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(54) **INFORMATION PROCESSING DEVICE, APPLICATION SOFTWARE START-UP SYSTEM, AND APPLICATION SOFTWARE START-UP METHOD**

(71) Applicant: **Maxell, Ltd.**, Kyoto (JP)

(72) Inventors: **Masayuki HIRABAYASHI**, Ibaraki-shi (JP); **Yasunobu HASHIMOTO**, Ibaraki-shi (JP); **Kazuhiko YOSHIZAWA**, Ibaraki-shi (JP)

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H04W 12/06	(2021.01)

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CPC ***G06F 21/32*** (2013.01); ***G06F 21/12*** (2013.01); ***G06F 21/31*** (2013.01); ***G06F 21/35*** (2013.01); ***G06F 21/604*** (2013.01); ***G06F 21/6218*** (2013.01); ***H04W 12/06*** (2013.01); *G06F 2221/2105* (2013.01)

(57) **ABSTRACT**

The purpose of the present invention is to provide a portable terminal and an application software start-up system whereby the application software that is started up is limited depending on the state of a user, thereby providing an improved ease of use. For this purpose, an application software start-up method for an information processing device comprises: performing identity authentication based on static biological information; determining the state of the user by comparing dynamic biological information acquired from the body of the user with previously measured dynamic biological information; and limiting the application software that is started up in accordance with the determined state of the user and on the basis of a permission level that is set in advance for each application software item.

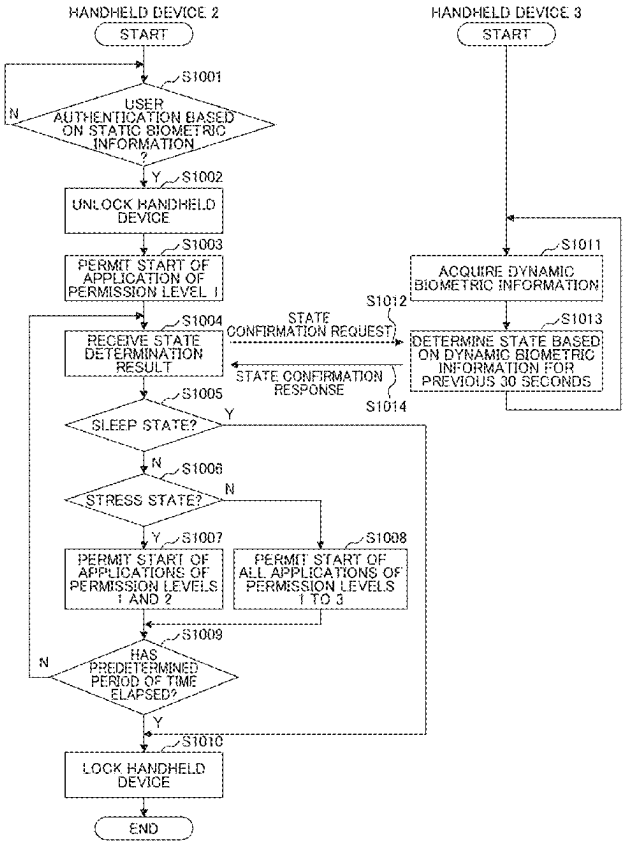


FIG. 1

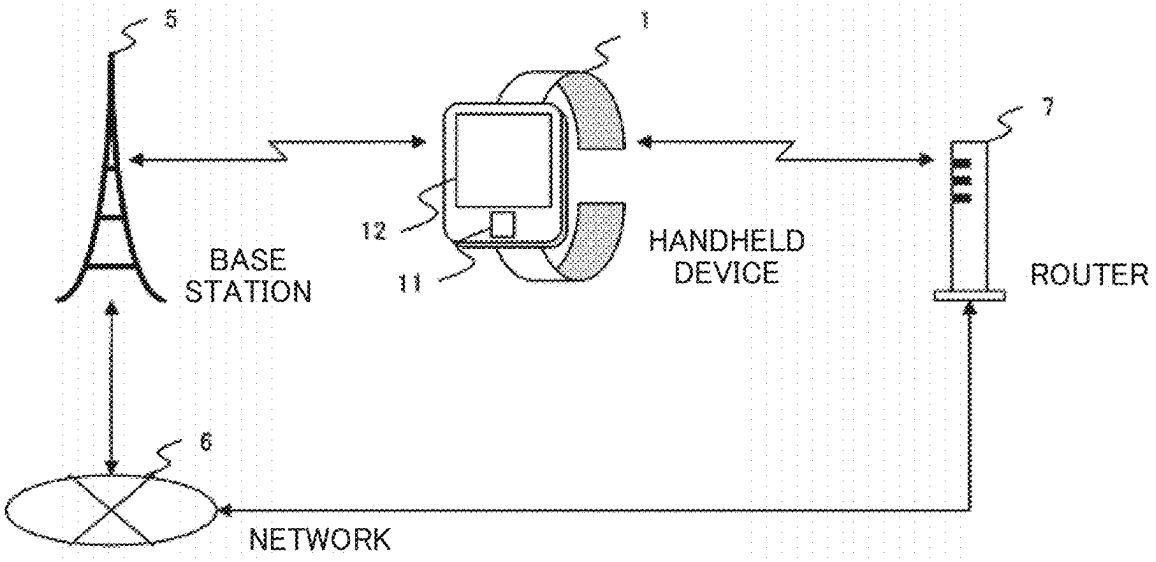


FIG. 2

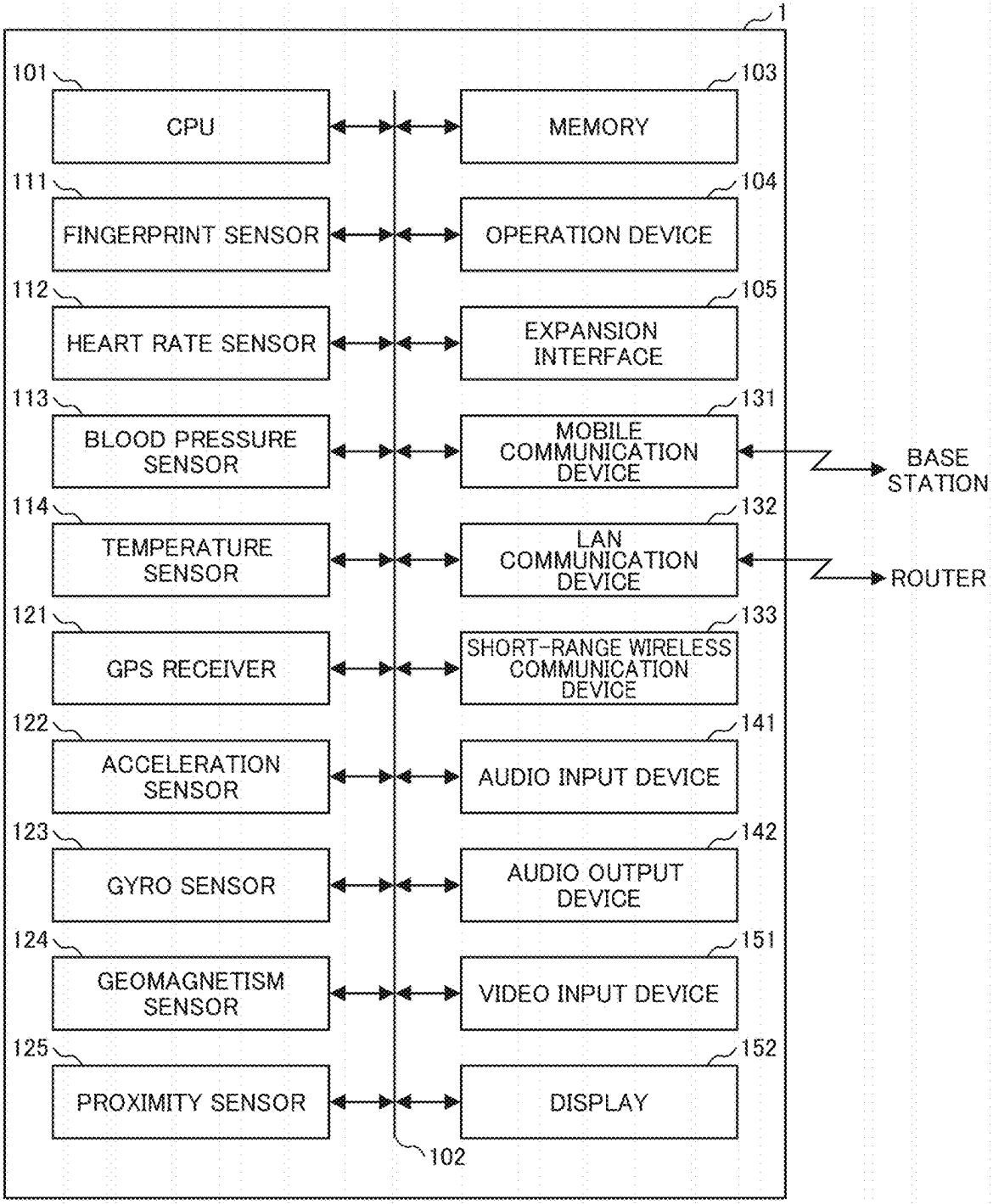

1
101
CPU
103
MEMORY
111
FINGERPRINT SENSOR
104
OPERATION DEVICE
112
HEART RATE SENSOR
105
EXPANSION INTERFACE
113
BLOOD PRESSURE SENSOR
131
MOBILE COMMUNICATION DEVICE
BASE STATION
114
TEMPERATURE SENSOR
132
LAN COMMUNICATION DEVICE
ROUTER
121
GPS RECEIVER
133
SHORT-RANGE WIRELESS COMMUNICATION DEVICE
122
ACCELERATION SENSOR
141
AUDIO INPUT DEVICE
123
GYRO SENSOR
142
AUDIO OUTPUT DEVICE
124
GEOMAGNETISM SENSOR
151
VIDEO INPUT DEVICE
125
PROXIMITY SENSOR
152
DISPLAY
102

FIG. 3

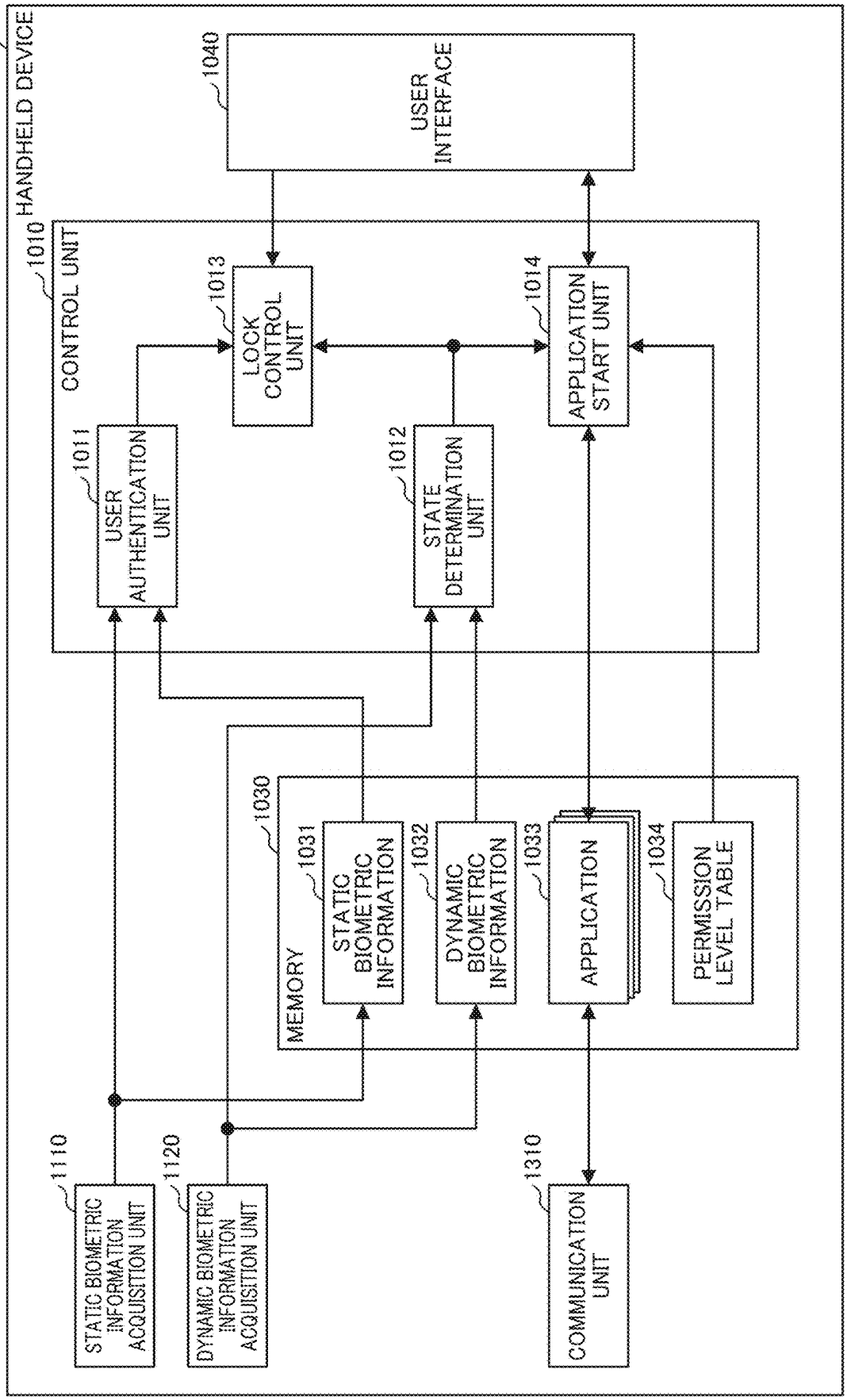

1
HANDHELD DEVICE
1040
USER INTERFACE
1010
CONTROL UNIT
1013
LOCK CONTROL UNIT
1014
APPLICATION START UNIT
1011
USER AUTHENTICATION UNIT
1012
STATE DETERMINATION UNIT
1030
MEMORY
1031
STATIC BIOMETRIC INFORMATION
1032
DYNAMIC BIOMETRIC INFORMATION
1033
APPLICATION
1034
PERMISSION LEVEL TABLE
1110
STATIC BIOMETRIC INFORMATION ACQUISITION UNIT
1120
DYNAMIC BIOMETRIC INFORMATION ACQUISITION UNIT
1310
COMMUNICATION UNIT

FIG. 4

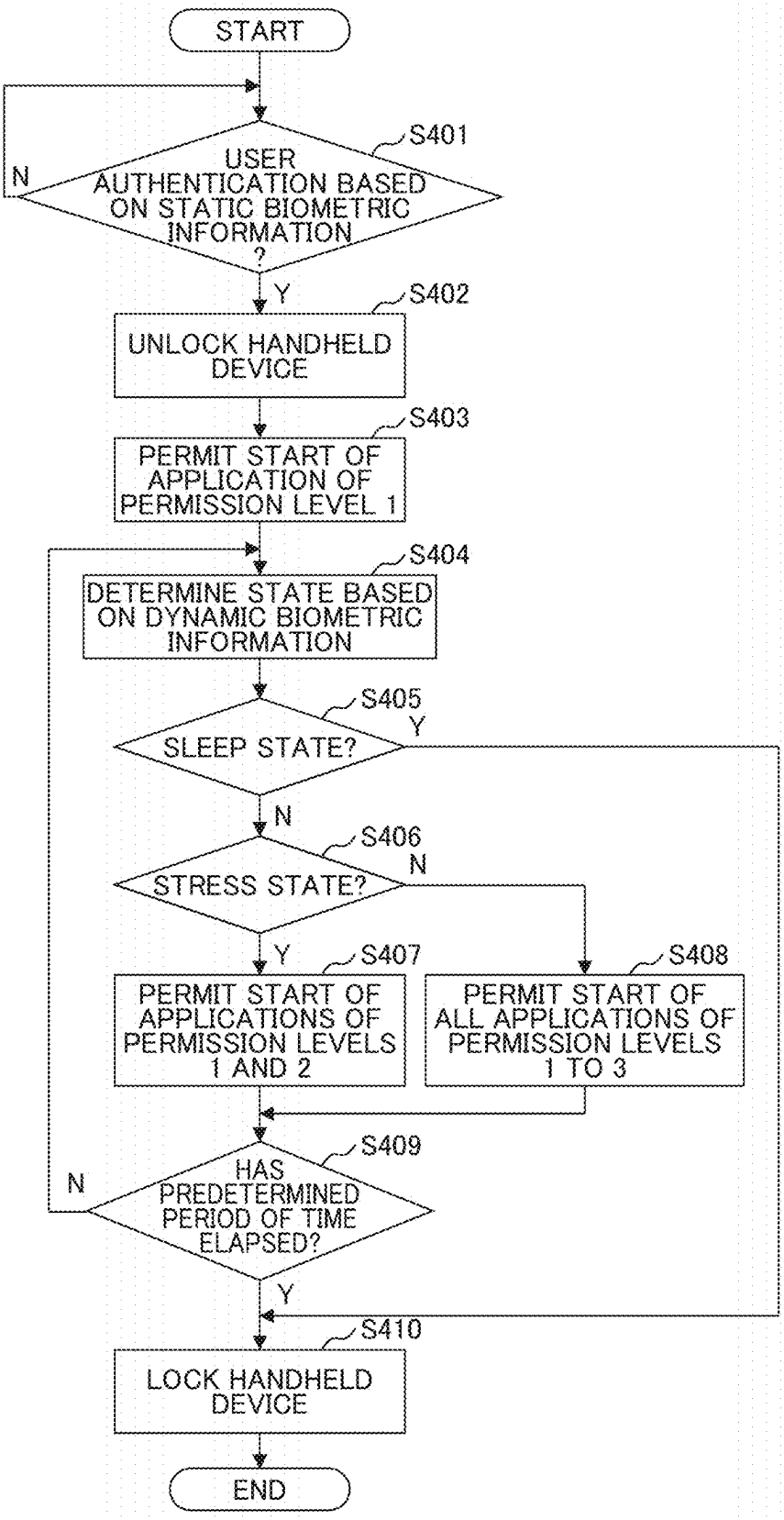

START
S401
USER AUTHENTICATION BASED ON STATIC BIOMETRIC INFORMATION ?
N
Y
S402
UNLOCK HANDHELD DEVICE
S403
PERMIT START OF APPLICATION OF PERMISSION LEVEL 1
S404
DETERMINE STATE BASED ON DYNAMIC BIOMETRIC INFORMATION
S405
SLEEP STATE?
Y
N
S406
STRESS STATE?
N
Y
S407
PERMIT START OF APPLICATIONS OF PERMISSION LEVELS 1 AND 2
S408
PERMIT START OF ALL APPLICATIONS OF PERMISSION LEVELS 1 TO 3
S409
HAS PREDETERMINED PERIOD OF TIME ELAPSED?
N
Y
S410
LOCK HANDHELD DEVICE
END

FIG. 5A

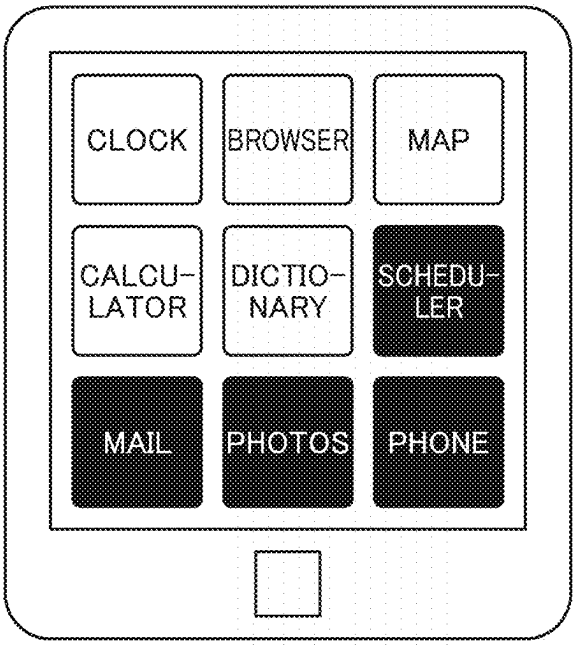

CLOCK
BROWSER
MAP
CALCU-LATOR
DICTIO-NARY
SCHEDU-LER
MAIL
PHOTOS
PHONE

FIG. 5B

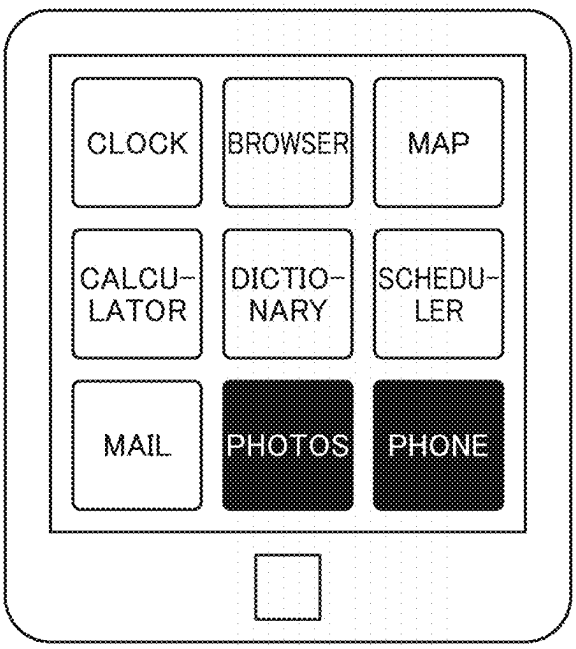

CLOCK
BROWSER
MAP
CALCU-LATOR
DICTIO-NARY
SCHEDU-LER
MAIL
PHOTOS
PHONE

FIG. 5C

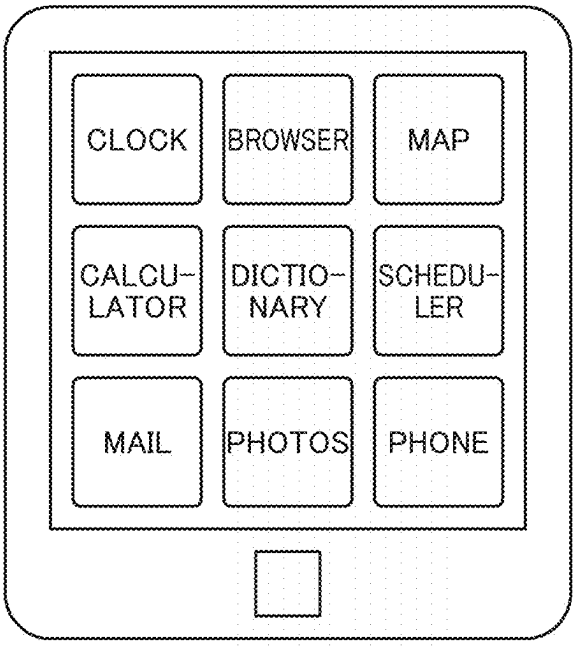

CLOCK
BROWSER
MAP
CALCU-LATOR
DICTIO-NARY
SCHEDU-LER
MAIL
PHOTOS
PHONE

FIG. 6

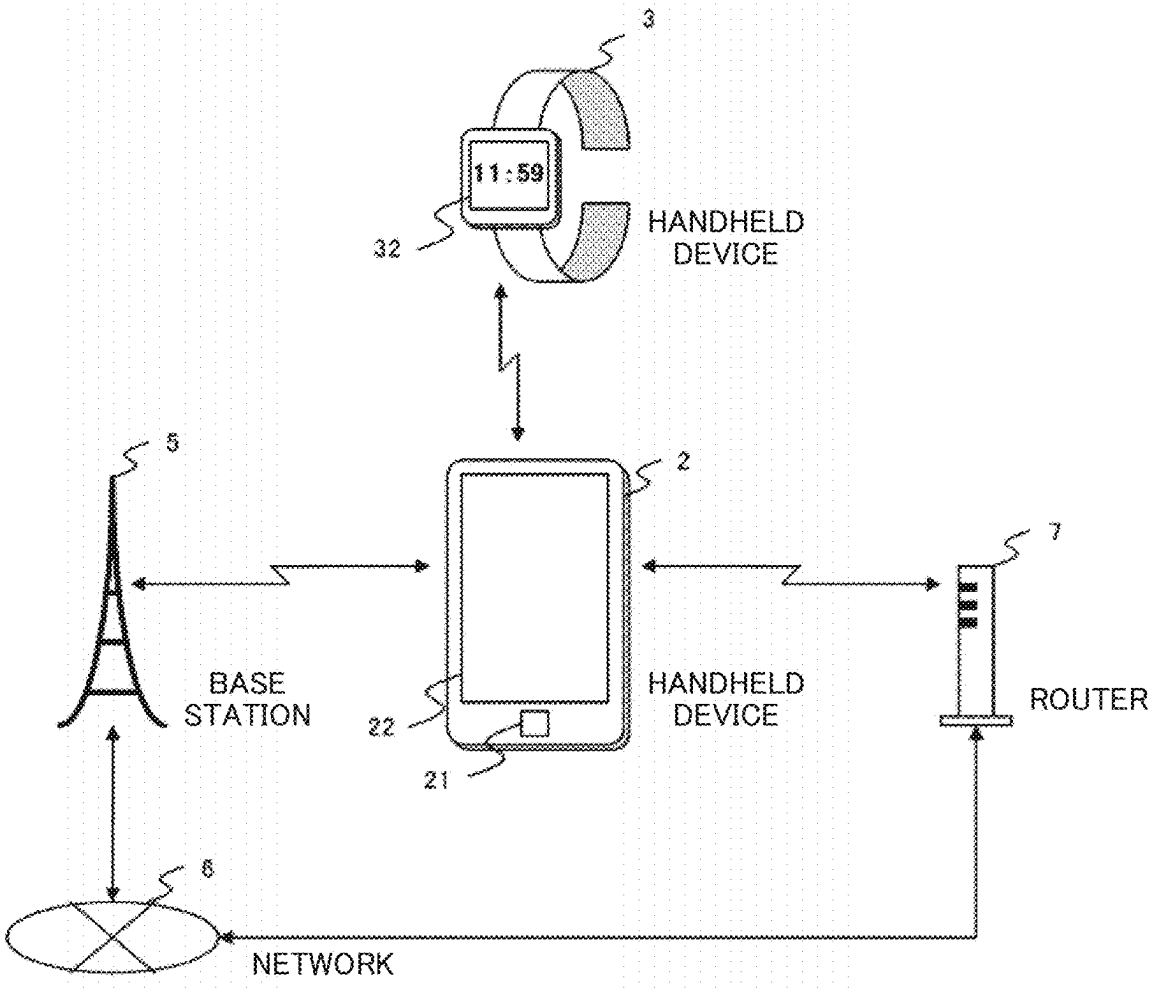

3
11:59
32
HANDHELD DEVICE
5
2
7
BASE STATION
22
HANDHELD DEVICE
ROUTER
21
6
NETWORK

FIG. 7

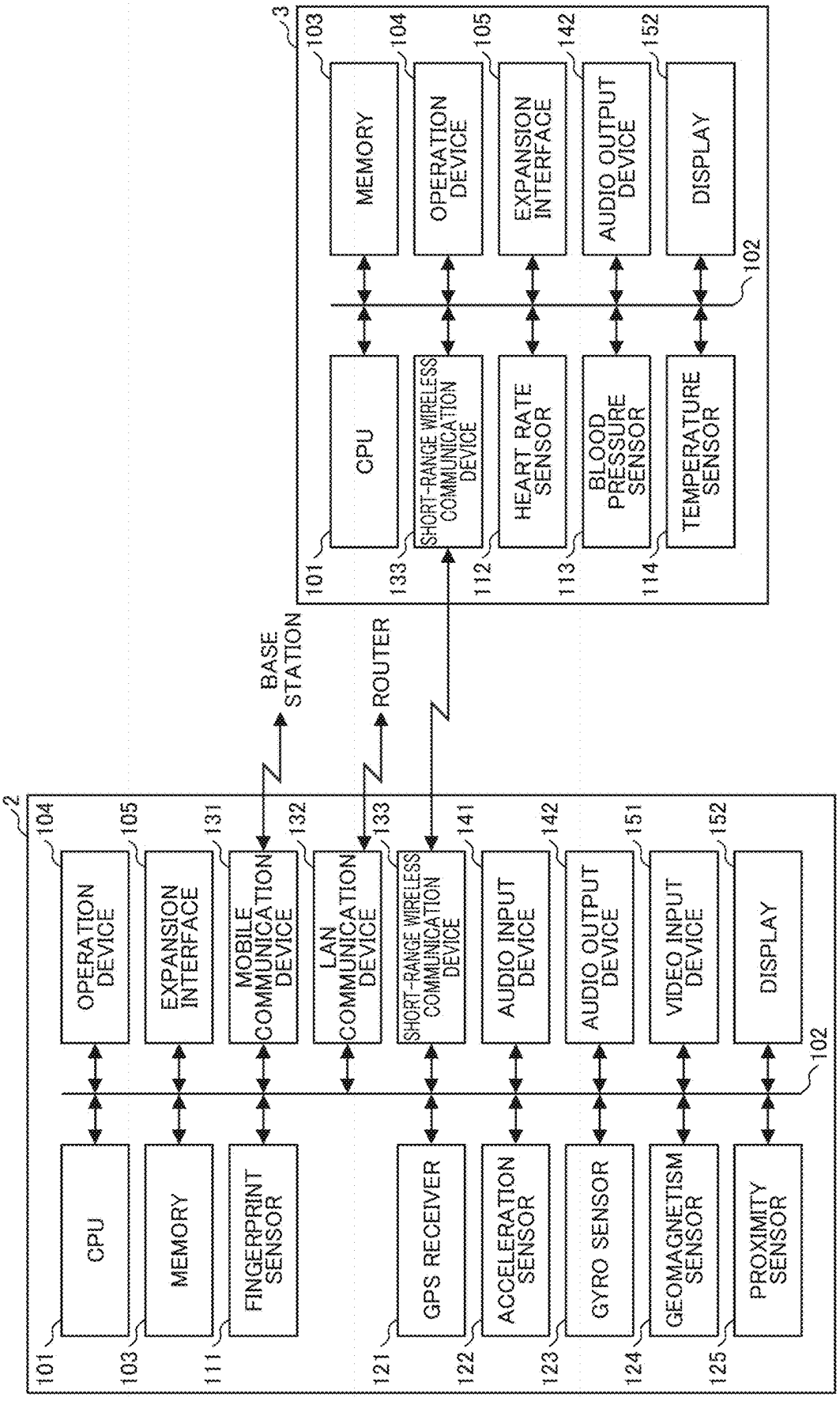

2
101
CPU
103
MEMORY
111
FINGERPRINT SENSOR
104
OPERATION DEVICE
105
EXPANSION INTERFACE
131
MOBILE COMMUNICATION DEVICE
132
LAN COMMUNICATION DEVICE
133
SHORT-RANGE WIRELESS COMMUNICATION DEVICE
121
GPS RECEIVER
122
ACCELERATION SENSOR
123
GYRO SENSOR
124
GEOMAGNETISM SENSOR
125
PROXIMITY SENSOR
141
AUDIO INPUT DEVICE
142
AUDIO OUTPUT DEVICE
151
VIDEO INPUT DEVICE
152
DISPLAY
102
BASE STATION
ROUTER
3
101
CPU
103
MEMORY
104
OPERATION DEVICE
105
EXPANSION INTERFACE
142
AUDIO OUTPUT DEVICE
152
DISPLAY
102
133
SHORT-RANGE WIRELESS COMMUNICATION DEVICE
112
HEART RATE SENSOR
113
BLOOD PRESSURE SENSOR
114
TEMPERATURE SENSOR

FIG. 8

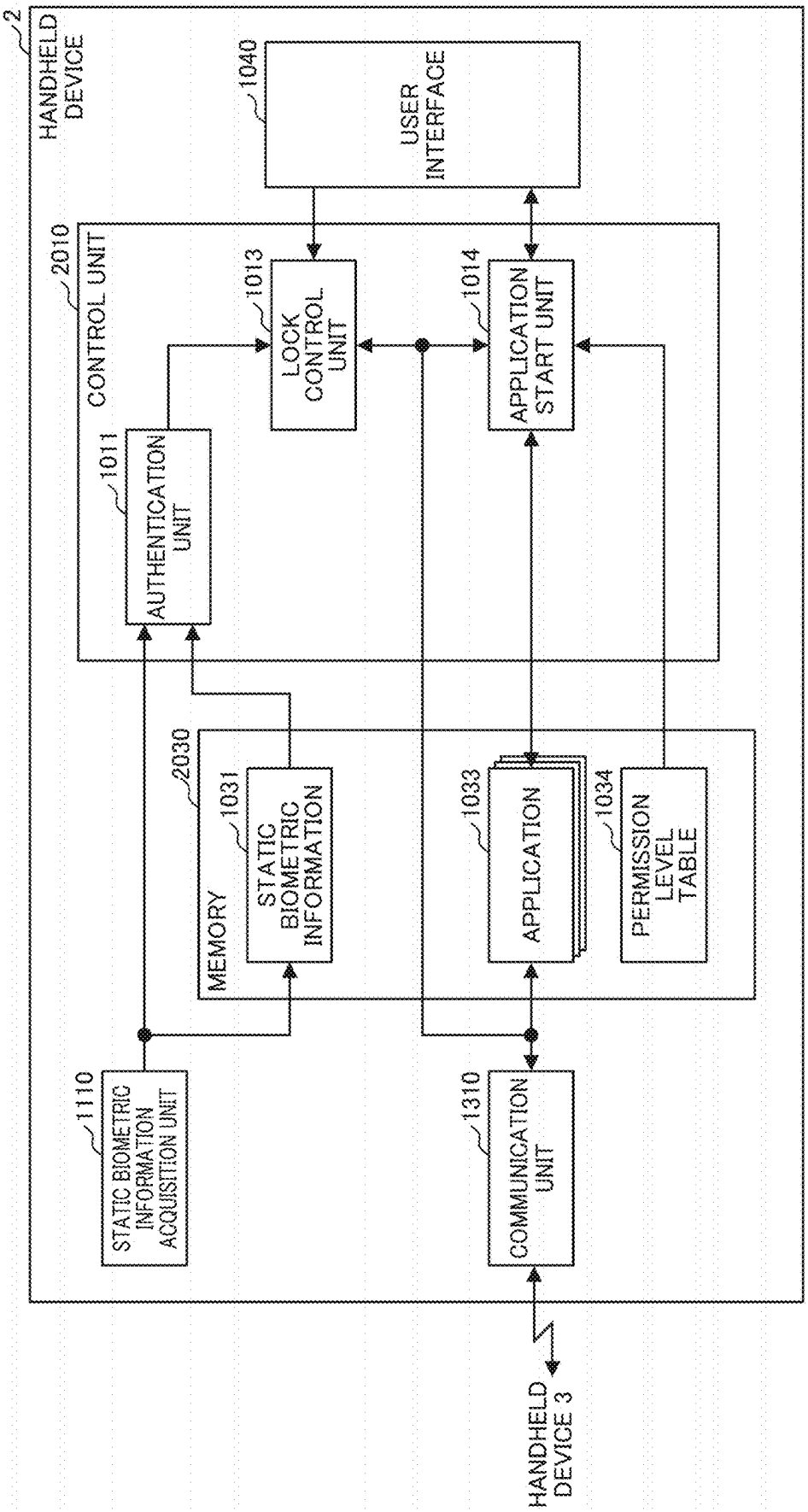

2
HANDHELD DEVICE
1040
USER INTERFACE
2010
CONTROL UNIT
1013
LOCK CONTROL UNIT
1014
APPLICATION START UNIT
1011
AUTHENTICATION UNIT
2030
MEMORY
1031
STATIC BIOMETRIC INFORMATION
1033
APPLICATION
1034
PERMISSION LEVEL TABLE
1110
STATIC BIOMETRIC INFORMATION ACQUISITION UNIT
1310
COMMUNICATION UNIT
HANDHELD DEVICE 3

FIG. 9

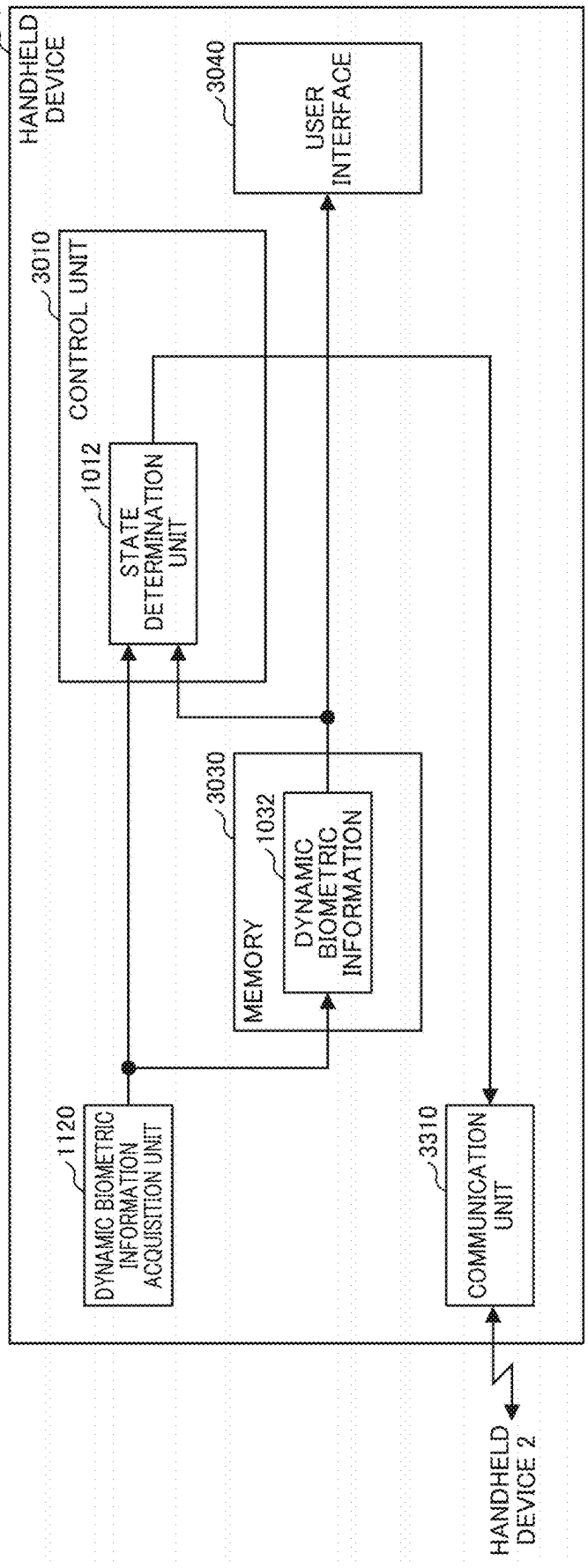

3
HANDHELD DEVICE
3040
USER INTERFACE
3010
CONTROL UNIT
1012
STATE DETERMINATION UNIT
3030
MEMORY
1032
DYNAMIC BIOMETRIC INFORMATION
1120
DYNAMIC BIOMETRIC INFORMATION ACQUISITION UNIT
3310
COMMUNICATION UNIT
HANDHELD DEVICE 2

FIG. 10

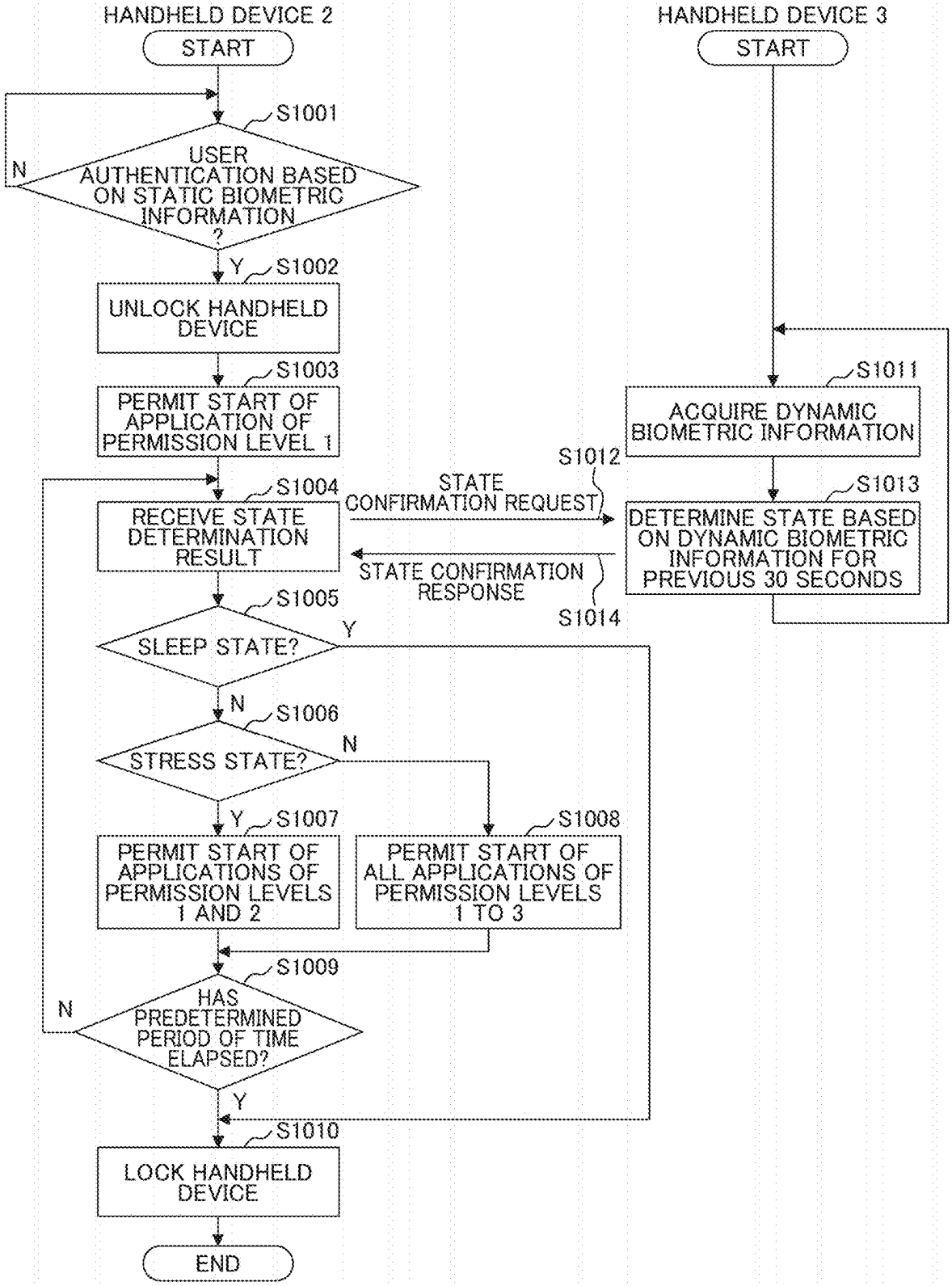

HANDHELD DEVICE 2
START
S1001
USER AUTHENTICATION BASED ON STATIC BIOMETRIC INFORMATION ?
N
Y
S1002
UNLOCK HANDHELD DEVICE
S1003
PERMIT START OF APPLICATION OF PERMISSION LEVEL 1
S1004
RECEIVE STATE DETERMINATION RESULT
S1005
SLEEP STATE?
Y
N
S1006
STRESS STATE?
N
Y
S1007
PERMIT START OF APPLICATIONS OF PERMISSION LEVELS 1 AND 2
S1008
PERMIT START OF ALL APPLICATIONS OF PERMISSION LEVELS 1 TO 3
S1009
HAS PREDETERMINED PERIOD OF TIME ELAPSED?
N
Y
S1010
LOCK HANDHELD DEVICE
END
STATE CONFIRMATION REQUEST
S1012
STATE CONFIRMATION RESPONSE
S1014
HANDHELD DEVICE 3
START
S1011
ACQUIRE DYNAMIC BIOMETRIC INFORMATION
S1013
DETERMINE STATE BASED ON DYNAMIC BIOMETRIC INFORMATION FOR PREVIOUS 30 SECONDS

FIG. 11A

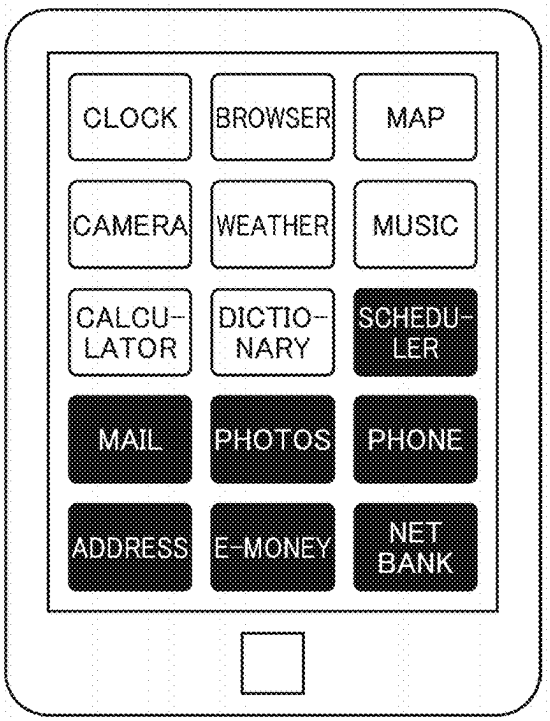


FIG. 11B

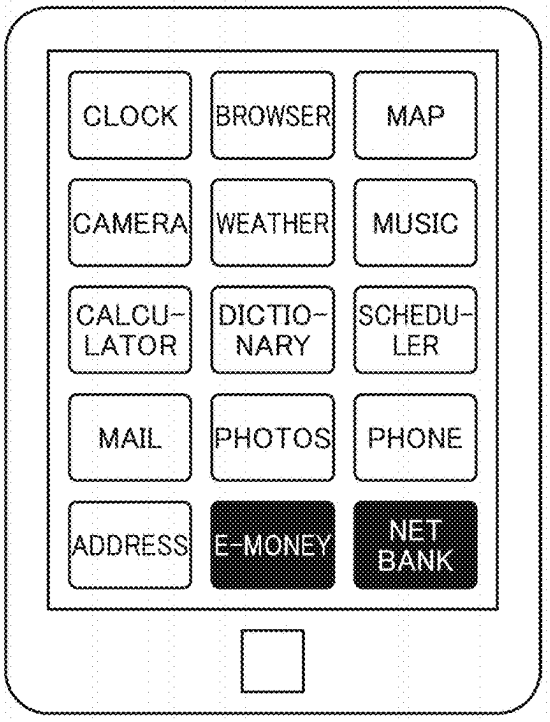


FIG. 11C

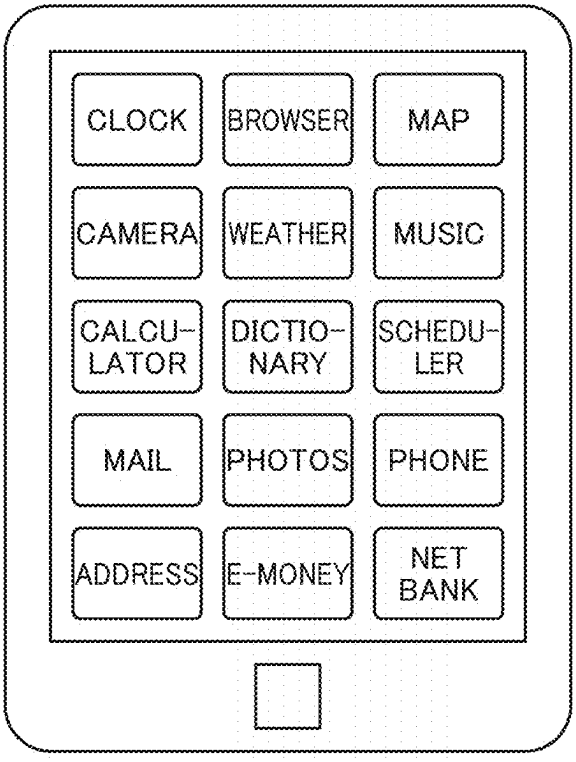

CLOCK
BROWSER
MAP
CAMERA
WEATHER
MUSIC
CALCU-LATOR
DICTIO-NARY
SCHEDU-LER
MAIL
PHOTOS
PHONE
ADDRESS
E-MONEY
NET BANK

FIG. 12

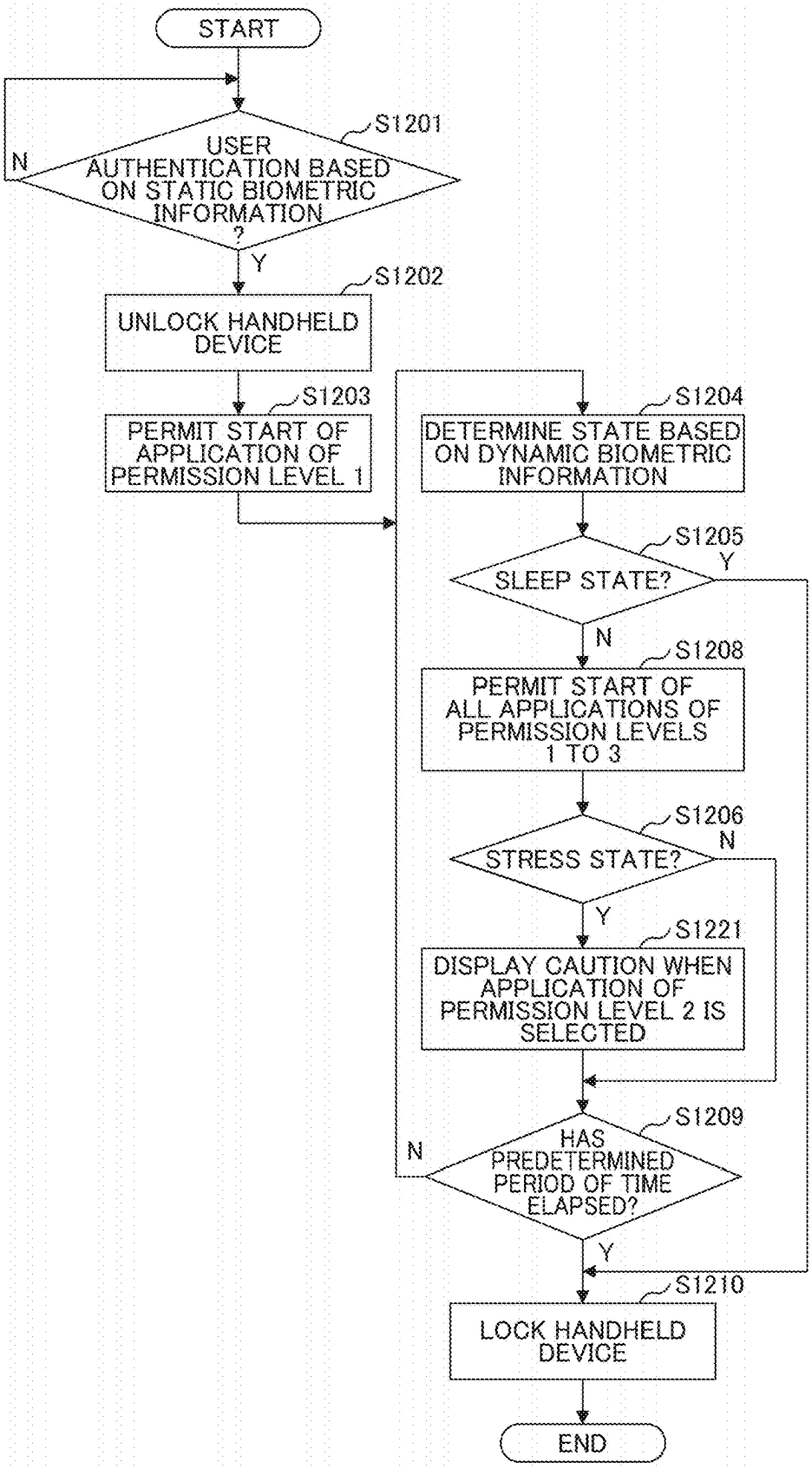

START
S1201
USER AUTHENTICATION BASED ON STATIC BIOMETRIC INFORMATION ?
N
Y
S1202
UNLOCK HANDHELD DEVICE
S1203
PERMIT START OF APPLICATION OF PERMISSION LEVEL 1
S1204
DETERMINE STATE BASED ON DYNAMIC BIOMETRIC INFORMATION
S1205
SLEEP STATE?
Y
N
S1208
PERMIT START OF ALL APPLICATIONS OF PERMISSION LEVELS 1 TO 3
S1206
STRESS STATE?
N
Y
S1221
DISPLAY CAUTION WHEN APPLICATION OF PERMISSION LEVEL 2 IS SELECTED
S1209
HAS PREDETERMINED PERIOD OF TIME ELAPSED?
N
Y
S1210
LOCK HANDHELD DEVICE
END

FIG. 13

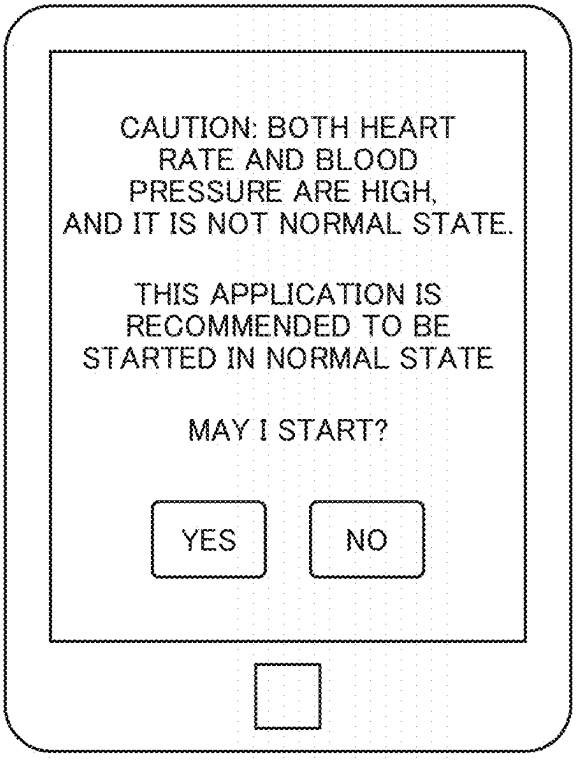

CAUTION: BOTH HEART RATE AND BLOOD PRESSURE ARE HIGH, AND IT IS NOT NORMAL STATE.
THIS APPLICATION IS RECOMMENDED TO BE STARTED IN NORMAL STATE
MAY I START?
YES
NO

FIG. 14

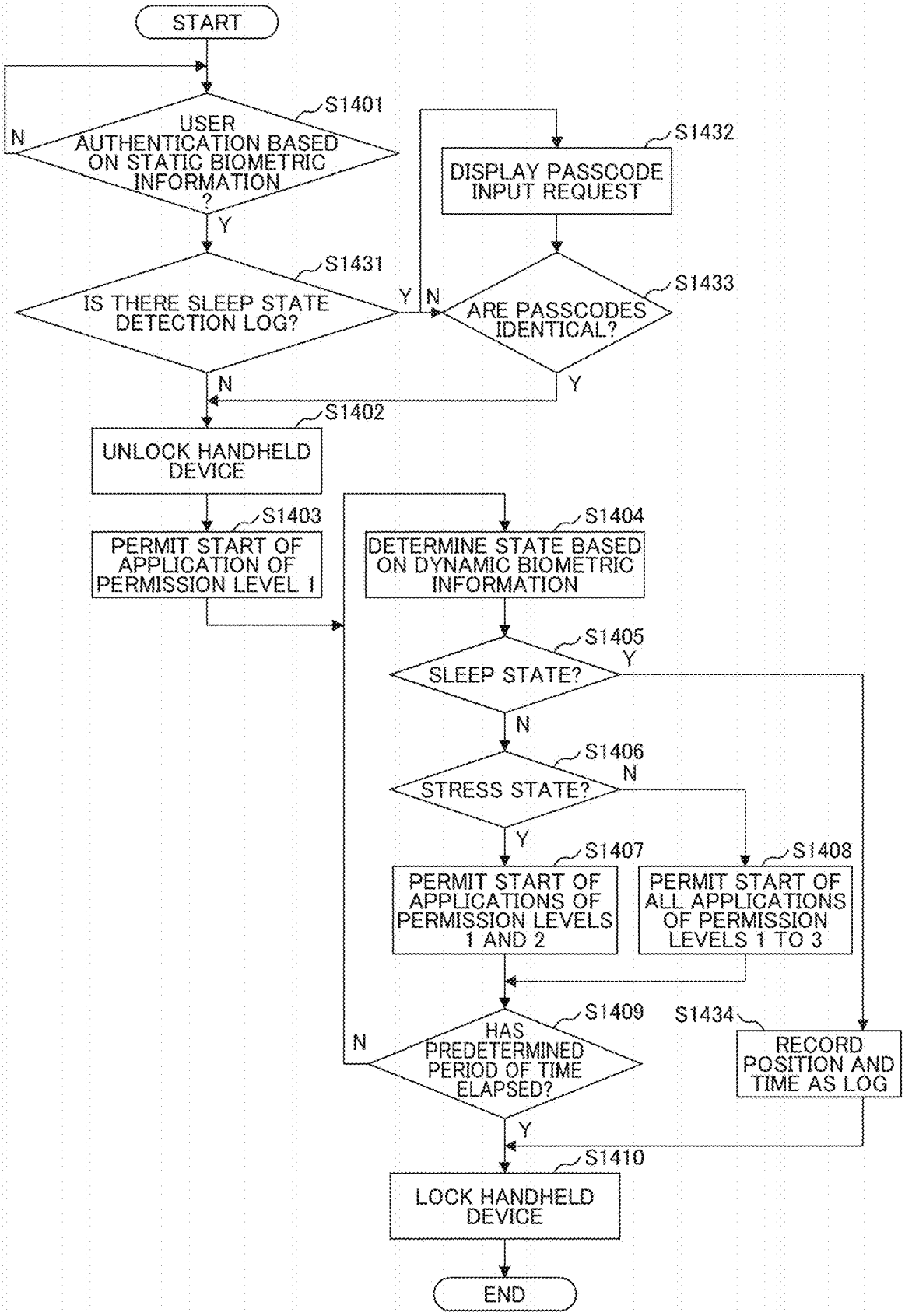

START
S1401
USER AUTHENTICATION BASED ON STATIC BIOMETRIC INFORMATION ?
N
Y
S1431
IS THERE SLEEP STATE DETECTION LOG?
Y
N
S1432
DISPLAY PASSCODE INPUT REQUEST
S1433
ARE PASSCODES IDENTICAL?
N
Y
S1402
UNLOCK HANDHELD DEVICE
S1403
PERMIT START OF APPLICATION OF PERMISSION LEVEL 1
S1404
DETERMINE STATE BASED ON DYNAMIC BIOMETRIC INFORMATION
S1405
SLEEP STATE?
Y
N
S1406
STRESS STATE?
N
Y
S1407
PERMIT START OF APPLICATIONS OF PERMISSION LEVELS 1 AND 2
S1408
PERMIT START OF ALL APPLICATIONS OF PERMISSION LEVELS 1 TO 3
S1409
HAS PREDETERMINED PERIOD OF TIME ELAPSED?
N
Y
S1434
RECORD POSITION AND TIME AS LOG
S1410
LOCK HANDHELD DEVICE
END

FIG. 15

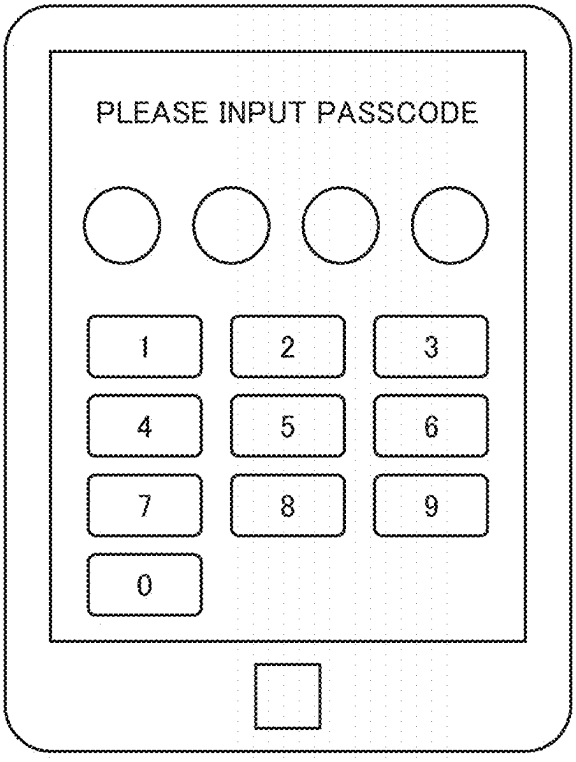


FIG. 16

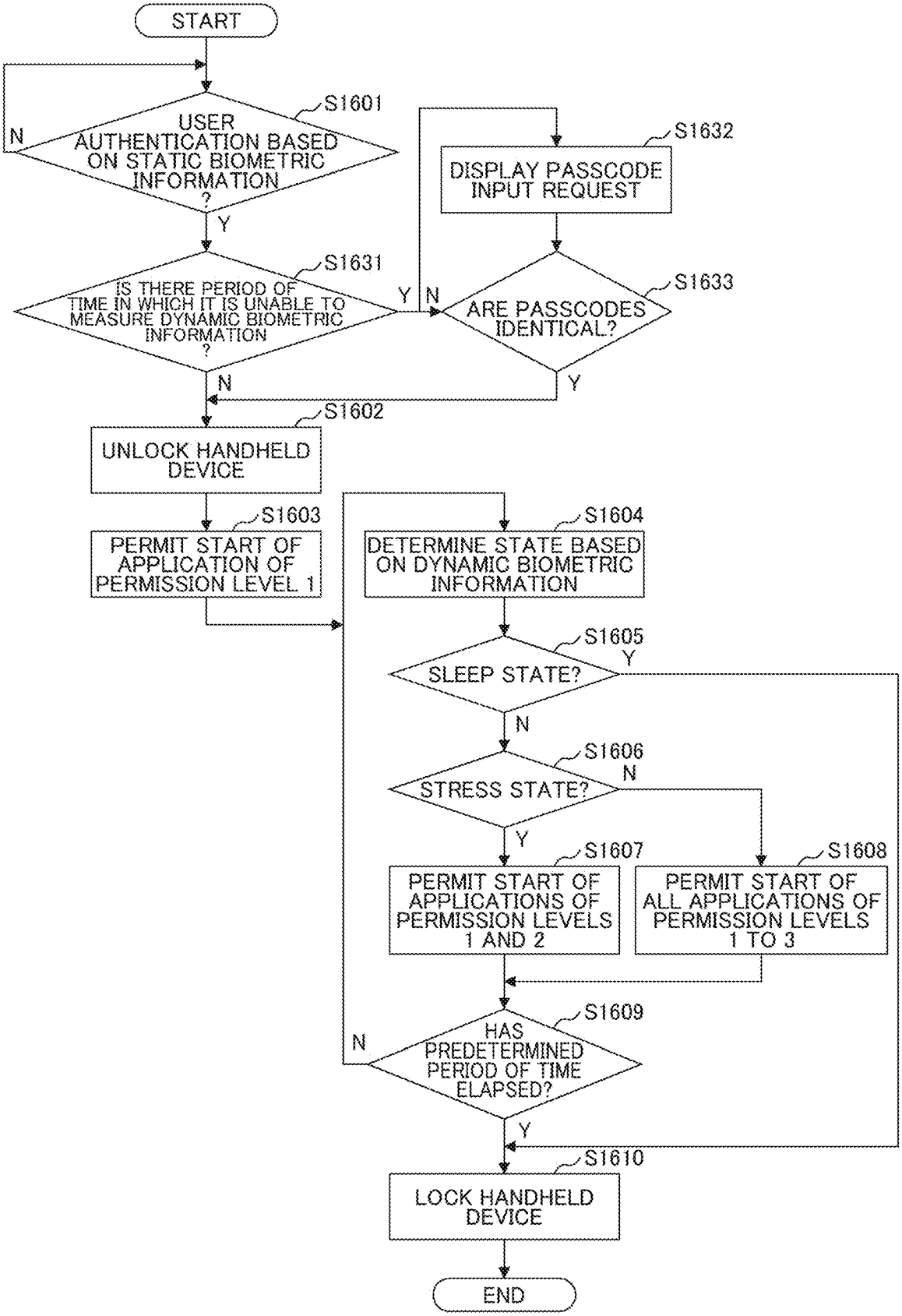
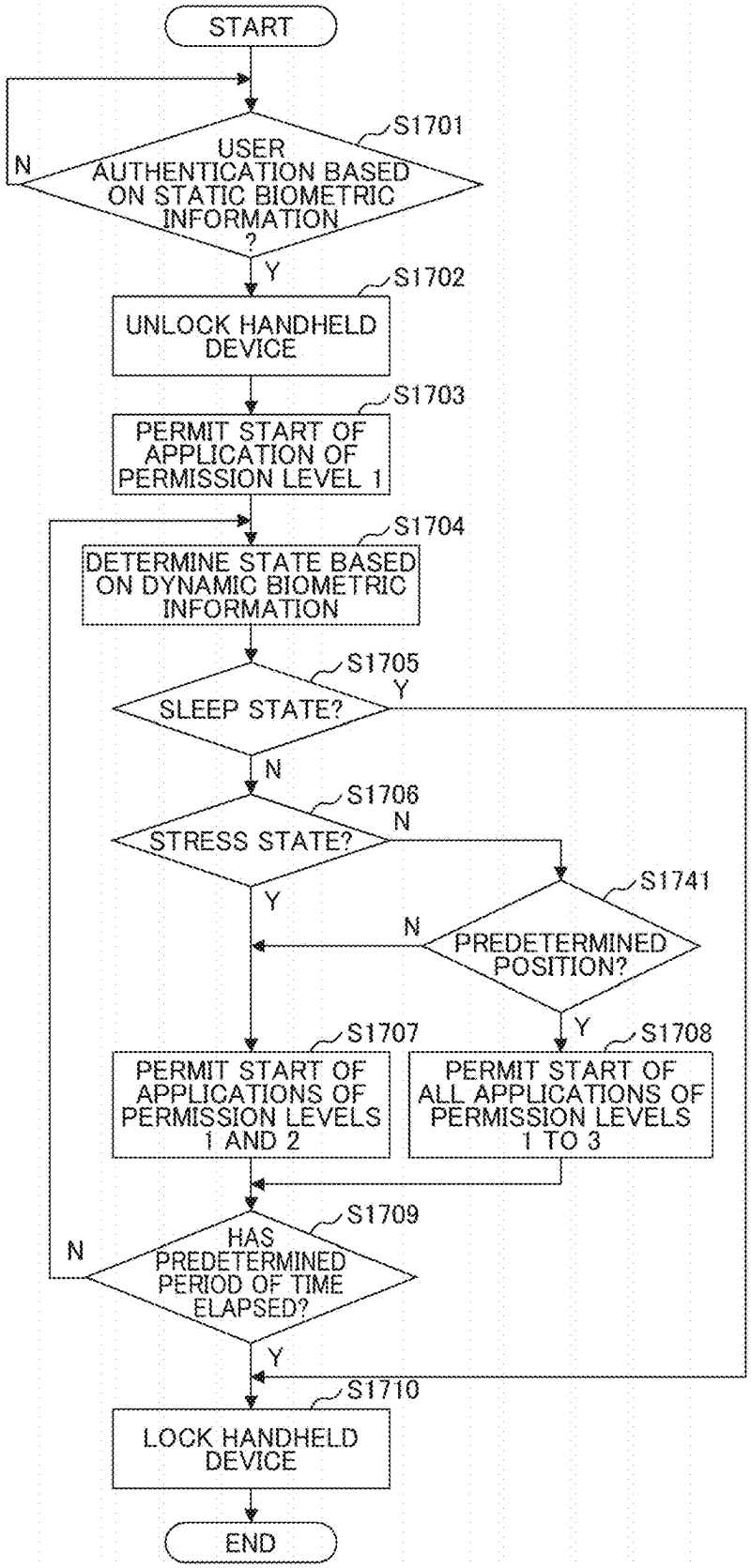

START
S1601
USER AUTHENTICATION BASED ON STATIC BIOMETRIC INFORMATION ?
N
Y
S1631
IS THERE PERIOD OF TIME IN WHICH IT IS UNABLE TO MEASURE DYNAMIC BIOMETRIC INFORMATION ?
Y
N
S1632
DISPLAY PASSCODE INPUT REQUEST
S1633
ARE PASSCODES IDENTICAL?
N
Y
S1602
UNLOCK HANDHELD DEVICE
S1603
PERMIT START OF APPLICATION OF PERMISSION LEVEL 1
S1604
DETERMINE STATE BASED ON DYNAMIC BIOMETRIC INFORMATION
S1605
SLEEP STATE?
Y
N
S1606
STRESS STATE?
N
Y
S1607
PERMIT START OF APPLICATIONS OF PERMISSION LEVELS 1 AND 2
S1608
PERMIT START OF ALL APPLICATIONS OF PERMISSION LEVELS 1 TO 3
S1609
HAS PREDETERMINED PERIOD OF TIME ELAPSED?
N
Y
S1610
LOCK HANDHELD DEVICE
END

FIG. 17


START
S1701
USER AUTHENTICATION BASED ON STATIC BIOMETRIC INFORMATION ?
N
Y
S1702
UNLOCK HANDHELD DEVICE
S1703
PERMIT START OF APPLICATION OF PERMISSION LEVEL 1
S1704
DETERMINE STATE BASED ON DYNAMIC BIOMETRIC INFORMATION
S1705
SLEEP STATE?
Y
N
S1706
STRESS STATE?
N
Y
S1741
PREDETERMINED POSITION?
N
Y
S1707
PERMIT START OF APPLICATIONS OF PERMISSION LEVELS 1 AND 2
S1708
PERMIT START OF ALL APPLICATIONS OF PERMISSION LEVELS 1 TO 3
S1709
HAS PREDETERMINED PERIOD OF TIME ELAPSED?
N
Y
S1710
LOCK HANDHELD DEVICE
END

INFORMATION PROCESSING DEVICE, APPLICATION SOFTWARE START-UP SYSTEM, AND APPLICATION SOFTWARE START-UP METHOD

TECHNICAL FIELD

[0001] The present invention relates to a start-up method of application software used in an information processing device.

BACKGROUND ART

[0002] A background art of the present technical field, there is JP 2005-293209 A (Patent Document 1). A problem is described in Patent Document 1 as follows. "In an existing biometrics authentication, static biometric information is simply used, and it is possible to verify an authorized user, but reading the user's intension is not performed. For this reason, when the user is involved in a certain crime and threatened and forced to perform an illegal operation by a criminal, although a system is equipped with a biometrics authentication, it is likely that the system is illegally operated, leading to heavy damage."

[0003] A solution to this problem is described as follows. "A physical feature information measuring unit that measures biometric information indicating a physical feature, a biometrics authentication unit that performs user identification based on information of the physical feature measured by the physical feature emotional information measuring unit, an feature information measuring unit that measures biometric information indicating an emotional feature, an emotional biometrics determination unit that determines a user mental state based on information of the emotional feature measured by the emotional feature information measuring unit, and an integrated authentication unit that determines that it is an authorized user and it is an authentication operation according to the user's intension based on information of a user identification result by the biometrics authentication unit and a mental state determination result by the emotional biometrics determination unit are provided."

CITATION LIST

Patent Document

[0004] Patent Document 1: JP 2005-293209 A

SUMMARY OF THE INVENTION

Problems to be Solved by the Invention

[0005] In the technique disclosed in Patent Document 1, by using the emotional biometrics, it is possible to detect a situation in which the user is threatened and forced to perform an illegal operation by a criminal, in addition to an examination of the user authentication performed by the existing biometrics authentication. Further, it is possible to check the "user's will" and the "user's intension" for the operation of the user. However, in an information processing device using a plurality of pieces of application software, checking of the "user's will" and the "user's intension" is not necessarily necessary for all pieces of application software, and there are application software in which no checking is necessary and application software in which additional checking of the "state of the user" is desirable.

[0006] In this regard, it is an object of the present invention to provide an information processing device and an application software start-up system which are convenient and capable of limiting application software according to the state of the user.

Solutions to Problems

[0007] In order to solve the above problem, for example, a configuration set forth in a claim is employed. The present invention includes a plurality of mechanisms capable of solving the above problem, and as an example, provided is an application software start-up method of an information processing device which includes performing user authentication based on static biometric determining a state of a user by comparing dynamic biometric information acquired from a body of the user with dynamic biometric information which is measured in advance, and limiting application software to be started according to the determined state of the user based on a permission level which is set to each application software in advance.

Effects of the Invention

[0008] According to the present invention, it is possible to provide an information processing device, an application software start-up system, and an application software start-up method which are convenient.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. **1** is a configuration diagram illustrating a communication system including a handheld device according to a first embodiment.

[0010] FIG. **2** is a hardware configuration diagram illustrating the handheld device according to the first embodiment.

[0011] FIG. **3** is a functional block diagram illustrating the handheld device according to the first embodiment.

[0012] FIG. **4** is a flowchart illustrating an application permission operation of the handheld device according to the first embodiment.

[0013] FIG. **5**A, **5**B, **5**C illustrate a display screen of the handheld device according to the first embodiment.

[0014] FIG. **6** is a configuration diagram illustrating a communication system including a handheld device according to a second embodiment.

[0015] FIG. **7** is a hardware configuration diagram illustrating the handheld device according to the second embodiment.

[0016] FIG. **8** is a functional block diagram illustrating the handheld device according to the second embodiment.

[0017] FIG. **9** is a functional block diagram illustrating the handheld device according to the second embodiment.

[0018] FIG. **10** is a flowchart illustrating an application permission operation of the handheld device according to the second embodiment.

[0019] FIG. **11**A, **11**B, **11**C illustrate a display screen of the handheld device according to the second embodiment.

[0020] FIG. **12** is a flowchart illustrating an application permission operation of a handheld device according to a third embodiment.

[0021] FIG. **13** illustrates a display screen of the handheld device according to the third embodiment.

[0022] FIG. **14** is a flowchart illustrating an application permission operation of a handheld device according to a fourth embodiment.

[0023] FIG. **15** illustrates a display screen of the handheld device according to the fourth embodiment.

[0024] FIG. **16** is a flowchart illustrating an application permission operation of a handheld device according to a fifth embodiment.

[0025] FIG. **17** is a flowchart illustrating an application permission operation of a handheld device according to a sixth embodiment.

MODE FOR CARRYING OUT THE INVENTION

[0026] Hereinafter, exemplary embodiments of the present invention will be described with reference to the appended drawings.

First Embodiment

[0027] FIG. **1** is a configuration diagram illustrating a communication system including a handheld device **1** which is an example of an information processing device used in the present embodiment. The communication system according to the present embodiment is configured with the handheld device **1** worn on the body of the user, a base station **5** of a mobile telephone communication network, a wide area public network **6** such as the Internet, a router **7**, and the like.

[0028] The handheld device **1** is a wristwatch-type handheld device having a communication function and can establish a connection with the base station **5** or the router **7** and acquire various kinds of information from the network **6**. The handheld device **1** includes a fingerprint sensor **11** and a touch panel **12** installed on the surface thereof. Although not illustrated, the handheld device **1** includes a heart rate sensor, a blood pressure sensor, a temperature sensor, and the like which are installed on the back surface to come into contact with the wrist when the user wears it. In the present embodiment, the wristwatch-type handheld device is described as the handheld device **1**, but the handheld device **1** may be a glasses-type handheld device or a ring-type handheld device. Further, the handheld device **1** may be any other portable digital device. Furthermore, an information processing device which is equipped with a sensor that detects dynamic biometric information may be used, and for example, a personal computer (PC) which is equipped with a temperature detection sensor using infrared rays and capable of detecting a body temperature of the user may be used instead of the handheld device.

[0029] The base station **5** is a device that performs a relay between the handheld device **1** and the network **6** and can perform transmission and reception of various kinds of information with the handheld device **1**. The router **7** has a function of a wireless local area network (LAN) such as wireless fidelity (Wi-Fi) and can be connected to the network **6** via a communication line.

[0030] FIG. **2** is a hardware configuration diagram illustrating the handheld device **1** of the present embodiment. A central processing unit (CPU) **101** controls the handheld device **1** in general according to a predetermined program. The CPU **101** may be an arbitrary control circuit or a dedicated circuit such as an application specific IC (ASIC).

[0031] The system bus **102** is a data communication path in which transmission and reception of data are performed between the CPU **101** and the respective units of the handheld device **1**.

[0032] The memory **103** is configured with a read only memory (ROM), a random access memory (RAM), a flash ROM, or the like, and stores a program and various kinds of setting information for controlling the handheld device **1**, an application program (hereinafter, referred to as an "application"), biometric information of the user, and the like.

[0033] The operation device **104** is an input device used to input an operation instruction to the handheld device **1**, and in the present embodiment, the operation device **104** is configured with a touch panel and a button switch which is arranged to be superimposed on a display device **152** (which will be described later). Further, one of the touch panel and the button switch may be arranged. Furthermore, the handheld device **1** may be operated using a keyboard or the like which is connected to an expansion interface (I/F) **105** (which will be described later). Moreover, the handheld device **1** may be operated using a separate information terminal device connected via wired communication or wireless communication. The display device **152** may have the touch panel function.

[0034] The expansion interface **105** is a group of interfaces for expanding the function of the handheld device **1**, and in the present embodiment, the expansion interface **105** is configured with a video/audio interface, a universal serial bus (USB) interface, a memory interface, or the like. The video/audio interface receives a video signal or an audio signal from an external video/audio output device and outputs a video signal or an audio signal to the external video/audio output device. The USB interface establishes a connection with a keyboard or any other USB device. The memory interface is connected to a memory card or any other memory medium and performs transmission reception of data.

[0035] The fingerprint sensor **111** is a sensor that detects static biometric information of the user who uses the handheld device **1**, and detects a fingerprint pattern when the user touches with a finger, compares the detected fingerprint pattern with a fingerprint pattern of the authorized user registered in the memory **103**, and performs user authentication according to whether or not the fingerprint patterns are identical to each other.

[0036] A heart rate sensor **112**, a blood pressure sensor **113**, and a temperature sensor **114** are a group of sensors for detecting the dynamic biometric information of the user who wears the handheld device **1**, and detects the current state of the user by measuring the heart rate, the blood pressure, the body temperature, and the like through the group of sensors and comparing the heart rate, the blood pressure, the body temperature, and the like which are measured with measured values of the authorized user in the normal state which are registered in the memory **103** in advance. Further, any other sensor may be installed.

[0037] A global positioning system receiver **121**, an (GPS) acceleration sensor **122**, a gyro sensor **123**, a geomagnetism sensor **124**, and a proximity sensor **125** are a group of sensors for detecting the state of the handheld device **1**, and it is possible to detect a position, a motion, an inclination, a direction, an approach state of an object therearound, and the like through the group of sensors. Further, any other sensor may be installed.

[0038] A mobile communication device **131** is configured with an antenna and communication circuits including as an encoding circuit and a decoding circuit, and performs telephone communication (call) and transmission reception of data through wireless communication with the base station **5** of the mobile telephone communication network. The LAN communication device **132** is connected to a wireless communication access point through wireless communication and performs transmission reception of data. A short-range wireless communication device **133** performs wireless communication with a peripheral device in a short range. For example, Bluetooth (registered trademark), infrared rays, Wi-Fi direct, or the like is used as the short-range wireless communication. Each of the LAN communication device **132** and the short-range wireless communication device **133** includes an encoding circuit, a decoding circuit, an antenna, and the like.

[0039] An audio input device **141** and an audio output device **142** are audio processing devices of the handheld device **1**. The audio input device **141** is a microphone and converts a voice of the user or the like into audio data and receives it. The audio output device **142** is a speaker and provides an audio signal to the user of the handheld device **1**.

[0040] A video input device **151** and the display device **152** are video processing devices of the handheld device **1**. The video input device **151** is a camera unit that receives video data of a surrounding area or an object by converting light input from a lens into an electrical signal using an electronic device such as a charge coupled device (CCD) sensor or a complementary metal oxide semiconductor (CMOS) sensor. The display device **152** is a display such as a liquid crystal (LC) panel and provides a video signal to the user of the handheld device **1**. The display device **152** includes a video RAM (not illustrated) and has a function of display a video based on video data input to the video RAM and performs format conversion, a process of superimposing a menu or other on screen display (OSD) signals, and the like as necessary.

[0041] The exemplary configuration of the handheld device **1** includes components which are not essential in the present embodiment, but effects of the present embodiment are obtained even through a configuration having no non-essential components. A component which is not illustrated such as a digital television broadcasting receiving function, an e-money payment function, or the like may be further added.

[0042] FIG. **3** is a functional block diagram illustrating the handheld device **1** of the present embodiment. Functional blocks of the handheld device **1** are controlled by the control unit **1010**.

[0043] The control unit **1010** operates on the CPU **101** with which the handheld device **1** illustrated in FIG. **2** is equipped, includes a user authentication unit **1011**, a state determination unit **1012**, a lock control unit **1013**, an application start unit **1014**, and the like, and controls a memory **1030**, a static biometric information acquisition unit **1110**, a dynamic biometric information acquisition unit **1120**, a communication unit **1310**, or the like based on an instruction given from a user interface **1040** such that the static biometric information and the dynamic biometric information are acquired, stored, and compared, the handheld device **1** is locked or unlocked, or an application starts.

[0044] The user interface **1040** is configured with the operation device **104**, the audio input device **141**, the audio output device **142**, the video input device **151**, the display device **152**, and the like which are illustrated in FIG. **2**, and presents the user with various kinds of information and transfers the instruction of the user to the control unit **1010**.

[0045] The static biometric information acquisition unit **1110** is configured with the fingerprint sensor **111** and the like which are illustrated in FIG. **2** and detects a fingerprint and the like which are the static biometric information of the user who uses the handheld device **1**.

[0046] The dynamic biometric information acquisition unit **1120** is configured with the heart rate sensor **112**, the blood pressure sensor **113**, the temperature sensor **114**, and the like which are illustrated in FIG. **2**, and measures the heart rate, the blood pressure, the body temperature, and the like which are the dynamic biometric information of the user who wears the handheld device **1**.

[0047] The communication unit **1310** is configured with the mobile communication device **131**, the LAN communication device **132**, the short-range wireless communication device **133**, and the like which are illustrated in FIG. **2** and performs acquisition of an application and transmission reception of various kinds of data.

[0048] The memory **1030** is configured with the memory **103** and the like which are illustrated in FIG. **2**, and stores static biometric information **1031**, dynamic biometric information **1032**, an application **1033**, a permission level table **1034** which is a table of levels at which applications are permitted to start, and the like, in addition to the program and various kinds of setting information for controlling the handheld device **1**.

[0049] The static biometric information **1031** is, for example, a fingerprint of the authorized user acquired through the static biometric information acquisition unit **1110**. Before the handheld device **1** is used, the static biometric information of the authorized user is registered in advance.

[0050] The dynamic biometric information **1032** is, for example, the heart rate, the blood pressure, and the body temperature of the user acquired through the dynamic biometric information acquisition unit **1120**. When the handheld device **1** is used, for example, the dynamic biometric information of the user in the normal state is measured and registered.

[0051] The application **1033** is an application program acquired through the communication unit **1310** or an application program which is pre-installed. A plurality of application programs can be registered, and an application permission level can be registered in the permission level table **1034** in association with each application program.

[0052] The user authentication unit **1011** determines whether or not the user is an authorized user by comparing the static biometric information acquired through the static biometric information acquisition unit **1110** when the handheld device **1** is used with the static biometric information **1031**. When the user is authenticated to be the authorized user, the lock control unit **1013** is controlled such that the handheld device **1** is unlocked.

[0053] The lock control unit **1013** is controlled by the user authentication unit **1011** such that the lock control unit **1013** unlocks the handheld device **1**, and, for example, when the user interface **1040** is not operated for a certain period of time, the lock control unit **1013** locks the handheld device **1**.

Further, even when the state determination unit **1012** is determined to be in a sleep state, the lock control unit **1013** locks the handheld device **1**.

[0054] The state determination unit **1012** determines the state of the user by comparing the dynamic biometric information acquired through the dynamic biometric information acquisition unit **1120** when the handheld device **1** is used with the dynamic biometric information **1032**, and controls the lock control unit **1013** and the application start unit **1014**. For example, when the user is determined to be in the sleep state, the lock control unit **1013** is controlled such that the lock control unit **1013** locks the handheld device **1**. Further, when the user is determined to be in the normal state, all applications are set to enter a startable state, and when the user is determined to be in a stress state, applications that can be started are limited. Applications to be limited are registered in the permission level table **1034**. A start permission level of each application may be decided in advance and may be registered by the user through the user interface **1040**.

[0055] An application to be started is not limited to the application **1033** stored in the memory **1030**, and an application on the network **6** may be started through the communication unit **1310**.

[0056] FIG. **4** is a flowchart illustrating an application permission operation of the handheld device **1** of the present embodiment. This flowchart illustrates a process of performing the user authentication through the handheld device **1**, checking the state of the user, and limiting an application to be started according to the state of the user. First, the static biometric information is detected, and the user authentication is performed. The static biometric information acquisition unit **1110** acquires the static biometric information, and the user authentication unit **1011** performs the user authentication as to whether or not the acquired static biometric information is identical to the static biometric information **1031** which is registered in advance by comparing the acquired static biometric information with the static biometric information **1031** (S**401**). For example, the fingerprint serving as the static biometric information is detected, the user authentication is performed, and when the detected fingerprint is determined to be identical to the registered fingerprint, the lock control unit **1013** unlocks the handheld device **1** (S**402**), and the application start unit **1014** permits a start of an application of the permission level **1** (S**403**).

[0057] For example, the application of the permission level **1** is an application that does not relate to information of the user him/herself and has no particular problem even when it is used by anyone else such as a clock application, a web browser, a map application, a camera application, a weather forecast application, a music application, a calculator application, a dictionary application, a game application, and a navigation application. The permission level of each application is registered in the permission level table **1034**.

[0058] A display example of a screen of the handheld device **1** at this time is illustrated in FIG. **5**A. The clock application, the web browser, the map application, the calculator application, and the dictionary application are the applications of the permission level **1** and thus are in the startable state, and the other applications have a different icon color which indicates that they are in the non-startable state.

[0059] The user authentication may be performed through any other biometric authentication such as a vein authentication, a face authentication, an iris authentication, or a retina authentication, in addition to the fingerprint authentication, and for example, when the handheld device **1** is worn on the wrist, the user authentication may be performed through the vein authentication for the part on which the handled device **1** is worn, so that a situation in which anyone else wears the handheld device **1** and pretends to be the authorized user can be prevented. Alternatively, the unlocking operation may be performed by inputting a passcode, and a pattern lock may be released by the trajectory of the finger.

[0060] Generally, there is no difference between a period of time in which the static biometric information for the fingerprint authentication, the vein authentication, the face authentication, the iris authentication, the retina authentication, or the like is acquired and a period of time in which the passcode is input, and a period of time taken until the application of the permission level **1** enters the startable state is about several seconds.

[0061] Then, the dynamic biometric information is detected, and the state of the user is determined. The state of the user is determined such that the dynamic biometric information acquisition unit **1120** acquires the dynamic biometric information, and the state determination unit **1012** compares the acquired dynamic biometric information with the dynamic biometric information **1032** that is registered in advance (S**404**).

[0062] For example, the heart rate, the blood pressure, and the body temperature which are the dynamic biometric information are measured in the normal state and registered in the dynamic biometric information **1032**, the dynamic biometric information acquisition unit **1120** measures the heart rate, the blood pressure, and the body temperature, and when the heart rate, the blood pressure, and the body temperature are equal to or less than lower limit values in the normal state, the sleep state is determined. Further, for example, when the heart rate and the blood pressure are equal to or larger than upper limit values in the normal state, the stress state is determined, and a state which corresponds to neither the sleep state nor the stress state is determined to be the normal state.

[0063] Generally, a period of time in which the dynamic biometric information such as the heart rate, the blood pressure, the body temperature, the brain wave, or the amount of sweating is acquired is longer than a period of time in which the static biometric information is acquired, and a period of time taken until applications of permission levels **2** and **3** (which will be described later) enter the startable state is about several tends of seconds. For this reason, acquisition of the dynamic biometric information may start at the same time as when acquisition of the static biometric information starts, or the dynamic biometric information may be constantly acquired, and the state determination may be performed based on the biometric information obtained for previous 30 seconds.

[0064] First, the process is switched according to whether or not the state of the user is the sleep state (S**405**). When the state of the user is determined to be the sleep state, the handheld device **1** is locked (S**410**), and the process ends (the permission level **0**). For example, when the user is asleep in a station, a park, or the like, although another person causes the handheld device **1** to touch the finger of

the user and perform the fingerprint authentication, if the heart rate, the blood pressure, and the body temperature are equal to or less than the lower limit values in the normal state, the state of the user is determined to be the sleep state, and thus the handheld device **1** can be locked.

[0065] When the state of the user is determined not to be the sleep state, the process is switched according to whether or not the state of the user is the stress state (S**406**). When the state of the user is determined to be the stress stat, the applications of the permission levels **1** and **2** are permitted to be started (S**407**).

[0066] For example, the application of the permission level **2** is an application that relates to the user him/herself and is considered to have a problem when it is used by anyone else such as a schedule application, a mail application, a photo application, telephone application, or an address book application. The application of the permission level **2** is an application which is considered to have no particular problem regardless of the state of the user when the user is the authorized user. A display example of a screen of the handheld device **1** at this time is illustrated in FIG. **5**B. In addition to the fact that the applications of the permission level **1** are in the startable state, the schedule application and the mail application are the applications of the permission level **2** and thus are in the startable state, and the other applications have a different icon color which indicates that they are in the non-startable state.

[0067] When the state of the user is determined not to be the stress state (determined to be the normal state), all applications of the permission levels **1** to **3** are permitted to be started (S**408**).

[0068] For example, the application of the permission level **3** is an application that relates to information of the user him/herself and is considered to have a big problem when it is used by anyone else such as an e-money application or an online banking application. The application of the permission level **3** is an application which is considered to have a problem depending on the state of the user even when the user is the authorized user.

[0069] For example, when the user is panicked and unable to make conscious determination due to a bank transfer fraud or the like or when the user is coercive to perform an operation by another person, if the heart rate and the blood pressure are equal to or larger than the upper limit values in the normal state, the state of the user is determined to be the stress state, and the e-money application, the online banking application, and the like can be set not to be started.

[0070] FIG. **5**C illustrates a display example of the screen of the handheld device **1** when all applications are permitted to be started. In addition to the fact that the application of the permission level **1** and the application of the permission level **2** are in the startable state, the e-money application and the online banking application are the applications of the permission level **3** and thus are in the startable state, and it is indicated that all applications are in the startable state.

[0071] Then, the process is switched according to whether or not a predetermined period of time has elapsed while the user does not perform an operation (S**409**). When a predetermined period of time (for example, 10 seconds) has elapsed, the handheld device **1** is locked (S**410**), and the process ends.

[0072] When a predetermined period of time has not elapsed, the process returns to step S**404**, and the process is continued. For example, when the state of the user is determined to be the stress state, and the application of the permission level **3** enters the non-startable state, if the state of the user returns to the normal state later, all applications enter the startable state. Thereafter, when the state of the user is determined to be the stress state again, the application of the permission level **3** enters the non-startable state, and when the state of the user is determined to be the sleep state, the handheld device **1** is locked.

[0073] The permission level of each application may be decided in advance by the handheld device **1** or may be set to be changed by the user.

[0074] The upper limit values and the lower limit values of the heart rate, the body temperature, and the blood pressure in the normal state may be decided in advance by the handheld device **1**, but when the heart rate, the body temperature, and the blood pressure of the user are measured and learned, and the upper limit values and the lower limit values are obtained based on them, more accurate determination can be performed.

[0075] Commonly, in the sleep state, the heart rate, the blood pressure, and the body temperature decrease, and in the stress state, the heart rate and the blood pressure increase, but when the user measures and registers the heart rate, the body temperature, and the blood pressure in the sleep state and the stress state in advance, more accurate determination can be performed. Further, even when anyone else wears the handheld device **1** and causes the handheld device **1** to touch the finger of the authorized user and perform the fingerprint authentication, the heart rate, the body temperature, and the blood pressure are detected to be different from a tendency toward previous measured values of the authorized user, and in this case, the handheld device **1** may be locked.

[0076] The determination of the state of the user may be performed based on other dynamic biometric information such as the brain wave or the amount of sweating in addition to the heart rate, the blood pressure, and the body temperature.

[0077] Further, the terminal device **1** may perform the user authentication based on the dynamic biometric information obtained from a heart rate waveform, a brain wave, or the like instead of the static biometric information obtained from the fingerprint or the like.

[0078] As described above, according to the present embodiment, an application software start-up method of an information processing device includes performing user authentication based on static biometric information, determining a state of a user by comparing dynamic biometric information acquired from a body of the user with dynamic biometric information which is measured in advance, and limiting application software to be started according to the determined state of the user based on a permission level which is set to each application software in advance. Further, the information processing device is forcibly locked according to the determined state of the user.

[0079] Further, an information processing device includes a static biometric information acquisition unit that acquires static biometric information, a user authentication unit that performs user authentication by comparing the acquired static biometric information with static biometric information which is registered in advance, a dynamic biometric information acquisition unit that acquires dynamic biometric information from a body of the user, a state determination unit that determines a state of the user by comparing the

acquired dynamic biometric information which is measured in advance, a lock control unit that unlocks the information processing device through the authentication of the user authentication unit, and an application start unit that starts application software which is selected by the user among a plurality of pieces of application software, wherein the application start unit limits application software to be started according to the state of the user determined by the state determination unit based on a permission level which is set to each application software in advance. Further, the lock control unit forcibly locks the information processing device according to the state of the user determined by the state determination unit.

[0080] Accordingly, in the present embodiment, it is determines whether or not the user is the authorized user based on the static biometric information, the state of the user is determined based on the dynamic biometric authentication, and the start of an application is limited stepwise according to the state of the user. Thus, when determination of the user is suspected, it is possible to limit the start of the specific application, for example, when it is against the user's will.

Second Embodiment

[0081] FIG. **6** is a configuration diagram illustrating a communication system including a handheld device **2** and a handheld device **3** according to the present embodiment. The present communication system is configured with the handheld device **2**, the handheld device **3** worn on the body of the user, a base station **5** such as a mobile telephone communication network, a wide area public network **6** such as the Internet, a router **7**, and the like. The present embodiment is an example in which functions are divided such that the sensors for detecting the dynamic biometric information in the handheld device **1** according to the first embodiment, for example, a heart rate sensor **312**, a blood pressure sensor **313**, a temperature sensor **314**, and the like are installed in the handheld device **3**, and the other functions of the handheld device **1** are implemented in the handheld device **2**.

[0082] In FIG. **6**, the handheld device **2** is a smart phone. The handheld device **2** includes a fingerprint sensor **21** and a touch panel **22** installed on the surface thereof. The handheld device **2** can establish a connection with the base station **5** or the router **7** and acquire various kinds of information from the network **6**. In the present embodiment, the smart phone is described as the handheld device **2**, but the handheld device **2** may be a mobile phone, a tablet terminal, or the like or may be a personal digital assistants (PDA) or a laptop personal computer (PC). Further, the handheld device **2** may be a music player, a digital camera, a portable game machine, or the like having a communication function or an information processing device including any other digital device.

[0083] The handheld device **3** is a wristwatch-type handheld device having a communication function and has a function of performing transmission reception of various kinds of information with the handheld device **2**. The handheld device **3** incudes a touch panel **32** installed on the surface thereof. Although not illustrated, the handheld device **1** includes a heart rate sensor, a blood pressure sensor, a temperature sensor, and the like which are installed on the back surface to come into contact with the wrist when the user wears it. In the present embodiment, the wristwatch-type handheld device is described as the handheld device **3**, but the handheld device **1** may be a glasses-type handheld device or a ring-type handheld device. Further, the handheld device **1** may be any other portable digital device.

[0084] FIG. **7** is a hardware configuration diagram illustrating the handheld device **2** and the handheld device **3** according to the present embodiment. In FIG. **7**, the same components as those in FIG. **2** which is a hardware configuration diagram illustrating the handheld device **1** according to the first embodiment are denoted by the same reference numerals. In FIG. **7**, components of the handheld device **2** is similar to the components obtained by excluding the heart rate sensor **112**, the blood pressure sensor **113**, and the temperature sensor **114** from the components of FIG. **2**, and a description of the components is omitted. Further, components of the handheld device **3** are similar to the components described above with reference to FIG. **2**, and thus a description of the components is omitted.

[0085] The heart rate sensor **312**, the blood pressure sensor **313**, and the temperature sensor **314** of the handheld device **3** are a group of sensors for detecting the state of the user who wears the handheld device **3** and can detect, for example, the heart rate, the blood pressure, and the body temperature of the user through the group of sensors. Further, any other sensor may be installed. The handheld device **3** transmits the detected data to the handheld device **2** through the short-range wireless communication device **133**. The handheld device **2** can receive the detected data through the short-range wireless communication device **133** and detect the state of the user who wears the handheld device **3**. The handheld device **2** and the handheld device **3** are assumed to be in an authenticated state.

[0086] The exemplary configurations of the handheld devices **2** and **3** illustrated in FIG. **7** includes components which are not essential in the present embodiment, but effects of the present embodiment are obtained even through a configuration having no non-essential components. A component which is not illustrated such as a digital television broadcasting receiving function, an e-money payment function, or the like may be further added.

[0087] FIG. **8** is a functional block diagram illustrating the handheld device **2** according to the present embodiment. In FIG. **8**, the same components as those in FIG. **3** which is a functional block diagram illustrating the handheld device **1** according to the first embodiment are denoted by the same reference numerals.

[0088] In FIG. **8**, the components of the handheld device **2** are similar to the components obtained by excluding the dynamic biometric information acquisition unit **1120**, the dynamic biometric information memory **1032**, and the state determination unit **1012** from the components of FIG. **3**, and thus a description of the same components as in FIG. **3** is omitted.

[0089] The functional blocks of the handheld device **2** are controlled by the control unit **2010**. The control unit **2010** operates on the CPU **101** with which the handheld device **2** illustrated in FIG. **8** is equipped, includes the user authentication unit **1011**, the lock control unit **1013**, the application start unit **1014**, and the like, and controls a memory **2030**, the static biometric information acquisition unit **1110**, the communication unit **1310**, and the like based on an instruction given from the user interface **1040** such that the static biometric information is acquired, stored, and compared, the handheld device **2** is locked or unlocked, or an application starts.

[0090] The memory **2030** is configured with the memory **103** and the like which are illustrated in FIG. **7**, and stores static biometric information **1031**, an application **1033**, a permission level table **1034** which is a table of levels at which applications are permitted to start, and the like, in addition to the program and various kinds of setting information for controlling the handheld device **2**.

[0091] The communication with the handheld device **3** is performed through the short-range wireless communication device **133**.

[0092] FIG. **9** is a functional block diagram illustrating the handheld device **3** according to the present embodiment. In FIG. **9**, the same components as those in FIG. **3** which is a functional block diagram illustrating the handheld device **1** according to the first embodiment are denoted by the same reference numerals. In FIG. **9**, the components of the handheld device **3** include the dynamic biometric information acquisition unit **1120**, the dynamic biometric information memory **1032**, and the state determination unit **1012** among the components of FIG. **3**, and thus a detailed description thereof is omitted.

[0093] The functional blocks of the handheld device **3** are controlled by the control unit **3010**. The control unit **3010** operates on the CPU **101** with which the handheld device **3** illustrated in FIG. **7** is equipped, includes the state determination unit **1012** and the like, and controls the dynamic biometric information acquisition unit **1120**, a memory **3030**, a communication unit **3310**, and the like based on an instruction given from a user interface **3040** such that the dynamic biometric information is acquired, stored, transmitted, and displayed.

[0094] The user interface **3040** is configured with the operation device **104**, the audio output device **142**, the display device **152**, and the like which are illustrated in FIG. **7**, and presents the user with various kinds of information and transfers the instruction of the user to the control unit **3010**.

[0095] The communication unit **3310** is configured with a short-range wireless communication device **333** and the like which are illustrated in FIG. **7** and performs communication with the handheld device **2**.

[0096] The memory **3030** is configured with the memory **103** and the like which are illustrated in FIG. **7**, and stores a program and various kinds of setting information for controlling the handheld device **3**.

[0097] The state determination unit **1012** determines the state of the user by comparing the dynamic biometric information acquired through the dynamic biometric information acquisition unit **1120** when the handheld device **3** is used with the dynamic biometric information **1032**, and transmits the state of the user to the handheld device **2** through the communication unit **3310**.

[0098] For example, when the user is determined to be in the sleep state, the sleep state is transmitted to the handheld device **2** through the communication unit **3310**, so that the handheld device **2** is locked. Further, an application to be started in the handheld device **2** is limited according to the state of the user. Further, when the user is determined to be in the normal state, all applications are set to enter the startable state, and when the user is determined to be in the stress state, applications that can be started are limited.

[0099] FIG. **10** is a flowchart illustrating an application permission operation of the handheld devices **2** and **3** of the present embodiment. This flowchart illustrates a process of performing the user authentication through the handheld device **2**, checking the state of the user through the handheld device **3**, and limiting an application to be started according to the state of the user.

[0100] First, the handheld device **2** detects the static biometric information, and performs the user authentication (S**1001**). For example, it is determined whether or not the user is the authorized user through the fingerprint authentication. In other words, a fingerprint pattern detected when the user touches the fingerprint sensor **211** with the finger is compared with the fingerprint pattern of the user registered in the memory **203**, and it is determined whether or not the two fingerprints are identical to each other. When the two fingerprints are determined to be identical to each other, the handheld device **2** is unlocked (S**1002**), and the application of the permission level **1** is permitted to be started (S**1003**).

[0101] A display example of a screen of the handheld device **2** at this time is illustrated in FIG. **11**A. The clock application, the web browser, the map application, the camera application, the weather forecast application, the music application, the calculator application, and the dictionary application are the applications of the permission level **1** and thus are in the startable state, and the other applications have a different icon color which indicates that they are in the non-startable state.

[0102] The user authentication may be performed through any other biometric authentication such as the vein authentication, the face authentication, the iris authentication, or the retina authentication, the unlocking operation may be performed by inputting a passcode, and a pattern lock may be released by the trajectory of the finger.

[0103] The handheld device **3** measures the heart rate through the heart rate sensor **312**, measures the blood pressure through the blood pressure sensor **313**, and measures the body temperature through the temperature sensor **314** (S**1011**).

[0104] The handheld device **2** requests the handheld device **3** to confirm the state of the user through a short-range wireless communication device **233** (S**1012**).

[0105] The handheld device **3** detects the dynamic biometric information, and determines the state of the user (S**1013**). For example, the state of the user is determined based on a result of measuring the heart rate, the blood pressure, and the body temperature. In other words, for example, when the heart rate, the blood pressure, and the body temperature measured through the heart rate sensor **312**, the blood pressure sensor **313**, the temperature sensor **114** of the handheld device **3** are equal to or less than the lower limit values in the normal state, the state of the user is determined to be the sleep state. Further, for example, when the heart rate and the blood pressure are equal to or larger than the upper limit values in the normal state, the state of the user is determined to be the stress state, and the state which corresponds to neither the sleep state nor the stress state is determined to be the normal state.

[0106] The handheld device **3** constantly acquires the dynamic biometric information, and performs, for example, the state determination based on the biometric information obtained for previous 30 seconds.

[0107] Then, the handheld device **3** transmits the state of the user to the handheld device **2** through the short-range wireless communication device **333** as a response (S**1014**).

[0108] The handheld device **2** switches the process according to whether or not the state of the user received

through the short-range wireless communication device **233** is the sleep state (S**1005**). When the state of the user is determined to be the sleep state, the handheld device **2** is locked (S**1010**), and the process ends.

[0109] Further, even when the user does not wear the handheld device **3** or even when the terminal device **3** does not transmit the state of the user to the handheld device **2** as a response, the handheld device **2** is locked, and the process ends.

[0110] Steps S**1006** to **1009** which are processes performed when the state of the user is determined not to be the sleep state are similar to steps S**406** to **409** of FIG. **4** in the first embodiment, and thus a detailed description thereof is omitted.

[0111] A display example of the screen of the handheld device **2** when the applications of the permission levels **1** and **2** are permitted to be started in S**1007** is illustrated in FIG. **11**B. In addition to the fact that the applications of the permission level **1** are in the startable state, the schedule application, the mail application, the photo application, the telephone application, and the address book application are the applications of the permission level **2** and thus are in the startable state, and the other applications have a different icon color which indicates that they are in the non-startable state.

[0112] A display example of the screen of the handheld device **2** when all the applications of the permission levels **1** to **3** are permitted to be started in S**1008** is illustrated in FIG. **11**C. In addition to the fact that the applications of the permission levels **1** and **2** are in the startable state, the e-money application and the online banking application are the applications of the permission level **3** and thus are in the startable state, and it is indicated that all applications are in the startable state.

[0113] In the present embodiment, the handheld device **3** determines the state of the user, but the handheld device **3** may not determine the state of the user but transmit the measured values of the heart rate, the blood pressure, and the body temperature to the handheld device **2**, and the handheld device **2** may determine the state of the user.

[0114] Further, the terminal device **2** may not perform the user authentication for the user, and the terminal device **3** may control whether or not the terminal device **2** is locked by performing the user authentication through the fingerprint authentication or the like and transmitting an authentication result to the terminal device **2**. At this time, the terminal device **3** may perform the user authentication based on the dynamic biometric information obtained from the heart rate waveform, the brain wave, or the like rather than the static biometric information obtained from the fingerprint or the like.

[0115] In the present embodiment, the example in which the number of handheld devices is 2 has been described, but the number of handheld devices may be three or more, and the authentication function and the state determination function may be separated. In other words, the system including a plurality of handheld devices according to the present embodiment can be understood to be an application software start-up system including a plurality of information processing devices.

[0116] As described above, according to the present embodiment, an application software start-up method of an information processing device including a plurality of information processing devices includes performing, by at least one of the information processing devices, user authentication based on static biometric information of a body of a user, determining, by another information processing device, a state of a user by comparing dynamic biometric information acquired from the body of the user with dynamic biometric information which is measured in advance, and limiting application software to be started according to the determined state of the user based on a permission level which is set to each application software in advance.

[0117] Further, An application software start-up system includes first and second first information processing devices, the first information processing device includes a static biometric information acquisition unit that acquires static biometric information of a body, a user authentication unit that performs user authentication by comparing the acquired static biometric information with static biometric information which is registered in advance, a lock control unit that unlocks a handheld device through the authentication of the user authentication unit, an application start unit that starts application software which is selected by a user among a plurality of pieces of application software, and a first communication unit that receives a state of the user from the second information processing device, and the second information processing device includes a dynamic biometric information acquisition unit that acquires dynamic biometric information from the body of the user, a state determination unit that determines a state of the user by comparing the acquired dynamic biometric information which is measured in advance, and a second communication unit that transmits the determined state of the user to the first information processing device, wherein the application start unit limits application software to be started according to the state of the user received from the first communication unit based on a permission level which is set to each application software in advance.

[0118] Accordingly, in the present embodiment, the same effects as in the first embodiment are obtained, and when a plurality of handheld devices are registered in advance, and the user authentication function and the state determination function are distributed, each handheld device can be worn on a part of the body suitable for acquisition of each biometric information, and thus the handheld devices can be implemented in a form optimal for the respective functions.

Third Embodiment

[0119] FIG. **12** is a flowchart illustrating an application permission operation of the handheld device **1** of the present embodiment. In FIG. **12**, steps S**1201** to S**1204** are similar to steps S**401** to S**404** of FIG. **4** in the first embodiment, and thus a description thereof is omitted.

[0120] In step S**1205**, the process is switched according to whether or not the state of the user is the sleep state. When the state of the user is determined to be the sleep state, the handheld device **1** is locked (S**1210**), and the process ends. When the state of the user is determined not to be the sleep state in step S**1205**, all the applications of the permission levels **1** to **3** are permitted to be started (S**1208**).

[0121] Here, the process is switched according to whether or not the state of the user is the stress state (S**1206**). When the state of the user is determined to be the stress stat, if the user selects the application of the permission level **3**, a caution screen is displayed (S**1221**), and it is started only when the user confirms it. When the state of the user is

determined not to be the stress state (determined to be the normal state), the caution screen is not displayed.

[0122] For example, when the application of the permission level **3** such as the e-money application of the online banking application is requested to be started, an application software start confirmation screen illustrated in FIG. **13** is displayed on the display device **152**.

[0123] Steps S**1209** to S**1210** are similar to steps S**409** to S**410** of FIG. **4**, and thus a description thereof is omitted.

[0124] The determination of the state of the user may be performed based on other dynamic biometric information such as the brain wave or the amount of sweating in addition to the heart rate, the blood pressure, and the body temperature.

[0125] In the present embodiment, the example in which the number of handheld devices is 1 has been described, but the number of handheld devices may be two or more, and the authentication function and the state determination function may be separated.

[0126] Through the above configuration, in the present embodiment, the same effects as in the first embodiment can be obtained, and since it is checked when a specific application is started according to the state of the user, for example, when determination of the user is suspected, it is possible to encourage reconsideration of the start of the specific application.

Fourth Embodiment

[0127] FIG. **14** is a flowchart illustrating an application permission operation of the handheld device **1** of the present embodiment. In FIG. **14**, steps S**1401** to S**1403** are similar to steps S**401** to S**403** of FIG. **4**, and thus a process of inputting a passcode (S**1431** to S**1433**) is added.

[0128] First, the static biometric information is detected, and the user authentication is performed. The static biometric information acquisition unit **1110** acquires the static biometric information, and the user authentication unit **1011** performs the user authentication as to whether or not the acquired static biometric information is identical to the static biometric information **1031** which is registered in advance by comparing the acquired static biometric information with the static biometric information **1031** (S**1401**). For example, the fingerprint serving as the static biometric information is detected, the user authentication is performed, and when the detected fingerprint is determined to be identical to the registered fingerprint, the process proceeds to step S**1431**. The user authentication may be performed through any other biometric authentication such as the vein authentication, the authentication, face the iris authentication, or the retina authentication, in addition to the fingerprint authentication.

[0129] Then, the process is switched according to whether or not a sleep state detection log (which will be described later) in the memory **103** (S**1431**). When there is no sleep state detection log, the process proceeds to step S**1402**, and the lock control unit **1013** unlocks the handheld device **1**, and the application start unit **1014** permits the start of the application of the permission level **1** (S**1403**).

[0130] When there is a sleep state detection log, the process proceeds to step S**1432**, a passcode input request screen illustrated in FIG. **15** is displayed, and the process proceeds to step S**1402** when a passcode which is information other than the biometric information input from the user interface **1040** such as the operation device **104** or the audio input device **141** is identical to a passcode which is set in advance in step S**1433**. A pattern lock may be released by the trajectory of the finger instead of the passcode.

[0131] Steps S**1404** to S**1410** are similar to step S**404** to S**410** of FIG. **4**, but a process of recording the sleep state detection log (S**1434**) is added.

[0132] When the state of the user is determined to be in the sleep state in step S**1405**, since it is suspected that anyone else causes the handheld device **1** to touch the finger of the user and perform the user authentication, in step S**1434**, position information which is a place in which the user authentication is performed is specified through the GPS receiver **121** and recorded as a log together with time information, the handheld device **1** is locked (S**1410**), and the process ends. The log is recorded in the memory **103**.

[0133] Further, in step S**1434**, a warning may be displayed on the display device **152**, a vibrator for an incoming call may be operated, a photograph or a video may be captured through the video input device **151**, attached to an e-mail together with the log, and transmitted to an address which is designated in advance.

[0134] In the present embodiment, the example in which the number of handheld devices is 1 has been described, but the number of handheld devices may be two or more, and the authentication function and the state determination function may be separated.

[0135] Through the above configuration, in the present embodiment, the same effects as in the first embodiment can be obtained, and when the handheld device is likely to be operated by anyone else, a warning is displayed, a photograph is captured, and a log is recorded, and thus it can be expected that a family member or anyone else is prevented from furtively looking at an e-mail. Further, when the log is recorded, it is necessary to input the passcode in order to lock the handheld device, and thus it is possible to prevent anyone else from performing the unlocking operation.

Fifth Embodiment

[0136] FIG. **16** is a flowchart illustrating an application permission operation of the handheld device **1** of the present embodiment. In FIG. **16**, steps S**1601** to S**1603** are similar to steps S**401** to S**403** of FIG. **4** in the first embodiment, and thus a process of inputting a passcode (S**1631** to S**1633**) is added.

[0137] First, the static biometric information is detected, and the user authentication is performed. The static biometric information acquisition unit **1110** acquires the static biometric information, and the user authentication unit **1011** performs the user authentication as to whether or not the acquired static biometric information is identical to the static biometric information **1031** which is registered in advance by comparing the acquired static biometric information with the static biometric information **1031** (S**1601**). For example, the fingerprint serving as the static biometric information is detected, the user authentication is performed, and when the detected fingerprint is determined to be identical to the registered fingerprint, the process proceeds to step S**1631**. The user authentication may be performed through any other biometric authentication such as the vein authentication, the face authentication, the iris authentication, or the retina authentication, in addition to the fingerprint authentication.

[0138] Then, the process is switched according to whether or not there is a period of time in which it is unable to measure the dynamic biometric information after the handheld device **1** is previously unlocked (S**1631**). When there is

not period of time in which it is unable to measure the dynamic biometric information, the process proceeds to step S**1602**, the lock control unit **1013** unlocks the handheld device **1**, and the application start unit **1014** permits the start of the application of the permission level **1** (S**1603**).

[0139] When there is a period of time in which it is unable to measure the dynamic biometric information, since anyone else is likely to wear the handheld device **1**, cause the handheld device **1** to touch the finger of the user, and perform the user authentication, the passcode input request screen illustrated in FIG. **15** is displayed on the handheld device **1**, and when the input passcode is identical to the passcode which is set in advance in step S**1633**, the process proceeds to step S**1602**. A pattern lock may be released by the trajectory of the finger instead of the passcode.

[0140] Steps S**1604** to S**1610** are similar to step S**404** to S**410** of FIG. **4**, and thus a description thereof is omitted.

[0141] In the present embodiment, the example in which the number of handheld devices is 1 has been described, but the number of handheld devices may be two or more, and the authentication function and the state determination function may be separated.

[0142] Through the above configuration, in the present embodiment, the same effects as in the first embodiment can be obtained, and when the handheld device is removed, it is necessary to input the passcode in order to unlock the handheld device next time, and thus it is possible to prevent anyone else from performing the unlocking operation.

Sixth Embodiment

[0143] FIG. **17** is a flowchart illustrating an application permission operation of the handheld device **1** of the present embodiment. In FIG. **17**, steps S**1701** to S**1710** are similar to steps S**401** to S**410** of FIG. **4** in the first embodiment, and thus a process of switching an application according to a current position (S**1741**) is added.

[0144] In step S**1706**, the process is switched according to whether or not the state of the user is the stress state. When the state of the user is determined to be the stress state, the applications of the permission levels **1** and **2** are permitted to be started (S**1707**). When the state of the user is determined not to be the stress state (determined to be the normal state), the process is switched according to the current position of the handheld device **1** (S**1741**). The current position is specified through the GPS receiver **121**, and when the current position is a predetermined position which is set in advance, all the applications of the permission levels **1** to **3** are permitted to be started (S**1708**). The predetermined position is, for example, the user's home or company or the like. When the current position is not a predetermined position which is set in advance, the applications of the permission levels **1** and **2** are permitted to be started (S**1707**).

[0145] Alternatively, all the applications of the permission levels **1** to **3** may be permitted to be started at a predetermined timing which is set in advance.

[0146] Alternatively, a face photograph of the user may be registered, and all the applications of the permission levels **1** to **3** may be permitted to be started when a face is captured through the video input device **151**, and the user is recognized. Alternatively, all the applications of the permission levels **1** to **3** may be permitted to be started when the user is recognized, but anyone else around the user except the user is not recognized.

[0147] The determination of the state of the user may be performed based on other dynamic biometric information such as the brain wave or the amount of sweating in addition to the heart rate, the blood pressure, and the body temperature.

[0148] In the present embodiment, the example in which the number of handheld devices is 1 has been described, but the number of handheld devices may be two or more, and the authentication function and the state determination function may be separated.

[0149] Through the above configuration, in the present embodiment, the same effects as in the first embodiment can be obtained, and a specific application is permitted to be started when the user is at a safe position which is set in advance, and thus it is possible to limit the start of the application at a place which is not assumed by the user.

[0150] The above embodiments have been described in detail in order to facilitate understanding of the present invention, and the present invention is not limited to one necessarily having all components described above. Further, a component of a certain embodiment may be replaced with a component of another embodiment, and a component of a certain embodiment may be added to a component of another embodiment. Furthermore, addition, deletion, or replacement of another component may be performed on a component of each embodiment.

[0151] Further, all or some of the components, the functions, processing units, the processing devices, and the like described above may be implemented by hardware, for example, may be designed by, for example, an integrated circuit (IC). Furthermore, each component, each function, or the like may be implemented by software by interpreting and executing a program that implements each function through a processor. Information such as a program that implements each function, a table, or a file may be stored in a memory, a recording device such as a hard disk or a solid state drive (SSD), or a recording medium such as an IC card or an SD card.

[0152] Further, control lines or information lines considered to be necessary for the sake of description are illustrated, and all control lines or information lines necessary in a product are not necessarily illustrated. Practically, most of components may be considered to be connected with one another.

REFERENCE SIGNS LIST

[0153] **1**, **2**, **3** handheld device
[0154] **5** base station
[0155] **6** network
[0156] **7** router
[0157] **101** CPU
[0158] **102** system bus
[0159] **103** memory
[0160] **104** operation device
[0161] **105** expansion interface
[0162] **111** fingerprint sensor
[0163] **112** heart rate sensor
[0164] **113** blood pressure sensor
[0165] **114** temperature sensor
[0166] **121** GPS receiver
[0167] **122** acceleration sensor
[0168] **123** gyro sensor
[0169] **124** geomagnetism sensor

[0170] **125** proximity sensor
[0171] **131** mobile communication device
[0172] **132** LAN communication device
[0173] **133** short-range wireless communication device
[0174] **141** audio input device
[0175] **142** audio output device
[0176] **151** video input device
[0177] **152** display device
[0178] **1010** control unit
[0179] **1011** user authentication unit
[0180] **1012** state determination unit
[0181] **1013** lock control unit
[0182] **1014** application start unit
[0183] **1030** memory
[0184] **1031** static biometric information
[0185] **1032** dynamic biometric information
[0186] **1033** application
[0187] **1034** the permission level table
[0188] **1040** user interface
[0189] **1110** static biometric information acquisition unit
[0190] **1120** dynamic biometric information acquisition unit
[0191] **1310** communication unit

The invention claimed is:

1. An information processing device, comprising:

a static biometric information acquisition sensor that acquires static biometric information;

a processor that performs user authentication based on the acquired static biometric information and obtains an authentication result;

a wireless communication interface that:

performs communication with another information processing device; and

receives dynamic biometric information from the another information processing device; and

a display screen that displays information based on a state of the user that is determined using the received dynamic biometric information,

wherein the processor is configured to, in response to receiving information indicating that the another information processing device cannot acquire the dynamic biometric information or that the user is in the sleep state via communication between the information processing device and the another information processing device, execute a lock operation to lock the information processing device.

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