

DESCRIPTION

AUTHENTICATION SYSTEM, COMPUTER PROGRAM, ELECTRIC DEVICE, AND MOBILE TERMINAL

TECHNICAL FIELD

[0001] The present disclosure relates to an authentication system, a computer program, an electric device, and a mobile terminal.

BACKGROUND ART

[0002] There has been proposed a ceiling fan that is attached to a ceiling of a room and circulates indoor air, and includes a lighting device (see, for example, PTL 1).

[0003] In addition, in recent years, a ceiling fan that can be remotely controlled from a mobile terminal by being registered in a dedicated application of the mobile terminal has been provided.

Citation List

Patent Literature

[0004] PTL 1: Unexamined Japanese Patent Publication No. 2006-109580

SUMMARY OF THE INVENTION

[0005] An electric device released as a model for a certain first country may be sold as a model for a second country different from the first country with a different product number. In this case, due to a difference in distribution costs, a difference occurs between selling price in the first country and selling price in the second country. In recent years, there has been a problem (so-called “in-flow problem”) that an unauthorized dealer imports the model for the first country to the second country and inexpensively sells the model. Thus, the sales of the model for the second country imported to the second country through a proper route are greatly affected.

[0006] An object of the present disclosure is to provide a deterrent against selling an electric device in a place other than an original destination of the electric device by restricting control of the electric device by a mobile terminal in the place other than the original destination.

[0007] An authentication system of the present disclosure is an authentication system that

includes an electric device and a mobile terminal. The system includes a storage that stores a device identification (ID) of the electric device, an authentication unit that determines whether or not a destination of the electric device identified by the device ID is consistent with a user belonging place that is a region to which a user of the mobile terminal belongs, and a function restriction unit that differentiates control from the mobile terminal on a function provided by the electric device between a case where the destination of the electric device is not consistent with the user belonging place and a case where the destination of the electric device is consistent with the user belonging place.

[0008] Another aspect of the present disclosure is a computer program. This computer program causes a computer to execute acquiring a device identification (ID) of an electric device, acquiring information on a user belonging place that is a region to which a user of a mobile terminal belongs, determining whether or not a destination of the electric device identified by the device ID is consistent with the user belonging place, and differentiating control from the mobile terminal on a function provided by the electric device between a case where the destination of the electric device is not consistent with the user belonging place and a case where the destination of the electric device is consistent with the user belonging place.

[0009] Still another aspect of the present disclosure is an electric device. This electric device provides a predetermined function based on a command transmitted in connection with an authentication system that includes the electric device and a mobile terminal. The authentication system includes a storage that stores a device identification (ID) of the electric device, an authentication unit that determines whether or not a destination of the electric device identified by the device ID is consistent with a user belonging place that is a region to which a user of the mobile terminal belongs, and a function restriction unit that differentiates control from the mobile terminal on a function provided by the electric device between a case where the destination of the electric device is not consistent with the user belonging place and a case where the destination of the electric device is consistent with the user belonging place.

[0010] Still another aspect of the present disclosure is a mobile terminal. This mobile terminal is a mobile terminal that enables control of an electric device. The terminal includes a communicator that receives a device identification (ID) from the electric device, transmits the received device ID and user information to an outside, and receives an authentication result, and a display that differentiates contents to be displayed in

accordance with the authentication result received by the communicator.

[0011] Another aspect of the present disclosure is a computer program. The computer program causes a computer to execute receiving a device identification (ID) from an electric device, transmitting the received device ID and user information, receiving an authentication result, and differentiating contents to be displayed in accordance with the received authentication result.

[0012] According to the present disclosure, it is possible to provide a deterrent against selling an electric device in a place other than an original destination.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Fig. 1 is a diagram illustrating a configuration of an authentication system according to an exemplary embodiment.

Fig. 2 is a diagram illustrating a configuration of a ceiling fan according to the exemplary embodiment.

Fig. 3 is a diagram illustrating an example of an App screen according to the exemplary embodiment.

Fig. 4 is a diagram illustrating an example of the App screen according to the exemplary embodiment.

Fig. 5 is a diagram illustrating an example of the App screen according to the exemplary embodiment.

Fig. 6 is a diagram illustrating a function comparison according to the exemplary embodiment.

Fig. 7 is a block diagram illustrating a functional block of each device of the authentication system according to the exemplary embodiment.

Fig. 8 is a sequence diagram illustrating an authentication operation in the authentication system according to the exemplary embodiment.

DESCRIPTION OF EMBODIMENT

[0014] The subject of devices or methods in the present disclosure includes a computer. This computer executes a program, and thus, functions of the subject of devices or methods in the present disclosure are realized.

[0015] The computer includes, as a main hardware configuration, a processor that operates according to the program. A type of the processor is not limited as long as the

processor can realize the functions by executing the program. The processor includes one or a plurality of electronic circuits including a semiconductor integrated circuit (IC) or a large scale integration (LSI). Although the processor is referred to as the IC or the LSI in the present disclosure, the terms vary depending on a degree of integration, and may be referred to as a system LSI, a very large scale integration (VLSI), or an ultra large scale integration (ULSI). A field-programmable gate array (FPGA) that is programmed after fabrication of the LSI, or a reconfigurable logic device capable of reconfiguring a bonding relationship inside the LSI or setting up a circuit section inside the LSI can also be used for the same purpose.

[0016] The plurality of electronic circuits may be integrated on one chip or may be provided on a plurality of chips. The plurality of chips may be aggregated into one device or may be provided in a plurality of devices. The program is recorded in a computer-readable non-transitory recording medium such as a read-only memory (ROM), an optical disk, or a hard disk drive. The program may be stored in advance in a recording medium, or may be supplied to the recording medium via a wide area communication network including the Internet and the like.

[0017] The following exemplary embodiment illustrates a preferred specific example of the present disclosure. Thus, numerical values, shapes, materials, components, arranged positions and connection forms of the components, steps (processes), orders of steps, and the like to be illustrated in the following exemplary embodiment are examples and are not to limit the scope of the present disclosure. Accordingly, among the components in the following exemplary embodiment, the components that are not described in the independent claims representing the broadest concept of the present disclosure are described as optional components. In addition, in each of the drawings, substantially the same components are denoted by the same reference marks, and redundant description will be omitted or simplified.

[0018] Fig. 1 illustrates a configuration of authentication system 100 according to an exemplary embodiment of the present disclosure. Authentication system 100 includes ceiling fan 10, remote controller 12, router 14, mobile terminal 16, user management server 20, and device management server 22. Router 14, mobile terminal 16, user management server 20, and device management server 22 are connected to Internet 28.

[0019] Ceiling fan 10, remote controller 12, and router 14 are installed in a house of a user (user's house). Ceiling fan 10 is a ceiling fan attached to a ceiling of the user's house,

and is an electric device to be remotely controlled in the present exemplary embodiment. Ceiling fan 10 provides predetermined function based on a command transmitted in connection with authentication system 100. In the present exemplary embodiment, the command transmitted in connection with authentication system 100 is a command (also referred to as an instruction signal) transmitted from mobile terminal 16 on a condition that authentication (is authentication as to whether or not a product is sold at an authorized destination and details thereof will be described later) of ceiling fan 10 in authentication system 100 is successful. In the present exemplary embodiment, in a case where the authentication in authentication system 100 is successful, ceiling fan 10 is subject to be remotely controlled from mobile terminal 16.

[0020] Remote controller 12 is a remote controller dedicated to ceiling fan 10, and controls an operation of ceiling fan 10 in accordance with an operation of the user independently of mobile terminal 16 (device control App to be described later). Since remote controller 12 and ceiling fan 10 perform infrared communication, a communicable range between the remote controller and the ceiling fan is within a line-of-sight range of several meters. Router 14 performs Wi-Fi (registered trademark) communication with a device inside the user's house. Ceiling fan 10 is connected to mobile terminal 16 and device management server 22 via router 14.

[0021] Mobile terminal 16 is a mobile terminal operated by the user, and can perform mobile data communication (3G, 4G, or 5G communication) and Wi-Fi communication. Mobile terminal 16 may be, for example, a smartphone or a tablet terminal. Mobile terminal 16 may be disposed inside the user's house (that is, within a Wi-Fi communication range with router 14), or may be disposed outside the user's house (that is, outside the Wi-Fi communication range with router 14).

[0022] In a case where mobile terminal 16 is disposed inside the user's house (that is, within the Wi-Fi communication range with router 14), the mobile terminal performs the Wi-Fi communication. In addition, in a case where mobile terminal 16 is disposed outside the user's house (that is, out of the Wi-Fi communication range with router 14), the mobile terminal performs the mobile data communication. Note that, in a case where mobile terminal 16 is disposed outside the user's house (that is, out of the Wi-Fi communication range with router 14), the mobile terminal may be connected to a router other than router 14 outside the user's house to perform Wi-Fi communication with the router other than router 14.

[0023] App providing server 26 is an information processing device that provides various mobile applications. In the present exemplary embodiment, App providing server 26 provides a mobile application (hereinafter, also referred to as an “device control App”.) for remotely controlling ceiling fan 10. The device control App provided from App providing server 26 is installed in mobile terminal 16.

[0024] User management server 20 is an information processing device that manages a user of the device control App. Device management server 22 is an information processing device that manages ceiling fan 10. Functions of user management server 20 and device management server 22 may be provided by a single server, and user management server 20 and device management server 22 can be collectively regarded as authentication server 24.

[0025] Fig. 2 illustrates a configuration of ceiling fan 10. Ceiling fan 10 includes shaft 2, motor 3, blade 4, motor shaft 5, control unit 6, lighting unit 7, communicator 8, and storage 9.

[0026] Ceiling fan 10 is fixed to ceiling 1 while being pivotally supported by shaft 2. Motor 3 incorporated in ceiling fan 10 is, for example, a DC motor, and a stator of motor 3 is fixed to motor shaft 5 having a cylindrical shape extending downward from shaft 2. On the other hand, a rotor of motor 3 is rotatably attached to motor shaft 5 via a bearing (not illustrated). Blade 4 is fixed to an outer periphery of motor 3.

[0027] Communicator 8 performs Wi-Fi communication with router 14, and performs infrared communication with remote controller 12. Control unit 6 receives instruction signals from remote controller 12 and mobile terminal 16 via communicator 8, and rotates motor 3 according to an instruction indicated by the instruction signal. A known technique may be used for the control of motor 3 by control unit 6, and thus, the description thereof will be omitted here. In addition, control unit 6 turns on and off lighting unit 7 or adjusts luminance of the lighting according to the instruction indicated by the instruction signal.

[0028] Storage 9 stores device information that can identify a country or a region (hereinafter, referred to as a “destination”.) in which ceiling fan 10 is originally to be sold. The device information according to the present exemplary embodiment includes a device identification (ID). The device ID includes a model number of ceiling fan 10, identification information of the destination that can uniquely identify a destination, and a manufacturing number (serial number). The identification information of the destination may be, for example, a country name code, and may be “MY” in Malesia or “SG” in Singapore.

[0029] Next, the device control App installed in mobile terminal 16 will be described.

Figs. 3 to 5 illustrate screens (hereinafter, also referred to as “App screens 30”) of the device control App displayed on a display of mobile terminal 16.

[0030] Fig. 3 illustrates home screen 32 among App screens 30. Home screen 32 includes group icon 41 for grouping a plurality of devices, collective control icon 42 for collectively and remotely controlling the plurality of devices in the group, target device name 43 indicating device to be remotely controlled, speed adjustment area 44 for adjusting a rotation speed (also referred to as a “fan speed”) of blade 4 of ceiling fan 10, and dimming area 45 for adjusting the luminance of lighting unit 7 of ceiling fan 10 (also referred to as “dimming”).

[0031] Fig. 4 illustrates detailed setting screen 34 among App screens 30. Detailed setting screen 34 shows a detailed setting screen related to an operation of blade 4 (fan). Detailed setting screen 34 includes target device name 43, speed adjustment area 44, timer icon 46 for setting a timer function, fluctuation switch 47 for giving an instruction about fluctuation of a wind speed, reversing switch 48 for giving an instruction about reversal of the wind direction, and schedule icon 49 for setting a schedule operation.

[0032] Fig. 5 illustrates schedule editing screen 36 among App screens 30. Schedule editing screen 36 includes setting areas of a day of the week and a time (day-of-week setting area 50 and time setting area 51) related to an operation start or an operation stop of ceiling fan 10, fan setting area 52 for setting an operation aspect of blade 4, lighting setting area 53 for setting a lighting aspect of lighting unit 7, and melody setting area 54 for setting an aspect of sound to be output.

[0033] Fig. 6 is a diagram illustrating function comparison. Fig. 6 illustrates functions of ceiling fan 10 that can be controlled by the device control App of mobile terminal 16 and functions of ceiling fan 10 that can be controlled by remote controller 12. The number of functions of ceiling fan 10 that can be controlled by the device control App is greater than the number of functions of ceiling fan 10 that can be controlled by remote controller 12, and in the present exemplary embodiment, all the functions provided by ceiling fan 10 can be controlled from the device control App.

[0034] Among the plurality of functions provided by ceiling fan 10, a function that can be controlled by both remote controller 12 and the device control App is referred to as a “basic function”. The basic function of ceiling fan 10 in the present exemplary embodiment includes an on and off function (on and off switching function) of the operation, a stepwise fan speed changing function, a rotation direction switching function,

and a stepwise dimming control function and a toning control function.

[0035] On the other hand, the function of ceiling fan 10 that cannot be controlled from remote controller 12 and can be controlled only from the device control App is referred to as an “application function”. The application function of ceiling fan 10 in the present exemplary embodiment includes remote control, a fan speed changing function at any level, a schedule operation function, a 1/f fluctuation function of the fan, a scene storage function, a dimming control function and a toning control function at any level, a schedule setting failure notification function, a melody function at the start of the operation, a timer operation function, a sleep mode function, an abnormality notification function, and a grouping function.

[0036] Mobile terminal 16 (device control App) enables use (enables control) of both the basic function and the application function of ceiling fan 10. On the other hand, remote controller 12 enables use (enables control) of only the basic function of ceiling fan 10. Although details will be described later, the use of the application function of ceiling fan 10 is restricted in accordance with an authentication result of device management server 22 (authentication unit). On the other hand, the use of the basic function of ceiling fan 10 is not restricted regardless of the authentication result of device management server 22 (authentication unit).

[0037] Fig. 7 is a block diagram illustrating a functional block of each device of authentication system 100. Each block illustrated in the block diagram of the present disclosure can be realized by an element or a mechanical device including a central processing unit (CPU) and a memory of a computer in a hardware manner or a computer program in a software manner. In this case, each block realized by cooperation of the hardware and the software is illustrated in the block diagram. It will be understood by those skilled in the art that each of the functional blocks may be realized in various forms by a combination of the hardware and the software.

[0038] As described above, ceiling fan 10 includes communicator 8 and storage 9. Remote controller 12 includes communicator 60 and operation unit 61. Operation unit 61 includes input means such as a button, and receives an operation input by the user to the input means. Communicator 60 transmits an instruction signal for controlling the operation (basic function) of ceiling fan 10 to ceiling fan 10 by infrared communication in accordance with the operation of the user input to operation unit 61.

[0039] Mobile terminal 16 includes communicator 70, display 71, user registration unit

72, device registration unit 73, App screen control unit 74, remote control unit 75, and control target storage 76. Communicator 70 is connected to router 14 by Wi-Fi communication and is connected to Internet 28 by mobile data communication. Display 71 is a touch screen display that displays various kinds of information and receives a touch operation of the user.

[0040] Functions of user registration unit 72, device registration unit 73, App screen control unit 74, remote control unit 75, and control target storage 76 may be implemented in the device control App. The CPU of mobile terminal 16 may perform the functions of these functional blocks by executing the device control App. Details of the functions of these functional blocks will be described later.

[0041] User management server 20 includes communicator 80, registration screen providing unit 81, and user information storage 82. Communicator 80 communicates with a user-side device via Internet 28, and communicates with device management server 22 via a local area network (LAN) or the like. Registration screen providing unit 81 provides a screen for user registration (hereinafter, referred to as a “user registration screen”.) to mobile terminal 16. User information storage 82 stores information (hereinafter, referred to as “user information”.) regarding the user registered from mobile terminal 16.

[0042] Device management server 22 includes communicator 90, authentication unit 91, function restriction unit 92, instruction signal relay unit 93, and correspondence storage 94. Communicator 90 communicates with a user-side device via Internet 28, and communicates with user management server 20 via a LAN or the like. Correspondence storage 94 stores an ID (device ID) of ceiling fan 10 that has been successfully authenticated by authentication unit 91 and an ID (user ID) of the user who has registered ceiling fan 10 in association with each other. Details of functions of other functional blocks will be described later.

[0043] A computer program implementing a plurality of functional blocks of user management server 20 may be installed in user management server 20. The CPU of user management server 20 may perform the function of each functional block by executing the computer program. Similarly, a computer program in which a plurality of functional blocks of device management server 22 is mounted may be installed in device management server 22. The CPU of device management server 22 may perform the function of each functional block by executing the computer program. As described above, the functions of user management server 20 and device management server 22 may be implemented in a single

authentication server 24.

[0044] An operation of authentication system 100 having the above configuration will be described with reference to Fig. 8. Fig. 8 is a sequence diagram illustrating an authentication operation in authentication system 100.

[0045] The user connects mobile terminal 16 to router 14. Mobile terminal 16 downloads the device control App from App providing server 26 and installs the device control App on the own terminal in accordance with the operation of the user. When the user activates the device control App on mobile terminal 16, user registration unit 72, device registration unit 73, App screen control unit 74, remote control unit 75, and control target storage 76 are loaded on mobile terminal 16.

[0046] User registration unit 72 of mobile terminal 16 accesses user management server 20 via router 14, and requests data of the user registration screen. Registration screen providing unit 81 of user management server 20 transmits the data of the user registration screen to mobile terminal 16. User registration unit 72 of mobile terminal 16 displays the data of the user registration screen on display 71. The user registration screen includes (1) an input area of the user ID, (2) an input area of a password, (3) an input area of a name, and (4) an input area of a country or a region (hereinafter, referred to as a “user belonging place”.) to which the user belongs or lives.

[0047] User registration unit 72 of mobile terminal 16 transmits user information including the user ID, the password, the name, and the user belonging place input by the user on the user registration screen to user management server 20. User information storage 82 of user management server 20 stores the user information in which the user ID, the password, the name, and the user belonging place transmitted from mobile terminal 16 are associated with each other. The user ID registered by the user in user management server 20 is also stored in mobile terminal 16. Note that the user ID in the present exemplary embodiment may be a mail address of the user. In addition, the user may register the user ID, the password, the name, and the user belonging place with user management server 20 in advance via an Internet browser or the like. In a case where these pieces of information have been registered in advance, the user inputs the user ID and the password on the user registration screen, and in a case where “the input user ID and password” and “the user ID and the password stored in user information storage 82” coincide, the user ID registered by the user in user management server 20 is also stored in mobile terminal 16.

[0048] Subsequently, the user operates remote controller 12 to shift ceiling fan 10 to a Wi-Fi Protected Setup (WPS) mode. Communicator 8 of ceiling fan 10 searches for router 14 capable of performing Wi-Fi communication and is connected to router 14. The user inputs a device search instruction to the device control App of mobile terminal 16. Device registration unit 73 of mobile terminal 16 searches for the electric device subordinate to router 14 and detects ceiling fan 10 connected to router 14 via Wi-Fi connection. Device registration unit 73 of mobile terminal 16 requests ceiling fan 10 to provide the device information. Ceiling fan 10 transmits the device information (the device ID in the present exemplary embodiment) stored in storage 9 to mobile terminal 16.

[0049] In addition, in a case where router 14 does not support the WPS mode, ceiling fan 10 and router 14 may be connected in a mode other than the WPS mode. For example, the user operates remote controller 12 to activate ceiling fan 10 as an access point. Thereafter, the user operates mobile terminal 16 to connect to ceiling fan 10. Further, the user operates mobile terminal 16 to transmit information (such as a service set identifier and an encryption key of router 14) necessary for connection with router 14 to ceiling fan 10. Ceiling fan 10 can connect to router 14 by using information necessary for connection with router 14 obtained via mobile terminal 16.

[0050] Device registration unit 73 of mobile terminal 16 transmits a device registration request including the device ID of ceiling fan 10 and the user ID to device management server 22. Authentication unit 91 of device management server 22 authenticates whether or not ceiling fan 10 to be registered has been sold in an original destination, in other words, whether or not ceiling fan 10 is used in the original destination based on the device registration request (including the device ID acquired from storage 9 of ceiling fan 10) transmitted from mobile terminal 16.

[0051] Specifically, authentication unit 91 of device management server 22 reads data of the user belonging place associated with the user ID included in the device registration request from user information storage 82 of user management server 20. Authentication unit 91 determines whether or not the user belonging place acquired from user management server 20 is consistent with the destination of ceiling fan 10 identified by the device ID included in the device registration request. For example, in a case where the destination of ceiling fan 10 is Malesia (MY), it is determined that the user belonging place is consistent with the destination (authentication success) when the user belonging place is Malesia (MY), and it is determined that the user belonging place is inconsistent with the

destination (authentication failure) when the user belonging place is Singapore (SG).

[0052] Note that, even in a case where the destination of ceiling fan 10 and the user belonging place do not completely coincide but have an inclusion relationship, authentication unit 91 may determine that the destination is consistent with the user belonging place (authentication success). For example, in a case where the destination of ceiling fan 10 is Japan, authentication unit 91 may determine that the destination is consistent with the user belonging place (authentication success) when the user belonging place is Tokyo.

[0053] In a case where the destination of ceiling fan 10 is not consistent with the user belonging place, function restriction unit 92 of device management server 22 restricts the control from mobile terminal 16 (device control App) on the function provided by ceiling fan 10 as compared with a case where the destination of ceiling fan 10 is consistent with the user belonging place. In the present exemplary embodiment, in a case where the destination of ceiling fan 10 is consistent with the user belonging place, function restriction unit 92 enables the control of all the functions provided by ceiling fan 10 from mobile terminal 16. On the other hand, in a case where the destination of ceiling fan 10 is not consistent with the user belonging place, function restriction unit 92 restricts (prohibited in the present exemplary embodiment) the control from mobile terminal 16 on the functions provided by ceiling fan 10.

[0054] Hereinafter, an operation in a case where the destination of ceiling fan 10 is consistent with the user belonging place will be described. Function restriction unit 92 of device management server 22 stores the device ID included in the device registration request and the user ID included in the device registration request in association with each other in correspondence storage 94. Further, function restriction unit 92 transmits information indicating the authentication success to mobile terminal 16 as a response to the device registration request. In a case where device management server 22 notifies the authentication success, device registration unit 73 of mobile terminal 16 stores the device ID of ceiling fan 10 to be registered in control target storage 76.

[0055] App screen control unit 74 of mobile terminal 16 displays App screens 30 (for example, the screens of Figs. 3 to 5) on display 71 in accordance with the operation of the user. App screen control unit 74 displays, on App screen 30, the electric device stored in control target storage 76, in other words, the electric device (ceiling fan 10 in the present exemplary embodiment) that has been successfully authenticated by device management

server 22. The user designates ceiling fan 10 to be remotely controlled on App screen 30, and designates the operation of ceiling fan 10 (function to be controlled and setting thereof).

[0056] Remote control unit 75 of mobile terminal 16 transmits, to ceiling fan 10 designated on App screen 30, an instruction signal having contents for giving an instruction about the operation designated on App screen 30. In a case where mobile terminal 16 is connected to router 14 via Wi-Fi connection, for example, in a case where mobile terminal 16 is disposed inside the user's house, remote control unit 75 directly transmits an instruction signal to ceiling fan 10 via router 14. control unit 6 of ceiling fan 10 controls the operations of blade 4 and lighting unit 7 according to the received instruction signal.

[0057] On the other hand, in a case where mobile terminal 16 is not connected to router 14, for example, in a case where mobile terminal 16 is disposed outside the user's house, remote control unit 75 of mobile terminal 16 transmits an instruction signal to device management server 22 via Internet 28 by mobile data communication. This instruction signal includes, for example, a user ID of a transmission source, a device ID of ceiling fan 10 to be controlled, which is designated on App screen 30, and contents for giving an instruction about an operation designated on App screen 30. In a case where the user ID and the device ID included in the instruction signal are associated with each other in correspondence storage 94, that is, in a case where it is confirmed that ceiling fan 10 to be controlled has been successfully authenticated, instruction signal relay unit 93 of device management server 22 transfers the instruction signal to ceiling fan 10. control unit 6 of ceiling fan 10 controls the operations of blade 4 and lighting unit 7 according to the received instruction signal.

[0058] Next, an operation in a case where the destination of ceiling fan 10 is inconsistent with the user belonging place will be described. Function restriction unit 92 of device management server 22 prevents correspondence storage 94 from storing the device ID included in the device registration request and the user ID included in the device registration request in association with each other. That is, function restriction unit 92 rejects the registration of ceiling fan 10 designated by the device registration request. Further, function restriction unit 92 transmits information indicating the authentication failure to mobile terminal 16 as a response to the device registration request. In a case where device management server 22 notifies the authentication failure, device registration

unit 73 of mobile terminal 16 prevents the device ID of ceiling fan 10 to be registered from being stored in control target storage 76. That is, device registration unit 73 does not register ceiling fan 10 as device to be controlled by the device control App.

[0059] As a result, ceiling fan 10 is not displayed on App screen 30 of mobile terminal 16, and ceiling fan 10 cannot be selected as the device to be controlled. Thus, the user cannot control the operation (basic function + application function) of ceiling fan 10 by using mobile terminal 16. Note that, regardless of whether or not device management server 22 has authenticated ceiling fan 10, it is possible to control the operation (only basic function) of ceiling fan 10 by using remote controller 12.

[0060] As described above, function restriction unit 92 of device management server 22 enables the control of ceiling fan 10 from both remote controller 12 and mobile terminal 16 in a case where the destination of ceiling fan 10 is consistent with the user belonging place, and enables the control of ceiling fan 10 only from remote controller 12 in a case where the destination of ceiling fan 10 is not consistent with the user belonging place. In other words, function restriction unit 92 of device management server 22 restricts the use of the application function of ceiling fan 10 in accordance with the authentication result by authentication unit 91, but does not restrict the use of the basic function of ceiling fan 10 regardless of the authentication result by authentication unit 91.

[0061] Note that, in the present exemplary embodiment, in a case where the destination of ceiling fan 10 is not consistent with the user belonging place, the use (control) from mobile terminal 16 is prohibited for all the application functions of ceiling fan 10.

However, as a modification, even in a case where the destination of ceiling fan 10 is not consistent with the user belonging place, the use (control) from mobile terminal 16 may be permitted for some of the application functions. In other words, in a case where the destination of ceiling fan 10 is not consistent with the user belonging place, function restriction unit 92 of device management server 22 may restrict the use of some of the application functions of ceiling fan 10. Further, in a case where the destination of ceiling fan 10 is not consistent with the user belonging place, the use (control) from mobile terminal 16 may be permitted for a function different from a case where the destination of ceiling fan 10 is consistent with the user belonging place. In other words, in a case where the destination of ceiling fan 10 is not consistent with the user belonging place, function restriction unit 92 of device management server 22 may permit the use (control) of a function different from the basic function and the application function of ceiling fan 10.

[0062] In accordance with authentication system 100 according to the present exemplary embodiment, in a case where the destination of ceiling fan 10 is inconsistent with the user belonging place, the use of the application function of ceiling fan 10 is restricted by restricting the control from mobile terminal 16 on the function provided by ceiling fan 10. Accordingly, it is possible to provide a deterrent to ceiling fan 10 being sold in a place other than the original destination. On the other hand, even though the destination of the electric device is inconsistent with the user belonging place, it is possible to use the basic function of ceiling fan 10 by enabling the control of ceiling fan 10 from remote controller 12. Accordingly, it is possible to avoid an excessive increase in a disadvantage to the user who has purchased ceiling fan 10 sold in a place other than the original destination.

[0063] The present disclosure has been described above based on the exemplary embodiment. It will be understood by those skilled in the art that the exemplary embodiment is merely an example. Further, in various modifications of the exemplary embodiment, components or processing processes of the exemplary embodiment are variously combined. Further, the modifications fall within the scope of the present disclosure.

[0064] The modification will be described. In the above exemplary embodiment, the device ID that is the device information of ceiling fan 10 stored in ceiling fan 10 includes the information (for example, the country code) indicating the destination of ceiling fan 10. As the modification, the device ID includes data unique to the device (for example, a model number and a manufacturing number), but may not include information directly indicating the destination of ceiling fan 10. In this case, authentication server 24 (device management server 22) may further include a destination storage that stores the device ID of ceiling fan 10 and the destination of ceiling fan 10 in association with each other. Authentication unit 91 of authentication server 24 (device management server 22) may search the destination storage by using the device ID of ceiling fan 10 transmitted from mobile terminal 16 as a key, and identify the destination associated with the device ID as the destination of ceiling fan 10.

[0065] Another modification will be described. In the above exemplary embodiment, although authentication server 24 (device management server 22) includes authentication unit 91 and function restriction unit 92, as the modification, mobile terminal 16 (device control App) may include authentication unit 91 and function restriction unit 92. Authentication system 100 of the present modification may not include authentication

server 24. In addition, in the present modification, authentication unit 91 of mobile terminal 16 may authenticate (determine consistency with the destination) ceiling fan 10 by using the device information (device ID) acquired from ceiling fan 10 and the user belonging place input from the user and stored in mobile terminal 16. In addition, function restriction unit 92 of mobile terminal 16 may set whether or not to control ceiling fan 10 in accordance with the authentication result by authentication unit 91 by storing the device information of ceiling fan 10 in control target storage 76 in accordance with the authentication result by authentication unit 91.

[0066] Still another modification will be described. In the above exemplary embodiment, although remote controller 12 is provided in ceiling fan 10, remote controller 12 may not be provided. At this time, a method for activating ceiling fan 10 in the WPS mode or activating ceiling fan 10 as the access point is not limited as long as the activation can be realized. For example, a button or a switch is provided on ceiling fan 10, and ceiling fan 10 is activated in the WPS mode or activated as the access point by operating the button or the switch. In a case where the destination of ceiling fan 10 is not consistent with the user belonging place, function restriction unit 92 enables the use of only the basic function from mobile terminal 16, and in a case where the destination of ceiling fan 10 is consistent with the user belonging place, function restriction unit 92 enables the use of all the functions (basic function + application function) from mobile terminal 16.

[0067] Still another modification will be described. In the above exemplary embodiment, although it has been described that ceiling fan 10 is to be remotely controlled by mobile terminal 16 (device control App), the technique of the exemplary embodiment can also be applied to a case where another electric device (for example, an air conditioner, a lighting fixture, a recorder, and the like) is remotely controlled by mobile terminal 16 (device control App). The basic function (that is, function whose use is not restricted by the authentication result) in these electric devices may include at least an on and off functions of the operation. In addition, the application function (that is, function whose use is restricted by the authentication result) in these electric devices may include at least one of a schedule operation function, a timer function, an abnormality notification function, and a grouping function.

[0068] Any combination of the exemplary embodiment and the modifications is also useful as the exemplary embodiment of the present disclosure. Any new exemplary embodiment created by such a combination has effects of the exemplary embodiment and

the modifications that are combined together. In addition, it will be understood by those skilled in the art that functions to be performed by components described in the claims are performed by each of components shown in the exemplary embodiment and the modifications. Alternatively, the functions are performed by the components that cooperate with each other.

[0069] An outline of an aspect of the present disclosure is as follows. Authentication system (100) according to an aspect of the present disclosure is authentication system (100) including electric device (10) and mobile terminal (16). The system includes storage (9) that stores device information that can identify a destination of electric device (10), authentication unit (91) that determines whether or not the destination of electric device (10) identified by the device information acquired from storage (9) is consistent with a user belonging place that is a region to which a user of mobile terminal (16) belongs, and function restriction unit (92) that differentiates control from mobile terminal (16) on a function provided by electric device (10) between a case where the destination of electric device (10) is not consistent with the user belonging place and a case where the destination of electric device (10) is consistent with the user belonging place.

[0070] In accordance with this aspect, in a case where the destination of the electric device is not consistent with the user belonging place, the control from the mobile terminal on the function provided by the electric device is restricted, and thus, it is possible to provide a deterrent against selling the electric device in the place other than the original destination.

[0071] Note that a case where the control from mobile terminal (16) to the function provided by electric device (10) is restricted may be a case where only control of a part of functions provided by electric device (10) is enabled, or may be a case where control of all the functions provided by electric device (10) is prohibited.

[0072] Authentication system (100) may further include authentication server (24). Authentication server (24) may further include user information storage (82) that stores a user ID and a user belonging place in association with each other, authentication unit (91), and function restriction unit (92). Authentication unit (91) may determine whether or not the destination of electric device (10) identified by the device information acquired from storage (9) is consistent with the user belonging place associated with the user ID acquired from mobile terminal (16).

[0073] In accordance with this aspect, in a case where the destination of the electric

device is not consistent with the user belonging place, the control from the mobile terminal on the function provided by the electric device is restricted, and thus, it is possible to provide a deterrent against selling the electric device in the place other than the original destination.

[0074] Electric device (10) may have an application function to be restricted in accordance with an authentication result of authentication unit (91) and a basic function not to be restricted regardless of the authentication result of authentication unit (91). Function restriction unit (92) may restrict only the application function in accordance with the authentication result of authentication unit (91).

[0075] In accordance with this aspect, the basic function is not restricted regardless of the authentication result while providing a deterrent against selling the electric device in the place other than the original destination by restricting the application function. Thus, it is possible to avoid an excessive increase in a disadvantage of the user who has purchased the electric device.

[0076] The application function may include at least one of a schedule operation function of electric device (10), a timer function, an abnormality notification function, and a grouping function.

[0077] In accordance with this aspect, in a case where the destination of the electric device is consistent with the user belonging place, the convenience of the electric device can be enhanced.

[0078] The basic function may include at least an ON or OFF function of an operation of electric device (10).

[0079] In accordance with this aspect, even though the destination of the electric device is inconsistent with the user belonging place, it is possible to provide the user with a minimum benefit.

[0080] Electric device (10) may include remote controller (12) that controls electric device (10) independently of mobile terminal (16). Function restriction unit (92) may enable control of electric device (10) from both remote controller (12) and mobile terminal (16) in a case where the destination of electric device (10) is consistent with the user belonging place, and may enable control of electric device (10) only from remote controller (12) in a case where the destination of electric device (10) is not consistent with the user belonging place.

[0081] In accordance with this aspect, in a case where the destination of the electric

device is not consistent with the user belonging place, the control of the electric device from the mobile terminal is restricted, and thus, it is possible to provide a deterrent against selling the electric device in the place other than the original destination. On the other hand, even though the destination of the electric device is inconsistent with the user belonging place, the control of the electric device from the remote controller is enabled. Accordingly, it is possible to avoid the excessive increase in the disadvantage of the user who has purchased the electric device.

[0082] Electric device (10) may include remote controller (12) that controls electric device (10) independently of mobile terminal (16). Function restriction unit (92) may enable control of electric device (10) from both remote controller (12) and mobile terminal (16) in a case where the destination of electric device (10) is consistent with the user belonging place, and may enable control of electric device (10) only from remote controller (12) in a case where the destination of electric device (10) is not consistent with the user belonging place. Mobile terminal (16) enables the use of the application function and the basic function, and remote controller (12) enables the use of only the basic function.

[0083] In accordance with this aspect, in a case where the destination of the electric device is not consistent with the user belonging place, the use of the application function is restricted by restricting the control of the electric device from the mobile terminal, and thus, it is possible to provide the deterrent against selling the electric device in the place other than the original destination. On the other hand, even though the destination of the electric device is inconsistent with the user belonging place, the use of the basic function is enabled by enabling the control of the electric device from the remote controller, and thus, it is possible to avoid the excessive increase in the disadvantage to the user who has purchased the electric device.

[0084] Electric device (10) may be a ceiling fan. The application function may include at least one of a schedule operation function of electric device (10), a 1/f fluctuation function of a fan, a scene storage function, an arbitrary dimming and toning control function, a schedule setting failure notification function, a melody function at the start of an operation, a timer operation function, a sleep mode function, an abnormality notification function, and a grouping function.

[0085] In accordance with this aspect, in a case where the destination of the electric device is consistent with the user belonging place, the convenience of the electric device

can be enhanced.

[0086] Electric device (10) may be a ceiling fan. The basic function may include at least one of an ON or OFF function of an operation of electric device (10), a fan speed changing function, a rotation direction switching function, and a stepwise dimming and toning control function.

[0087] In accordance with this aspect, even though the destination of the electric device is inconsistent with the user belonging place, it is possible to provide the user with a minimum benefit.

[0088] Another aspect of the present disclosure is a computer program. This computer program causes a computer to execute acquiring device information that can identify a destination of electric device (10), acquiring information on a user belonging place that is a region to which a user of mobile terminal (16) belongs, determining whether or not the destination of electric device (10) identified by the device information is consistent with the user belonging place, and differentiating control from mobile terminal (16) on a function provided by electric device (10) between a case where the destination of electric device (10) is not consistent with the user belonging place and a case where the destination of electric device (10) is consistent with the user belonging place.

[0089] In accordance with this aspect, in a case where the destination of the electric device is not consistent with the user belonging place, the control from the mobile terminal on the function provided by the electric device is restricted. Accordingly, it is possible to provide a deterrent against selling the electric device in the place other than the original destination.

[0090] Still another aspect of the present disclosure is electric device (10). Electric device (10) provides a predetermined function based on a command transmitted in connection with authentication system (100) including electric device (10) and mobile terminal (16). Authentication system (100) includes storage (9) that stores device information that can identify a destination of electric device (10), authentication unit (91) that determines whether or not the destination of electric device (10) identified by the device information acquired from storage (9) is consistent with a user belonging place that is a region to which a user of mobile terminal (16) belongs, and function restriction unit (92) that differentiates control from mobile terminal (16) on a function provided by electric device (10) between a case where the destination of electric device (10) is not consistent with the user belonging place and a case where the destination of electric device (10) is consistent with the user

belonging place.

[0091] In accordance with this aspect, in a case where the destination of the electric device is not consistent with the user belonging place, the control from the mobile terminal on the function provided by the electric device is restricted. Accordingly, it is possible to provide a deterrent against selling the electric device in the place other than the original destination.

[0092] Still another aspect of the present disclosure is mobile terminal (16). Mobile terminal (16) is mobile terminal (16) that enables the control of electric device (10). Mobile terminal (16) includes communicator (70) that receives a device ID from electric device (10), transmits the received device ID and user information to an outside, and receives an authentication result, and display (71) that differentiates contents to be displayed in accordance with the authentication result received by communicator (70).

[0093] In accordance with this aspect, in a case where the destination of the electric device is not consistent with the user belonging place, the control from the mobile terminal on the function provided by the electric device is restricted. Accordingly, it is possible to provide a deterrent against selling the electric device in the place other than the original destination.

[0094] In addition, mobile terminal (16) of the present disclosure may include at least one of authentication success information indicating that a destination of electric device (10) is consistent with a user belonging place that is a region to which a user of mobile terminal (16) identified by the user information belongs, and authentication failure information indicating that the destination of electric device (10) is not consistent with the user belonging place.

[0095] In accordance with this aspect, in a case where the destination of the electric device is not consistent with the user belonging place, the control from the mobile terminal on the function provided by the electric device is restricted. Accordingly, it is possible to provide a deterrent against selling the electric device in the place other than the original destination.

[0096] In addition, in mobile terminal (16) of the present disclosure, display (71) may be configured to selectively display electric device (10) after communicator (70) receives the authentication success information, and not to selectively display electric device (10) after communicator (70) receives the authentication failure information.

[0097] In accordance with this aspect, in a case where the destination of the electric

device is not consistent with the user belonging place, the control from the mobile terminal on the function provided by the electric device is restricted. Accordingly, it is possible to provide a deterrent against selling the electric device in the place other than the original destination.

[0098] Still another aspect of the present disclosure is a computer program. This computer program causes a computer to execute receiving a device ID from electric device (10), transmitting the received device ID and user information to an outside, receiving an authentication result, and differentiating contents to be displayed in accordance with the received authentication result.

[0099] In accordance with this aspect, in a case where the destination of the electric device is not consistent with the user belonging place, the control from the mobile terminal on the function provided by the electric device is restricted. Accordingly, it is possible to provide a deterrent against selling the electric device in the place other than the original destination.

[0100] In addition, in the computer program of the present disclosure, the authentication result may include at least one of authentication success information indicating that a destination of electric device (10) is consistent with a user belonging place that is a region to which the user of mobile terminal (16) identified by the user information belongs, or authentication failure information indicating that the destination of electric device (10) is not consistent with the user belonging place.

[0101] In accordance with this aspect, in a case where the destination of the electric device is not consistent with the user belonging place, the control from the mobile terminal on the function provided by the electric device is restricted. Accordingly, it is possible to provide a deterrent against selling the electric device in the place other than the original destination.

[0102] In addition, the computer program of the present disclosure may further include selectively displaying electric device (10) after the authentication success information is received, and not selectively displaying electric device (10) after the authentication failure information is received.

[0103] In accordance with this aspect, in a case where the destination of the electric device is not consistent with the user belonging place, the control from the mobile terminal on the function provided by the electric device is restricted. Accordingly, it is possible to provide a deterrent against selling the electric device in the place other than the original

destination.

REFERENCE MARKS IN THE DRAWINGS

[0104]	1	ceiling
	2	shaft
	3	motor
	4	blade
	5	motor shaft
	6	control unit
	7	lighting unit
	8	communicator
	9	storage
	10	ceiling fan
	12	remote controller
	14	router
	16	mobile terminal
	20	user management server
	22	device management server
	24	authentication server
	26	App providing server
	28	Internet
	30	App screen
	32	home screen
	41	group icon
	42	collective control icon
	43	target device name
	44	speed adjustment area
	45	dimming area
	46	timer icon
	47	fluctuation switch
	48	reversing switch
	49	schedule icon
	50	day-of-week setting area

51	time setting area
52	fan setting area
53	lighting setting area
54	melody setting area
60	communicator
61	operation unit
70	communicator
71	display
72	user registration unit
73	device registration unit
74	App screen control unit
75	remote control unit
76	control target storage
80	communicator
81	registration screen providing unit
82	user information storage
90	communicator
91	authentication unit
92	function restriction unit
93	instruction signal relay unit
94	correspondence storage
100	authentication system

CLAIMS

1. An authentication system that includes an electric device and a mobile terminal, comprising:
 - a storage that stores a device identification (ID) of the electric device;
 - an authentication unit that determines whether or not a destination of the electric device identified by the device ID is consistent with a user belonging place that is a region to which a user of the mobile terminal belongs; and
 - a function restriction unit that differentiates control from the mobile terminal on a function provided by the electric device between a case where the destination of the electric device is not consistent with the user belonging place and a case where the destination of the electric device is consistent with the user belonging place.
2. The authentication system according to Claim 1, further comprising an authentication server,
 - wherein
 - the authentication server further includes
 - a user information storage that stores a user ID and the user belonging place in association with each other,
 - the authentication unit, and
 - the function restriction unit, and
 - the authentication unit determines whether or not the destination of the electric device identified by the device ID is consistent with the user belonging place associated with the user ID acquired from the mobile terminal.
3. The authentication system according to Claim 1 or 2, wherein
 - the electric device has an application function to be restricted in accordance with an authentication result of the authentication unit, and a basic function not to be restricted regardless of the authentication result of the authentication unit, and
 - the function restriction unit restricts only the application function in accordance with the authentication result of the authentication unit.
4. The authentication system according to Claim 3, wherein the application

function includes at least one of a schedule operation function of the electric device, a timer function, an abnormality notification function, and a grouping function.

5. The authentication system according to Claim 3, wherein the basic function includes at least an ON or OFF function of an operation of the electric device.

6. The authentication system according to Claim 1 or 2, wherein
the electric device includes a remote controller that controls the electric device independently of the mobile terminal, and
the function restriction unit

enables control of the electric device from both the remote controller and the mobile terminal in a case where the destination of the electric device is consistent with the user belonging place, and

enables control of the electric device from only the remote controller in a case where the destination of the electric device is not consistent with the user belonging place.

7. The authentication system according to Claim 3, wherein
the electric device includes a remote controller that controls the electric device independently of the mobile terminal,
the function restriction unit

enables control of the electric device from both the remote controller and the mobile terminal in a case where the destination of the electric device is consistent with the user belonging place, and

enables control of the electric device from only the remote controller in a case where the destination of the electric device is not consistent with the user belonging place,

the mobile terminal enables use of the application function and the basic function, and

the remote controller enables use of only the basic function.

8. The authentication system according to Claim 3, wherein
the electric device is a ceiling fan, and

the application function includes at least one of a schedule operation function of the electric device, a 1/f fluctuation function of a fan, a scene storage function, arbitrary dimming and toning control function, a schedule setting failure notification function, a melody function at a start of an operation, a timer operation function, a sleep mode function, an abnormality notification function, and a grouping function.

9. The authentication system according to Claim 3, wherein
the electric device is a ceiling fan, and
the basic function includes at least one of an ON or OFF function of an operation of the electric device, a fan speed changing function, a rotation direction switching function, and a stepwise dimming and toning control function.

10. A computer program causing a computer to execute
acquiring a device identification (ID) of an electric device,
acquiring information on a user belonging place that is a region to which a user of a mobile terminal belongs,
determining whether or not a destination of the electric device identified by the device ID is consistent with the user belonging place, and
differentiating control from the mobile terminal on a function provided by the electric device between a case where the destination of the electric device is not consistent with the user belonging place and a case where the destination of the electric device is consistent with the user belonging place.

11. An electric device that provides a predetermined function based on a command transmitted in connection with an authentication system that includes the electric device and a mobile terminal,
the authentication system including
a storage that stores a device identification (ID) of the electric device,
an authentication unit that determines whether or not a destination of the electric device identified by the device ID is consistent with a user belonging place that is a region to which a user of the mobile terminal belongs, and
a function restriction unit that differentiates control from the mobile terminal on a function provided by the electric device between a case where the destination

of the electric device is not consistent with the user belonging place and a case where the destination of the electric device is consistent with the user belonging place.

12. A mobile terminal that enables control of an electric device, comprising:
a communicator that receives a device identification (ID) from the electric device, transmits the received device ID and user information to an outside, and receives an authentication result; and
a display that differentiates contents to be displayed in accordance with the authentication result received by the communicator.

13. The mobile terminal according to Claim 12, wherein the authentication result includes at least one of authentication success information indicating that a destination of the electric device is consistent with a user belonging place that is a region to which a user of the mobile terminal identified by the user information belongs or authentication failure information indicating that the destination of the electric device is not consistent with the user belonging place.

14. The mobile terminal according to Claim 13, wherein the display is configured to selectively display the electric device after the communicator receives the authentication success information, and not to selectively display the electric device after the communicator receives the authentication failure information.

15. A computer program causing a computer to execute
receiving a device identification (ID) from an electric device,
transmitting the received device ID and user information,
receiving an authentication result, and
differentiating contents to be displayed in accordance with the received authentication result.

16. The computer program according to Claim 15, wherein the authentication result includes at least one of authentication success information indicating that a destination of the electric device is consistent with a user belonging place that is a region to which a user of the mobile terminal identified by the user information belongs or

authentication failure information indicating that the destination of the electric device is not consistent with the user belonging place.

17. The computer program according to Claim 16, further comprising:
selectively displaying the electric device after the authentication success information is received; and
not selectively displaying the electric device after the authentication failure information is received.