagram of the conference support system 1, although the user terminal 30 is located at a different position from the conference room 20, the location of the user terminal 30 is not limited to above. The user terminal 30 may be placed at the hands of participants in the conference room 20 and operated by the participants, for example. Alternatively, the user terminal 30 may be a terminal in a participant's office or a terminal in a system management office or the like that manages conference rooms, for example. That is, the user terminal 30 can be located either inside or outside the conference room 20.

[0021]

The network 40 is a communication network via which the server 10, the user terminal 30, the environment control equipment 200, and the sound collecting device

300 can communicate with one another, and is constituted by a carrier network which is a mobile phone network, or the Internet.

[0022]

The environment control equipment 200 is provided in a room or a space in which a conference is held (hereinafter referred to as the conference room 20) and controls the environment in the space of the conference room 20, for example. The environment control equipment 200 may include at least one of, or a combination of, a lighting device, an air conditioner, an aroma generating device, an acoustic device, and a ventilator, for example. In the example shown in Fig. 1, the environment control equipment 200 is provided on the ceiling of the conference room 20, but the location of the environment control equipment 200 is not limited to the ceiling of the conference room 20. The environment control equipment 200 may be built into a wall or floor of the conference room 20, for example. The environment control equipment 200 can also be disposed inside the conference room 20 as a device. Each environment control equipment 200 also has a control unit and a network interface, and can be operated according to a control instruction transmitted from the conference support device 100. Further, information in which the user controls the environment control equipment 200 can be transmitted to the conference support device 100 through the network interface.

[0023]

The sound collecting device 300 includes a microphone, a control unit, and a network interface. Speech spoken by the conference participants is collected by using the microphone, and the collected speech is transmitted as conversation data to the conference support device 100 of the server 10 through the network interface. In addition, the sound collecting device 300 receives an instruction for instructing the sound collecting device 300 to start collecting sound from the conference support device 100 through the network interface. Thereafter, the sound collecting device 300 starts collecting speech spoken by the conference participants by using the microphone. In Fig. 1, the sound collecting device 300 is disposed on a table in the

conference room 20, but the configuration of the sound collecting device 300 is not limited to this example. A sound collection application may be operated on an operating terminal (for example, the user terminal 30) of each conference participant, for example. The collected conversation data may be transmitted to the conference support device 100 via the network 40 by means of a communication function of the user terminal 30.

[0024]

Fig. 2 is a functional block diagram for explaining the functions of the conference support device 100.

[0025]

As shown in Fig. 2, the control unit 110 includes, as functions, a conference information acquisition unit 111, a control information acquisition unit 112, an equipment control unit 113, an activity estimation unit 114, a conversation data acquisition unit 115, an activity generation unit 116, a difference calculation unit 117, and a difference adjustment unit 118. The control unit 110 operates the operation system and controls the entire server 10, for example. In addition, the control unit 110 operates based on a program (not shown) stored in the storage unit 120 and performs each function described above. The program is not necessarily always stored in the storage unit 120 and may be stored in a ROM (not shown) or the like in the conference support device 100. Details of the following will be described later: the conference information acquisition unit 111, control information acquisition unit 112, equipment control unit 113, activity estimation unit 114, conversation data acquisition unit 115, activity generation unit 116, difference calculation unit 117, and difference adjustment unit 118.

[0026]

As shown in Fig. 2, the storage unit 120 includes a conference information DB 121, a correspondence relationship information DB 122, an equipment control DB 123, an estimation information DB 124, and an activity level information DB 125. The conference information DB 121 stores conference information as data. Further, the

correspondence relationship information DB 122 stores correspondence relationship information as data. Furthermore, the equipment control DB 123 includes equipment control information of environmental control equipment 200 as data.

[0027]

The estimation information DB 124 stores, as data, estimation information about the activity level of a conference to be held. In the present embodiment, the activity level is an index indicating the excitement level of a conference and is calculated based on the volume of conversation data of conference participants. That is, if the volume of the conversation data of the conference participants is high, it is determined that the activity level of the conference is high. Alternatively, if the volume of the conversation data of the conference participants is low, it is determined that the activity level of the conference is low.

[0028]

The activity level information DB 125 stores, as data, activity level information indicating the activity level of the conference generated by means of the activity generation unit 116 based on the conversation data of the conference participants collected by means of the sound collecting device 300. Details of the following will be described later: the conference information, correspondence relationship information, equipment control information, estimation information, and activity level information. The number of storage units 120 for storing each of these pieces of data may be one or more. The above pieces of data may be stored in one storage unit 120 by dividing the area of the one storage unit 120 into a plurality of areas, for example. Alternatively, the pieces of data may be stored in a distributed manner in a plurality of storage devices that are located at physically separated positions.

[0029]

(Functional configuration of conference support device 100)

Next, the functions of the conference support device 100 will be described with reference to the functional block diagram shown in Fig. 2.

[0030]

The conference information acquisition unit 111 acquires conference information such as the type and the like of a conference to be held and stores the information in the conference information DB 121. The screens shown in Figs. 3(a) to 3(d) are displayed on the user terminal 30 before the conference is held. The conference organizer, conference participant, or the like (hereinafter referred to as a user) inputs information on the type and the like of the conference through the screen displayed on the user terminal 30. Examples of the information on the conference include the location, type, content, and time of the conference. The conference information acquisition unit 111 acquires conference information input by using the user terminal 30 via the network 40.

[0031]

The location of the conference is displayed on the screen as shown in Fig. 3(a). The user specifies the location of the conference by specifying the place displayed on the screen. Examples of the location of the conference include conference rooms organized as rooms and open spaces. In the example shown in Figure 3(a), conference room 1602 corresponds to a conference room and meeting corners A to C correspond to the open spaces, for example.

[0032]

In the present embodiment, the conference type can be selected from categories of “formal”, “standard”, and “casual” as shown in Fig. 3(b), for example. In the present embodiment, a “standard” conference means a general conference and includes an internal meeting and the like. A “formal” conference means a somewhat more formal conference than the “standard” conference, such as a meeting with a client of the company. A “casual” conference means an informal conference and includes an in-house social gathering, for example. However, the conference type is not limited to above. An icebreaker held before the actual conference for the purpose of softening the atmosphere of the place may be set as the conference type, and a conference type such as “break” may be added, for example.

[0033]

The content of the conference is the specific content of the conference as shown in Fig. 3(c). In the example shown in Fig. 3(c), a “regular conference” is a conference which is held regularly in the company and the number of participants of the conference is fixed to some extent, for example. A “business meeting” is a conference with a client of the company such as meeting with the client and business negotiations with the client, for example. In the “presentation”, a presenter presents information to an audience about an agenda item in order to gain their understanding, for example. “Brainstorming” refers to a conference in which several people come together to brainstorm ideas and generate new ideas on an agenda item. In addition, the category “other” shown in Fig. 3(c) is an item provided as an option for content which does not correspond to the above described conference content.

[0034]

The conference time is the rough time during which the conference is held as shown in Fig. 3(d), for example, and the time is entered in 15 minute increments. In the present embodiment, the start time of the conference is set by the user pressing the “Start” button shown in Fig. 3(d). The time obtained by adding the time during which the conference is held to the start time of the conference is set as the end time of the conference. However, the setting of the start time and the end time of the conference is not limited to the setting means described above. Items for entering the start time and the end time may be provided in Fig. 3(d), and the user may set the predetermined start time and end time.

[0035]

The conference information acquired by means of the conference information acquisition unit 111 is stored in the conference information DB 121 for each conference as shown in Fig. 4. The example shown in Fig. 4 shows that on October 10, 2020, in conference room 1602, a “standard” type conference of which the content is a “regular conference” will be held between 14:00 and 15:00. Similarly, Fig. 4 shows that on October 10, 2020, in meeting corner A, a “casual” type conference of which

the content is “other” will be held between 16:00 and 18:00.

[0036]

The correspondence relationship information DB 122 stores correspondence relationship information indicating the correspondence relationship between the conference information and the control information of the environment control equipment 200 for controlling the environment of the space in which the conference is held. Fig. 5 shows an example of the correspondence relationship information. Fig. 5 shows the location, type, and time zone of the conference as the conference information. Fig. 5 further shows control information of the environmental control equipment 200 corresponding to the conference information. The time zone indicates the rough time zone of the start time of the conference. The time zones of morning, afternoon 1, afternoon 2, and night respectively indicate the hours of 6:00 to 12:00, 12:00 to 15:00, 15:00 to 18:00, and 18:00 to 24:00.

[0037]

Among the control information, the lighting is controlled by means of the lighting device. In the present embodiment, the lighting is set based on color temperature. Color temperature is a measure for expressing the color of sunlight, natural light, and light emitted from a light source such as artificial lighting, and the unit thereof is expressed in Kelvin (K). The bulb color is expressed as 3000 K, and the color tone is a warm color (yellow or orange), for example. The light type of the bulb color includes sunrise, sunset, incandescent bulb, candle, and the like. Daylight white is expressed as 5000 K and corresponds to sunlight as the light type.

[0038]

The airflow is a flow of air generated by means of an air conditioner or the like. In the present embodiment, it is assumed that the type of airflow such as light flow, steady flow, or fluctuating flow is selectable, for example. The fragrance is an air fragrance generated by means of the air conditioner or the like as similar to the airflow, for example. In the present embodiment, it is assumed that types of fragrance such as mint or citrus are selectable. Among the pieces of environment control

equipment 200, a dedicated aroma generating device may be provided as the device that generates the fragrance. Alternatively, the device that generates the fragrance can be included in the air conditioner that generates the airflow as described above.

[0039]

Sound is produced by means of an acoustic device. In the present embodiment, when the conference type is “formal”, no sound is played. When the conference type is “standard”, “natural environmental sounds” are played as the sound. In the present specification, “natural environmental sounds” are sounds heard in a natural environment such as a forest, for example, and sounds such as the chirping of birds or the murmuring of a river are played to a degree that does not interfere with a conference. In addition, when the conference type is “casual”, it is expected that a more casual atmosphere will be created by playing light music such as jazz.

[0040]

Ventilation is performed by means of a ventilator, and in the present embodiment, the ventilation intensity is indicated by three levels: strong, medium, and weak. In the example shown in Fig. 5, the intensity of ventilation increases from morning toward night in conference room 1602. This is because the carbon dioxide concentration in conference room 20 is expected to increase due to the holding of a conference, and therefore the intensity of ventilation is increased over time. Further ventilation can also be performed during a certain time period in the middle of each conference. It is possible to ventilate a room during a predetermined time from when half of the conference time has elapsed, for example. In the present embodiment, ventilation is performed for 15 minutes from when half of the conference time has elapsed.

[0041]

In addition, the correspondence relationship information indicates the correspondence relationship between the location of the conference of the conference information and the control information of the environmental control equipment 200 that can perform the control. Fig. 5 shows that in conference room 1602, the

environment control equipment 200 can control all of lighting, airflow, fragrance, sound, and ventilation, but can control only lighting in meeting corner C, for example.

[0042]

Although in the correspondence relationship information shown in an example of Fig. 5 the conference information does not have an item regarding the content of the conference, the present embodiment is not limited thereto. In the correspondence relationship information, the conference information may include the content of the conference.

[0043]

Based on the conference information acquired by means of the conference information acquisition unit 111, the control information acquisition unit 112 acquires the control information of the environment control equipment 200 from the correspondence relationship information DB 122, and stores the control information in the equipment control DB 123 as equipment control information. Fig. 6 shows an example of the equipment control information. An example of the equipment control information shown in Fig. 6 is the equipment control information of each piece of environmental control equipment 200 for a conference held between 15:00 and 16:00 in conference room 1602. In the example shown in Fig. 6, the lighting is set at a color temperature of 4000 K. The airflow is a steady flow, and the fragrance is mint. Further, in the example shown in Fig. 6, the “natural environmental sounds” are played. Fig. 6 shows that the medium level of ventilation is performed during 15 minute from 15:30 to 15:45. The row for the sound collection time in Fig. 6 also shows that sound is collected between 15:00 and 16:00 when the conference is held.

[0044]

The equipment control unit 113 controls the environmental control equipment 200 and the sound collecting device 300 based on the equipment control information for controlling the environmental control equipment 200, which is stored in the equipment control DB 123. Specifically, the equipment control unit 113 transmits control instructions to the environmental control equipment 200 and the sound

collecting device 300 through the network interface 140 based on the equipment control information. Each piece of environment control equipment 200 is made to operate according to the control instruction transmitted from the equipment control unit 113. Similarly, the sound collecting device 300 is made to operate according to the control instruction transmitted from the equipment control unit 113.

[0045]

Further, the equipment control unit 113 receives, via the network 40, the equipment control information of the environmental control equipment 200 directly controlled by the user in conference room 20, and updates the equipment control information of the equipment control DB 123 with the received equipment control information. Suppose that in a conference indicated by the equipment control information in Fig. 6, the user changes the lighting to 5000 K, for example. In the above case, the equipment control unit 113 receives the changed equipment control information and changes the lighting value of the equipment control information shown in Fig. 6 to 5000 K.

[0046]

Based on the conference information, the activity estimation unit 114 generates estimation information in which the activity level of the conference to be held is estimated and stores the estimation information in the estimation information DB 124. In the present embodiment, the estimation information is estimated based on the correspondence relationship shown in Fig. 7. As shown in Fig. 7, corresponding activity level estimation information is assigned according to the content of each conference. The estimation activity levels shown in Fig. 7 indicate activity levels in the first half of the conference, the middle of the conference, and the second half of the conference, and three levels of “high”, “medium”, and “low” are assigned. In pattern A corresponding to a “regular conference”, it is estimated that the activity level will be a “medium” level in the middle of the conference, for example. Fig. 8(a) shows an example of plotting a graph of the degree of estimation of the “regular conference”. In the example shown in Fig. 8(a), after the start of the conference, the activity level

gradually increases in the first half of the conference (the level of excitement increases) and reaches a certain level of activity in the middle of the conference. In addition, it is estimated that, in the second half of the conference, the activity level gradually decreases toward the end of conference.

[0047]

Further, in the example shown in Fig. 7, when the content of the conference is “business meeting”, the activity level estimation information is pattern B and it is estimated that the activity level will be a medium level in the middle and second half of the conference. Fig. 8(b) shows an estimated graph of the conference activity level in the case of pattern B. As shown in Fig. 8(b), it is estimated that in the first half of the conference, the conference will be held having a “low” activity level, and at or after the middle of the conference, the conference will proceed having about a “medium” activity level.

[0048]

Further, in the example shown in Fig. 7, if the content of the conference is “presentation”, the activity level estimation information is pattern C, and it is estimated that the activity level will become a “medium” level in the second half of the conference. Fig. 8 (c) shows an estimated graph of a conference activity level in the case of pattern C. As shown in Fig. 8(c), a presenter performs a presentation in the first half and the middle of the conference, and in that case, it is estimated that the activity level of the conference will be a “low” level. In the second half of the conference, by assuming that there will be questions and answers, it is estimated that the activity level of the conference will be about a “medium” level.

[0049]

In the example shown in Fig. 7, when the content of the conference is “brainstorming”, the activity level estimation information is pattern D, and the corresponding estimation information is as shown in Fig. 8(d). In the case of “brainstorming”, it is assumed that there will be a lively discussion (speech) in the conference, and therefore it is estimated that the activity level of the conference will

be a “high” level. Further, if “other” is selected as the content of the conference on the screen shown in Fig. 3(c), in the present embodiment, pattern A of a “regular conference” which is the form of a general conference is assigned, for example.

[0050]

The estimation information of the activity level when the conference type is “presentation” is not limited to the example shown in Fig. 8(c), for example. In the case of the presentation without a time for questions and answers, there may be estimation information in which the activity level in the second half of the conference is also a “low” level, for example. Alternatively, in the case of a relatively casual presentation, it is assumed that the conference has a certain activity level throughout the conference, and therefore there may be estimation information in which about a “medium” activity level is estimated throughout the conference. That is, the examples shown in Figs. 7 and 8(a) to 8(d) are examples of estimation information, and there may be activity level estimation information (patterns) in which the activity levels for various assumed conference situations are estimated. In the present embodiment, the activity levels and graphs in the graphs of Fig. 8(a) to 8(d) are generated based on the volume of conversation data of each conference held in the past, for example. As the conversation data of the past conferences used to generate the graphs in Figs. 8(a) to 8(d), one piece of conversation data of conferences held as expected with respect to the content of each conference may be used as the default, or an average value of a plurality of conferences may be used.

[0051]

The conversation data acquisition unit 115 acquires, via the network 40, the conversation data of the conference participants collected by means of the sound collecting device 300. In the present embodiment, the conversation data is speech data collected by means of the microphone of the sound collecting device 300. The data format of the conversation data (the speech data) does not limit the present embodiment. The conversation data may be data compressed based on a predetermined standard, for example.

[0052]

The activity generation unit 116 generates activity level information based on the speech data acquired by means of the conversation data acquisition unit 115. Specifically, the activity generation unit 116 generates activity level information indicating the activity level of the conference at the generation timing based on the volume of the speech data. That is, the activity generation unit 116 generates activity level information at every predetermined timing. The predetermined timing does not limit the present embodiment, and it is possible to set the predetermined timing in units of seconds to minutes, for example. With respect to the relationship between the volume and the activity level, as described above, when the volume of conversation data of conference participants is high, the activity level of the conference is high. Alternatively, when the volume of conversation data of conference participants is low, the activity level of the conference is low.

[0053]

The difference calculation unit 117 compares the activity level information generated by means of the activity generation unit 116 with the estimation information estimated by means of the activity estimation unit 114 and calculates a difference therebetween. Specifically, the difference calculation unit 117 calculates the difference between the activity level of the activity level information at the acquisition time of the conversation data and the activity level of the estimation information and calculates the difference information.

[0054]

The difference adjustment unit 118 updates the equipment control information stored in the equipment control DB 123 according to the difference information calculated by means of the difference calculation unit 117. Specifically, the difference adjustment unit 118 adjusts the equipment control information such that the difference between the estimation information and activity level information calculated by means of the difference calculation unit 117 is reduced. If the activity level information has a lower activity level than the estimation information, the difference adjustment unit 118

adjusts the equipment control information to increase the activity level. Meanwhile, if the activity level information has a higher activity level than the estimation information, the difference adjustment unit 118 adjusts the equipment control information to decrease the activity level. If the difference between the estimation information and the activity level information is within an allowable range, the difference adjustment unit 118 does not adjust the equipment control information. In the present embodiment, the allowable range of difference is when the estimation information and the activity level information at the acquisition time of the conversation data have the same value. However, the allowable range does not limit the present embodiment. If the activity levels indicated by the three levels of “high”, “medium”, and “low” at the acquisition time of the conversation data are the same for the estimation information and the activity level information, the difference may be considered to be in the allowable range, for example.

[0055]

In the present embodiment, the adjustment of the equipment control information when the activity level is increased is an adjustment for increasing the value of the lighting and raising the airflow, fragrance, and ventilation by one level. Meanwhile, the adjustment of the equipment control information when the activity level is decreased is an adjustment for decreasing the value of the lighting and lowering the airflow, fragrance, and ventilation by one level. The adjustment of the equipment control information to increase or decrease the activity level can be performed by adjusting any one or a combination of the lighting, airflow, fragrance, sound, and ventilation according to the location and time of the conference.

[0056]

Further, in the present embodiment, the degrees of adjustment of the equipment control information implemented by the difference adjustment unit 118 each differ in the first half of the conference, the middle of the conference, and the second half of the conference. As shown in Fig. 9(a), if the activity level information has a higher activity level than the estimation information in the first half of the

conference, the adjustment of the equipment control information is not performed. Meanwhile, as shown in Fig. 9(b), if the activity level information has a lower activity level than the estimation information in the first half of the conference, the equipment control information is updated such that the activity level increases. The above control is performed because it is preferable to increase the activity level as much as possible in the first half of the conference. Further, in the middle of the conference, a normal adjustment is made such that the difference between the activity level of the estimation information and the activity level of the activity level information is reduced.

[0057]

Furthermore, in the second half of the conference, as shown in Fig. 9(a), if the activity level information has a higher activity level than the estimation information, the equipment control information is updated such that the activity level decreases, for example. Meanwhile, as shown in Fig. 9(b), in the second half of the conference, if the activity level information has a lower activity level than the estimation information, the adjustment of the equipment control information is not performed. The above control is performed because, in the second half of the conference, it is preferable that the conference converge in a direction of decreasing the activity level.

[0058]

That is, in the present embodiment, in addition to updating the equipment control information such that the difference between the activity level of the estimation information and the activity level of the actual activity level information decreases depending on the difference, the equipment control information is adjusted according to the assumed situation of the conference in the first or second half of the conference. This enables more appropriate control of the environment control equipment 200 according to the situation of the conference in the present embodiment. The adjustment by means of the difference adjustment unit 118 does not limit the present embodiment, but the difference adjustment unit 118 may simply make an adjustment such that the difference between the activity level of the actual activity level information and the activity level of the estimation information decreases.

Alternatively, according to the content of the conference, adjustments for the first half and/or second half of the above conference may be applied.

[0059]

(Outline of processing flow of conference support system 1)

Next, a flow chart of an example of the operation of the conference support system 1 will be described with reference to Fig. 10. In the flow chart of Fig. 10, the processing also ends due to power being turned off or an interruption such as processing being ended. In the explanation of the flow chart below, the same contents as those described in the explanation of the conference support device 100 described above are omitted or simplified.

[0060]

In step S1001, the conference information acquisition unit 111 acquires conference information such as the type of a conference to be held and stores the conference information in the conference information DB 121. As for the conference information, the screens shown in Fig. 3(a) to 3(d) are displayed on the user terminal 30, and the user inputs information such as the conference type through the screens displayed on the user terminal 30. In the present embodiment, examples of information on the conference include the location, type, content, and time of the conference.

[0061]

In step S1002, the activity estimation unit 114 generates estimation information in which the activity level of the conference to be held is estimated based on the conference information and stores the estimation information in the estimation information DB 124. In the present embodiment, the estimation information is estimated based on the correspondence relationship shown in Fig. 7. As shown in Fig. 7, corresponding activity level estimation information is assigned according to the content of each conference.

[0062]

In step S1003, the control information acquisition unit 112 acquires the equipment control information of the environment control equipment 200 from the

correspondence relationship information DB 122 based on the conference information, and stores the information in the equipment control DB 123 as equipment control information.

[0063]

In step S1004, the equipment control unit 113 controls the environmental control equipment 200 and the sound collecting device 300 based on the equipment control information for controlling the environmental control equipment 200, which is stored in the equipment control DB 123. Specifically, based on the equipment control information, the equipment control unit 113 transmits control instructions to the environmental control equipment 200 and the sound collecting device 300 through the network interface 140. Each piece of environment control equipment 200 is made to operate according to the control instruction transmitted from the equipment control unit 113. In addition, the sound collecting device 300 is made to operate according to the control instruction transmitted from the equipment control unit 113 and collects the conversation of the conference. If the user directly controls the environment control equipment 200, the equipment control information is transmitted from the environment control equipment 200 to the equipment control unit 113 via the network 40. The equipment control unit 113 receives the transmitted equipment control information and stores the received information in the equipment control DB 123.

[0064]

In step S1005, the conversation data acquisition unit 115 acquires the conversation data of the conference participants collected by means of the sound collecting device 300 via the network 40.

[0065]

In step S1006, the activity generation unit 116 generates activity level information based on the speech data acquired by means of the conversation data acquisition unit 115. Specifically, the activity generation unit 116 generates activity level information indicating the activity level of the conference based on the volume of the speech data.

[0066]

In step S1007, the difference calculation unit 117 compares the activity level information generated by means of the activity generation unit 116 with the estimation information estimated by means of the activity estimation unit 114 and calculates the difference therebetween. Specifically, the difference calculation unit 117 calculates the difference between the activity level of the activity level information at the acquisition time of the conversation data and the activity level of the estimation information and calculates the difference information.

[0067]

In step S1008, the difference adjustment unit 118 determines whether the difference is within the allowable range. That is, in step S1008, if the difference adjustment unit 118 determines that the difference is within the allowable range (step S1008: YES), the process proceeds to step S1010. Alternatively, in step S1008, if the difference adjustment unit 118 determines that the difference is not within the allowable range (step S1008: NO), the process proceeds to step S1009.

[0068]

In step S1009, the difference adjustment unit 118 updates (changes) the equipment control information. Specifically, the difference adjustment unit 118 adjusts the equipment control information such that the difference between the estimation information and the activity level information, which is calculated by means of the difference calculation unit 117, is reduced. If the activity level information has a lower activity level than the estimation information, the difference adjustment unit 118 adjusts the equipment control information to increase the activity level, for example. Meanwhile, if the activity level information has a higher activity level than the estimation information, the difference adjustment unit 118 adjusts the equipment control information to lower the activity level.

[0069]

In the present embodiment, the adjustment of the equipment control information when the activity level is increased is an adjustment for increasing the

value of the lighting and raising the airflow, fragrance, and ventilation by one level. Meanwhile, the adjustment of the equipment control information when the activity level is decreased is an adjustment for decreasing the value of the lighting and lowering the airflow, fragrance, and ventilation by one level.

[0070]

In step S1010, the control unit 110 determines whether the conference has ended. In the present embodiment, the control unit 110 determines that the conference has ended when the equipment control unit 113 acquires, from the environmental control equipment 200, information indicating that each piece of environmental control equipment 200 has been turned off by the user. The control unit 110 also determines that the conference has ended when information indicating that “forced end” shown in Fig. 3(d) has been pressed is acquired through the user terminal 30. When, in step S1010, the control unit 110 determines that the conference has ended (step S1010: YES), the processing for the conference support method shown in Fig. 10 ends. Meanwhile, in step S1010, if the control unit 110 determines that the conference has not been ended (step S1010: NO), the process returns to the processing for acquiring conversation data in step S1005, and thereafter steps S1005 to S1010 are repeated.

[0071]

As described above, in the conference support system 1 according to the first embodiment, difference information is calculated which indicates the difference between the estimation information of the activity level estimated based on the conference information and the activity level information generated based on the conversation data of the conference participants. Further, in the conference support system 1, the equipment control information of the environmental control equipment 200 is updated based on the calculated difference information. By using the estimation information of the activity level estimated based on the conference information, the difference information is calculated which is between the detailed estimation information according to the content of the conference and the activity level

information of the actual conference, and it is possible to control the environment control equipment 200 based on the difference information. This enables more appropriate control of the environment of the space in which the conference is held.

[0072]

In addition, the conference support system 1 according to the first embodiment can include at least one of a lighting device, an air conditioner, an aroma generating device, an acoustic device, and a ventilator as the environment control equipment 200. This makes it possible to adjust the environment of the space more flexibly in the conference room 20. In addition, in the conference support system 1, the environment of the space can be adjusted according to the type and the location of the conference.

[0073]

In addition, the activity estimation unit 114 of the conference support device 100 according to the first embodiment can generate estimation information of the activity level corresponding to the content of the conference in the conference information. This makes it possible to estimate the activity level in detail according to the content of the conference, and to more appropriately set equipment control information according to the activity level of the conference.

[0074]

(Second embodiment)

One specific embodiment has been described as above, but the above described embodiment is an example and is not intended to limit the embodiments herein. The above embodiment has exemplified a form in which the activity estimation unit 114 associates estimation information of the activity level of the conference estimated in advance, according to the conference information, for example. In a conference support system 1 according to a second embodiment, the conference support device 100 is made to learn the correspondence relationship between conference information and activity level information, and the learned result is used as an activity estimation unit 154. Hereinafter, the configuration of the second embodiment which is different from that of the first embodiment will be described

[0075]

Fig. 11 is a functional block diagram for explaining the activity estimation unit 154 (a learned model) generated by learning based on conference information and activity level information in the conference support device 100 according to the second embodiment.

[0076]

A machine learning unit 151 inputs conference information and activity level information as a set to the machine learning unit 151 as learning data and teaching data. Then, by learning the relationship between the conference information and the activity level information, the machine learning unit 151 generates the activity estimation unit 154 as the learned model. That is, by causing the machine learning unit 151 to learn actual activity level information relative to the conference information, the activity estimation unit 154, which is what is referred to as a classifier, is generated. The activity estimation unit 154 outputs the appropriate estimation information in response to the input of the conference information.

[0077]

Specifically, the conference information and the corresponding activity level information as teaching data are used as input data of the machine learning unit 151. That is, in the correspondence relationship between the conference information and the activity level information, actual activity level information relative to the conference information is learned.

[0078]

A neural network model is used for the machine learning unit 151. As the neural network model used for the machine learning unit 151, models of a deep neural network (DNN), a convolutional neural network (CNN), a recurrent neural network (RNN, LSTM), or the like can be applied. However, the type of neural network model does not limit the present embodiment.

[0079]

In addition, Fig. 11 shows an example of a configuration in which a learning

unit 150 is provided as a separate component from the control unit 110. However, the second embodiment is not limited to this configuration. The learning unit 150 may be included in the control unit 110, for example. Further, the learning unit 150 is not necessarily provided in the conference support device 100. The conference information and activity level information may be read from the storage unit 120 as a learning set, the learning set may be learned in a system other than the server 10, and the activity estimation unit 154 may be generated as the learned model, for example. In this case, the activity estimation unit 154 is taken into the conference support device 100 from outside the server 10 through the input/output interface 130 or the network interface 140.

[0080]

As described above, in the conference support device 100 according to the second embodiment, by using the activity estimation unit 154, which is a learned model generated by actual learning, it is possible to generate more appropriate estimation information relative to the conference information. This makes it possible to control the environmental control equipment 200 more appropriately according to the situation of the conference, and to control the environment of the space of the conference appropriately.

[0081]

(Other embodiments)

Although embodiments of the present invention have been described above, the embodiments are not limited thereto, and various modifications can be made within the scope of the gist of the embodiments. It is also possible to combine some or all of the various embodiments to form a new embodiment.

[0082]

In the above embodiments, for the conference support system 1, a configuration example using what is referred to as cloud computing is given, in which the conference support device 100 controls the environment control equipment 200 based on conference information input through the user terminal 30. However, the

configuration of the conference support system 1 is not limited thereto. What is referred to as edge computing may be adopted in which the conference support device 100 and the user terminal 30 are provided for each conference room 20, and the environment control equipment 200 is controlled for each conference room 20, for example. In that case, the network 40 may be wired or wireless for short-range communication.

[0083]

In addition, a computer program (a conference support program) for causing a computer to execute the above method and a computer-readable recording medium on which the program is recorded are within the scope of the present embodiment. Any type of computer-readable recording medium can be used. In addition, the computer program described above is not limited to the program recorded in the recording medium described above, and may be transmitted via a telecommunication line, a wireless or wired communication line, a network represented by the Internet, or the like.

[0084]

The features of the conference support device 100, the conference support system 1, and the conference support method according to the present embodiment will be described below.

[0085]

(1) The conference support device 100 has the following configurations.

(i) The conference support device 100 includes the conference information acquisition unit 111 that acquires conference information on a conference to be held.

(ii) The conference support device 100 includes the activity estimation unit 114 that generates estimation information in which the activity level of the conference to be held is estimated based on the conference information.

(iii) The conference support device 100 includes the storage unit 120 that stores correspondence relationship information indicating the correspondence relationship between the equipment control information of the environmental control

equipment 200 that controls the environment of the space in which the conference is held and the conference information.

(iv) The conference support device 100 includes the control information acquisition unit 112 that acquires equipment control information corresponding to the conference information from the correspondence relationship information stored in the storage unit 120.

(v) The conference support device 100 includes the equipment control unit 113 that controls the environmental control equipment 200 and the sound collecting device 300 disposed in the space in which the conference is held, based on the equipment control information.

(vi) The conference support device 100 includes the conversation data acquisition unit 115 that acquires conversation data of conference participants from the sound collecting device 300.

(vii) The conference support device 100 includes the activity generation unit 116 that generates activity level information indicating the activity level of the conference based on the conversation data.

(viii) The conference support device 100 includes the difference calculation unit 117 that calculates difference information between the estimation information and the activity level information.

(ix) The conference support device 100 includes the difference adjustment unit 118 that changes equipment control information based on the difference information.

[0086]

According to the present disclosure, the conference support device 100 calculates the difference information between the estimation information of the activity level estimated based on the conference information and the activity level information generated based on the conversation data of the conference participants, and changes the equipment control information of the environment control equipment 200 based on the calculated difference information. By using the estimation information of the activity level estimated based on the conference information, it is

possible to calculate the difference information between the detailed estimation information according to the content of the conference and the activity level information of the actual conference, and to control the environment control equipment 200 based on the difference information. This enables more appropriate control of the environment of the space in which the conference is held.

[0087]

(2) The environment control equipment 200 preferably includes at least one of a lighting device, an air conditioner, an aroma generating device, an acoustic device, and a ventilator.

[0088]

According to the present disclosure, the environment control equipment 200 in the conference support system 1 can include at least one of a lighting device, an air conditioner, an aroma generating device, an acoustic device, and a ventilator. This makes it possible to adjust the environment of the space more flexibly in the conference room 20. In addition, the environment of the space can be adjusted according to the type and the location of the conference.

[0089]

(3) It is preferable that the activity estimation unit 114 generate estimation information based on information on the content of the conference corresponding to the conference information.

[0090]

According to the present disclosure, the activity estimation unit 114 of the conference support device 100 can generate estimation information of the activity level corresponding to the content of the conference in the conference information. This makes it possible to estimate the activity level in detail according to the content of the conference, and to more appropriately set equipment control information according to the activity level of the conference.

[0091]

(4) The conference support device 100 further has the following configuration.

(x) It is preferable that the conference support device 100 further include the learning unit 150. The activity estimation unit 154 is preferably a learned model obtained by causing the learning unit 150 to learn the correspondence relationship between the conference information and the activity level information.

[0092]

According to the present disclosure, by using the activity estimation unit 154, which is the learned model generated by actual learning, the conference support device 100 can generate more appropriate estimation information relative to the conference information. This makes it possible to control the environmental control equipment 200 more appropriately according to the situation of the conference, and to control the environment of the space of the conference appropriately.

[0093]

(5) The conference support system 1 has the following configurations.

(i) The conference support system 1 includes the environment control equipment 200 that controls the environment of the space in which the conference is held, the sound collecting device 300 disposed in the space in which the conference is held, and the conference support device 100 that controls the environment control equipment 200 and the sound collecting device 300. In addition, the conference support device 100 has the following configurations.

(ii) The conference support device 100 includes the conference information acquisition unit 111 that acquires conference information on the conference to be held.

(iii) The conference support device 100 includes the activity estimation unit 114 that generates estimation information in which the activity level of the conference to be held is estimated based on the conference information.

(iv) The conference support device 100 includes the storage unit 120 that stores the correspondence relationship information indicating the correspondence relationship between the equipment control information of the environmental control equipment 200 that controls the environment of the space in which the conference is held and the conference information.

(v) The conference support device 100 includes the control information acquisition unit 112 that acquires equipment control information corresponding to the conference information from the correspondence relationship information stored in the storage unit 120.

(vi) The conference support device 100 includes the equipment control unit 113 that controls the environmental control equipment 200 and the sound collecting device 300 based on the equipment control information.

(vii) The conference support device 100 includes the conversation data acquisition unit 115 that acquires conversation data of conference participants from the sound collecting device 300.

(viii) The conference support device 100 includes the activity generation unit 116 that generates activity level information indicating the activity level of the conference based on the conversation data.

(ix) The conference support device 100 includes the difference calculation unit 117 that calculates difference information between the estimation information and the activity level information.

(x) The conference support device 100 includes the difference adjustment unit 118 that changes equipment control information based on the difference information.

[0094]

According to the present disclosure, in the conference support system 1, the difference information is calculated which is between the estimation information of the activity level estimated based on the conference information and the activity level information generated based on the conversation data of the conference participants, and the equipment control information of the environment control equipment 200 is changed based on the calculated difference information. By using the estimation information of the activity level estimated based on the conference information, it is possible to calculate the difference information between the detailed estimation information according to the content of the conference and the activity level information of the actual conference, and to control the environment control

equipment 200 based on the difference information. This enables more appropriate control of the environment of the space in which the conference is held.

[0095]

(6) A conference support method executed by the computer preferably has the following processing.

(i) The conference support method includes processing for acquiring conference information on the conference to be held.

(ii) The conference support method includes processing for generating estimation information in which the activity level of the conference to be held is estimated based on the conference information.

(iii) The conference support method includes processing for acquiring the equipment control information corresponding to the conference information from the storage unit 120 that stores correspondence relationship information indicating the correspondence relationship between the equipment control information of the environmental control equipment 200 that controls the environment of the space in which the conference is held and the conference information.

(iv) The conference support method includes processing for controlling the environmental control equipment 200 and the sound collecting device 300 disposed in the space in which the conference is held, based on the equipment control information.

(v) The conference support method includes processing for acquiring the conversation data of the conference participants from the sound collecting device 300.

(vi) The conference support method includes processing for generating activity level information indicating the activity level of the conference based on the conversation data.

(vii) The conference support method includes processing for calculating the difference information between the estimation information and the activity level information.

(viii) The conference support method includes processing for changing the equipment control information based on the difference information.

[0096]

According to the present disclosure, by means of the conference support method, the difference information is calculated which is between the estimation information of the activity level estimated based on the conference information and the activity level information generated based on the conversation data of the conference participants, and the equipment control information of the environment control equipment 200 is changed based on the calculated difference information. By using the estimation information of the activity level estimated based on the conference information, it is possible to calculate the difference information between the detailed estimation information according to the content of the conference and the activity level information of the actual conference, and to control the environment control equipment 200 based on the difference information. This enables more appropriate control of the environment of the space in which the conference is held.

[0097]

(7) A conference support program causes a computer to perform the following processing.

(i) The processing includes processing for acquiring conference information on the conference to be held.

(ii) The processing includes processing for generating estimation information in which the activity level of the conference to be held is estimated based on the conference information.

(iii) The processing includes processing for acquiring the equipment control information corresponding to the conference information from the storage unit 120 that stores the correspondence relationship information indicating the correspondence relationship between the equipment control information of the environmental control equipment 200 that controls the environment of the space in which the conference is held and the conference information.

(iv) The processing includes processing for controlling the environmental control equipment 200 and the sound collecting device 300 disposed in the space in

which the conference is held, based on the equipment control information.

(v) The processing includes processing for acquiring the conversation data of the conference participants from the sound collecting device 300.

(vi) The processing includes processing for generating activity level information indicating the activity level of the conference based on the conversation data.

(vii) The processing includes processing for calculating the difference information between the estimation information and the activity level information.

(viii) The processing includes processing for changing the equipment control information based on the difference information.

[0098]

According to the present disclosure, by using the conference support program, the difference information is calculated which is between the estimation information of the activity level estimated based on the conference information and the activity level information generated based on the conversation data of the conference participants. Further, the equipment control information of the environment control equipment 200 is changed based on the calculated difference information. By using the estimation information of the activity level estimated based on the conference information, it is possible to calculate the difference information between the detailed estimation information according to the content of the conference and the activity level information of the actual conference, and to control the environment control equipment 200 based on the difference information. This enables more appropriate control of the environment of the space in which the conference is held.

[0099]

(8) The conference support program may be in a form recorded on a computer-readable recording medium.

[0100]

According to the present disclosure, by using the conference support program, the difference information is calculated which is between the estimation information of

the activity level estimated based on the conference information and the activity level information generated based on the conversation data of the conference participants. Further, the equipment control information of the environment control equipment 200 is changed based on the calculated difference information. By using the estimation information of the activity level estimated based on the conference information, it is possible to calculate the difference information between the detailed estimation information according to the content of the conference and the activity level information of the actual conference, and to control the environment control equipment 200 based on the difference information. This enables more appropriate control of the environment of the space in which the conference is held.

[0101]

The entire contents of Japanese Patent Application No. 2020-178062 (filing date: October 23, 2020) are incorporated herein.

Industrial Applicability

[0102]

According to the present disclosure, it becomes possible to provide a conference support device that can appropriately control the environment of the space in which the conference is held.

Reference Signs List

[0103]

- 1 Conference support system
- 10 Server
- 20 Conference room
- 30 User terminal
- 40 Network
- 100 Conference support device
- 110 Control unit
- 111 Conference information acquisition unit

112 Control information acquisition unit
113 Equipment control unit
114, 154 Activity estimation unit
115 Conversation data acquisition unit.
116 Activity generation unit
117 Difference calculation unit
118 Difference adjustment unit
120 Storage unit
121 Conference information DB
122 Correspondence relationship information DB
123 Equipment control DB
124 Estimation information DB
125 Activity level information DB
130 Input/output interface
140 Network interface
150 Learning unit
151 Machine learning unit
200 Environmental control equipment
300 Sound collecting device

CLAIMS

[Claim 1]

A conference support device comprising:

a conference information acquisition unit that acquires conference information on a conference to be held;

an activity estimation unit that generates estimation information in which an activity level of the conference to be held is estimated based on the conference information;

a storage unit that stores correspondence relationship information indicating a correspondence relationship between the conference information and equipment control information of environment control equipment that controls an environment of a space in which the conference is held;

a control information acquisition unit that acquires the equipment control information corresponding to the conference information from the correspondence relationship information stored in the storage unit;

an equipment control unit that controls the environmental control equipment and a sound collecting device disposed in the space in which the conference is held, based on the equipment control information;

a conversation data acquisition unit that acquires conversation data of a participant of the conference from the sound collecting device;

an activity generation unit that generates activity level information indicating the activity level of the conference based on the conversation data;

a difference calculation unit that calculates information indicating a difference between the estimation information and the activity level information; and

a difference adjustment unit that changes the equipment control information based on the difference information.

[Claim 2]

The conference support device according to claim 1, wherein

the environment control equipment includes at least one of a lighting device, an air conditioner, an aroma generating device, an acoustic device, and a ventilator.

[Claim 3]

The conference support device according to claim 1 or 2, wherein
the activity estimation unit generates the estimation information based on information on content of the conference corresponding to the conference information.

[Claim 4]

The conference support device according to any one of claims 1 to 3, further comprising:

a learning unit, wherein

the activity estimation unit is a learned model obtained by causing the learning unit to learn a correspondence relationship between the conference information and the activity level information.

[Claim 5]

A conference support system comprising:

environment control equipment that controls an environment of a space in which a conference is held;

a sound collecting device disposed in the space in which the conference is held; and

a conference support device that controls the environment control equipment and the sound collecting device, wherein

the conference support device includes:

a conference information acquisition unit that acquires conference information on the conference to be held;

an activity estimation unit that generates estimation information in which an activity level of the conference to be held is estimated based on the conference

information;

a storage unit that stores correspondence relationship information indicating a correspondence relationship between the conference information and equipment control information of the environmental control equipment;

a control information acquisition unit that acquires the equipment control information corresponding to the conference information from the correspondence relationship information stored in the storage unit;

an equipment control unit that controls the environmental control equipment and the sound collecting device based on the equipment control information;

a conversation data acquisition unit that acquires conversation data of a participant of the conference from the sound collecting device;

an activity generation unit that generates activity level information indicating the activity level of the conference based on the conversation data;

a difference calculation unit that calculates information indicating a difference between the estimation information and the activity level information; and

a difference adjustment unit that changes the equipment control information based on the difference information.

[Claim 6]

A conference support method executed by a computer, the conference support method comprising:

acquiring conference information on a conference to be held;

generating estimation information in which an activity level of the conference to be held is estimated based on the conference information;

acquiring the equipment control information corresponding to the conference information from a storage unit that stores correspondence relationship information indicating a correspondence relationship between the conference information and equipment control information of environment control equipment that controls an environment of a space in which the conference is held;

controlling the environmental control equipment and a sound collecting device disposed in the space in which the conference is held, based on the equipment control information;

acquiring conversation data of a participant of the conference from the sound collecting device;

generating activity level information indicating the activity level of the conference based on the conversation data;

calculating information indicating a difference between the estimation information and the activity level information; and

changing the equipment control information based on the difference information.

[Claim 7]

A conference support program for causing a computer to execute processing of:

acquiring conference information on a conference to be held;

generating estimation information in which an activity level of the conference to be held is estimated based on the conference information;

acquiring the equipment control information corresponding to the conference information from a storage unit that stores correspondence relationship information indicating a correspondence relationship between the conference information and equipment control information of environment control equipment that controls an environment of a space in which the conference is held;

controlling the environmental control equipment and a sound collecting device disposed in the space in which the conference is held, based on the equipment control information;

acquiring conversation data of a participant of the conference from the sound collecting device;

generating activity level information indicating the activity level of the

conference based on the conversation data;

calculating information indicating a difference between the estimation information and the activity level information; and

changing the equipment control information based on the difference information.

[Claim 8]

A computer-readable recording medium on which the program according to claim 7 is recorded.