US012131336B2

(12) **United States Patent**
Oomori et al.

(10) **Patent No.: US 12,131,336 B2**
(45) **Date of Patent: Oct. 29, 2024**

(54) **MOBILE TERMINAL APPARATUS AND MANAGEMENT APPARATUS**

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(73) Assignee: **NTT DOCOMO, INC.**, Chiyoda-ku (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1030 days.

(21) Appl. No.: **17/044,523**

(22) PCT Filed: **Feb. 28, 2019**

(86) PCT No.: **PCT/JP2019/007862**
§ 371 (c)(1),
(2) Date: **Oct. 1, 2020**

(87) PCT Pub. No.: **WO2019/202857**
PCT Pub. Date: **Oct. 24, 2019**

(65) **Prior Publication Data**

US 2021/0224823 A1 Jul. 22, 2021

(30) **Foreign Application Priority Data**

Apr. 16, 2018 (JP) 2018-078181

(51) **Int. Cl.**
G06Q 30/018 (2023.01)
G06Q 20/04 (2012.01)
G06Q 20/40 (2012.01)

(52) **U.S. Cl.**
CPC ***G06Q 30/0185*** (2013.01); ***G06Q 20/0457*** (2013.01); ***G06Q 20/4014*** (2013.01); ***G06Q 20/4016*** (2013.01)

(58) **Field of Classification Search**
CPC G06Q 30/0185; G06Q 20/0457; G06Q 20/4014; G06Q 20/4016; G06Q 10/02
See application file for complete search history.

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Primary Examiner — Sangeeta Bahl
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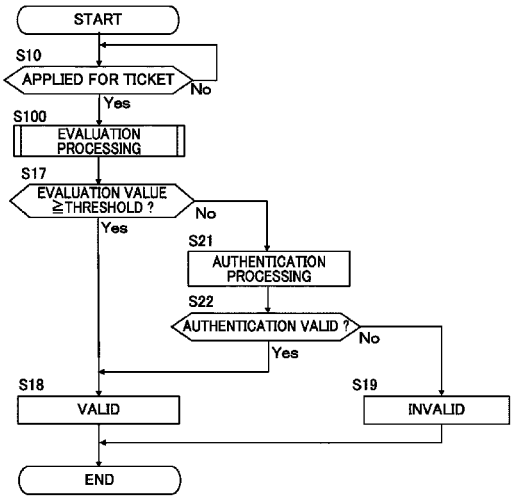
(57) **ABSTRACT**

A mobile terminal apparatus includes: an evaluator configured to, based on pre-purchase information relating to activities of a user during a pre-purchase period before purchase of an electronic ticket and post-purchase information relating to activities of a user during a post-purchase period after the purchase of the electronic ticket, evaluate identicalness of the user during the post-purchase period and a person who purchased the electronic ticket; and a setter configured to set a state relating to validity of the electronic ticket based on a result of the evaluation by evaluator.

7 Claims, 15 Drawing Sheets



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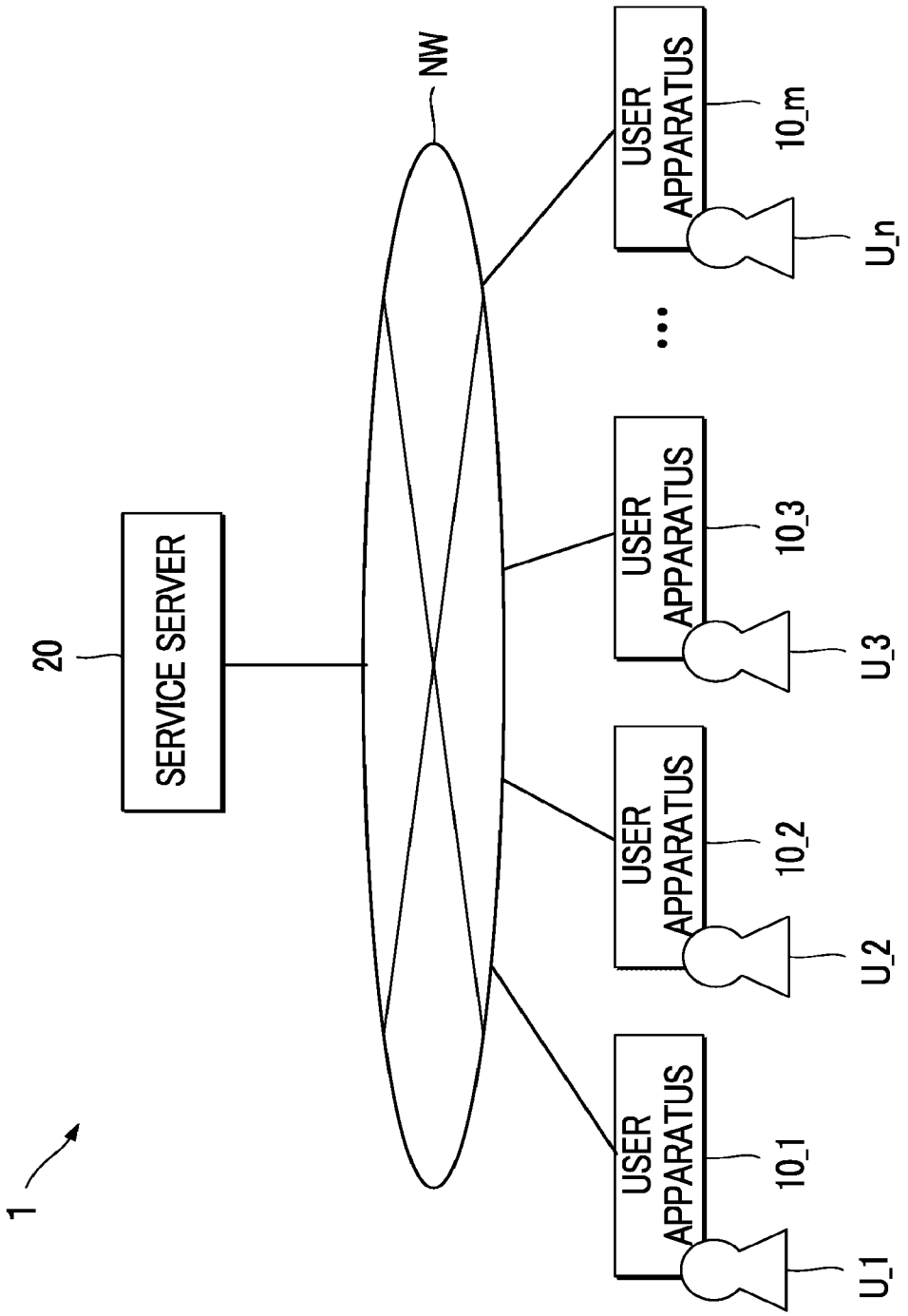

1
20
SERVICE SERVER
NW
USER APPARATUS
10_1
U_1
USER APPARATUS
10_2
U_2
USER APPARATUS
10_3
U_3
USER APPARATUS
10_m
U_n

FIG. 1

FIG. 2

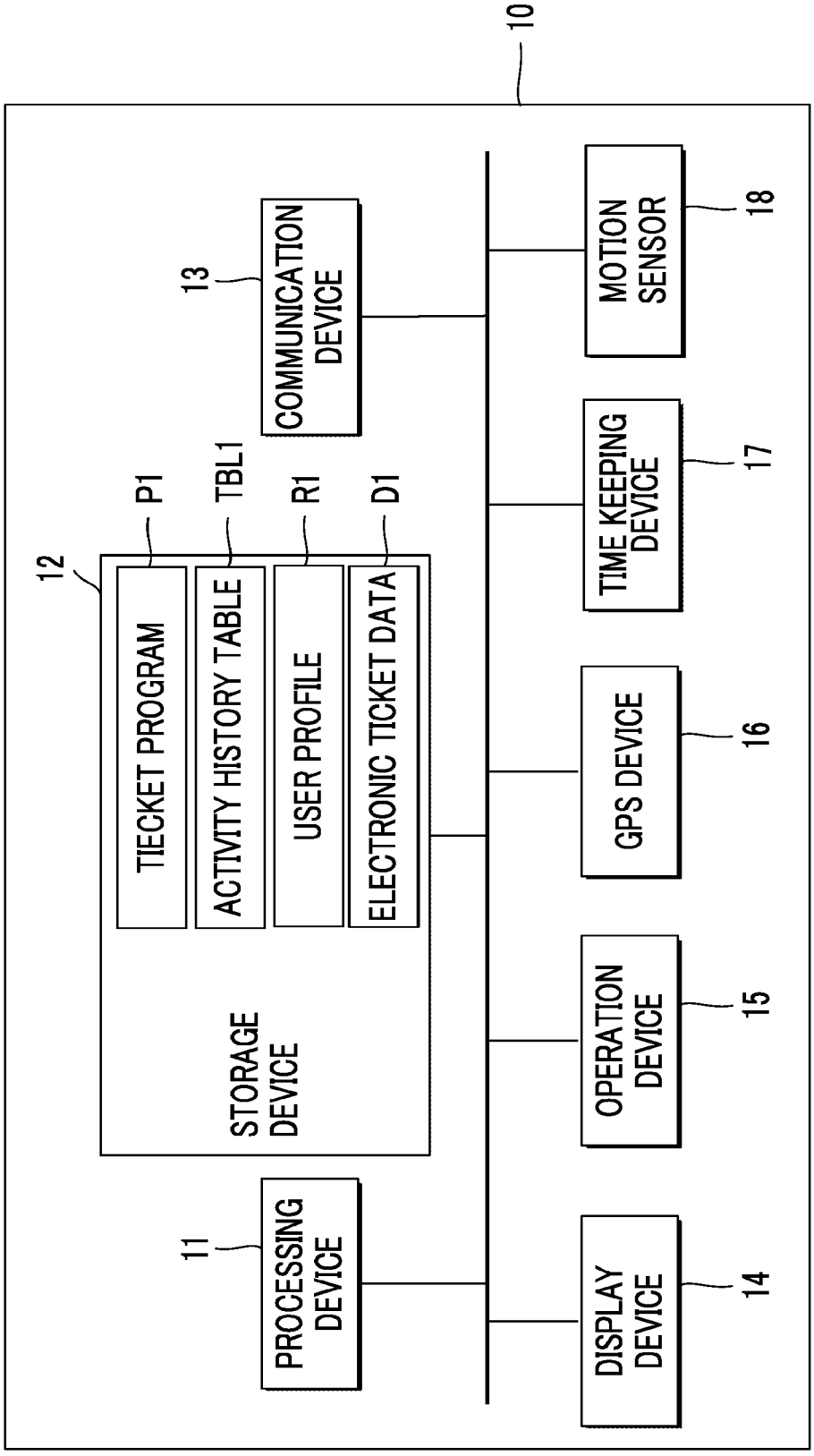

10
11
PROCESSING DEVICE
12
STORAGE DEVICE
TIECKET PROGRAM
P1
ACTIVITY HISTORY TABLE
TBL1
USER PROFILE
R1
ELECTRONIC TICKET DATA
D1
13
COMMUNICATION DEVICE
14
DISPLAY DEVICE
15
OPERATION DEVICE
16
GPS DEVICE
17
TIME KEEPING DEVICE
18
MOTION SENSOR

FIG. 3

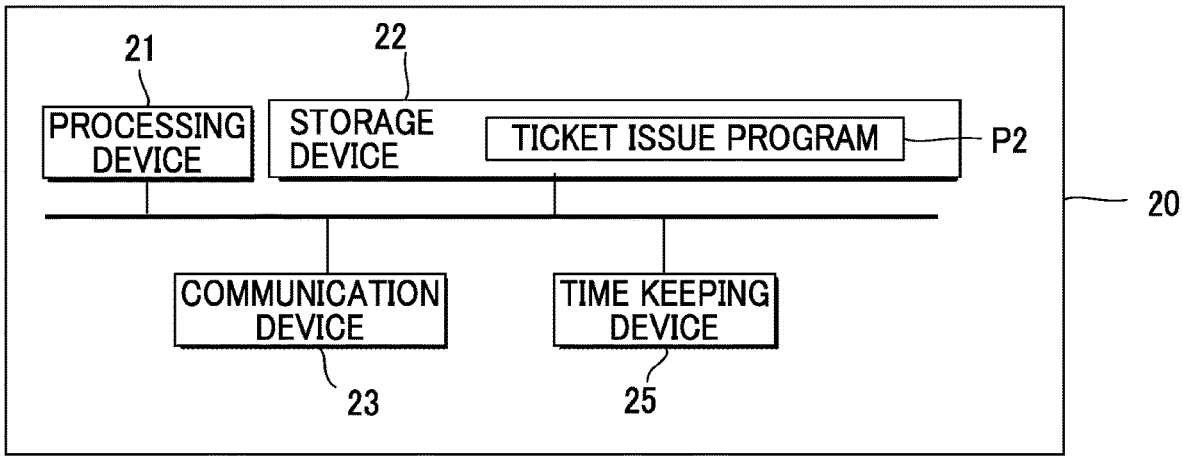

21
22
PROCESSING DEVICE
STORAGE DEVICE
TICKET ISSUE PROGRAM
P2
20
COMMUNICATION DEVICE
TIME KEEPING DEVICE
23
25

FIG. 4

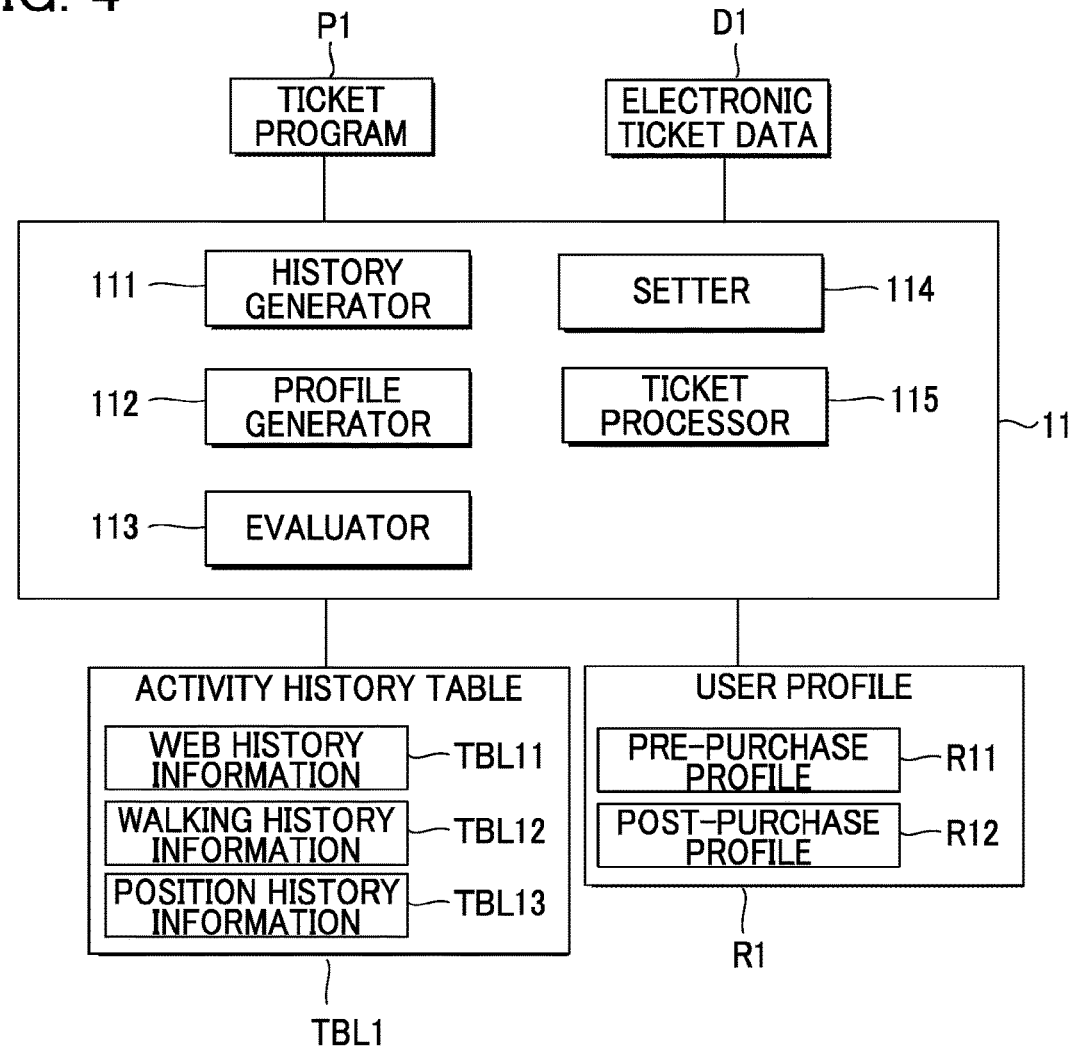

P1
D1
TICKET PROGRAM
ELECTRONIC TICKET DATA
111
HISTORY GENERATOR
SETTER
114
112
PROFILE GENERATOR
TICKET PROCESSOR
115
11
113
EVALUATOR
ACTIVITY HISTORY TABLE
WEB HISTORY INFORMATION
TBL11
WALKING HISTORY INFORMATION
TBL12
POSITION HISTORY INFORMATION
TBL13
USER PROFILE
PRE-PURCHASE PROFILE
R11
POST-PURCHASE PROFILE
R12
R1
TBL1

FIG. 5

TBL11

START TIME INFORMAITON	END TIME INFORMATION	URL
2017/6/29 18:01	2017/6/29 18:25	http://abc123・・・
2017/6/30 20:08	2017/6/30 20:26	http://adrc48・・・
2017/6/30 21:36	2017/6/30 21:49	http://abc123・・・
2017/7/1 17:22	2017/7/1 17:58	http://abc123・・・
2017/7/1 19:05	2017/7/1 19:16	http://kj859・・・
2017/7/1 19:05	2017/7/1 19:16	http://kj859・・・
・・・	・・・	・・・

FIG. 6

TBL12

TIME INFORMATION	WALKING SPEED
2017/6/29 8:05	4.1Km/h
2017/6/29 8:10	4.2Km/h
・・・	・・・
2017/6/30 18:20	4.3Km/h
2017/6/30 18:25	4.1Km/h
・・・	・・・
2017/7/1 7:45	3.7Km/h
2017/7/1 7:50	3.8Km/h

FIG. 7

TBL13

TIME INFO	CELL ID	POSITION INFO
2017/6/29 18:05	AW159	LATITUDE: 35.70 LONGITUDE: 139.98
2017/6/29 18:10	AW159	LATITUDE: 35.70 LONGITUDE: 139.98
...	...	...
2017/6/30 8:20	WQ186	LATITUDE: 34.61 LONGITUDE: 137.72
...	...	...
2017/7/1 7:45	XZ123	LATITUDE: 34.85 LONGITUDE: 135.61
...	...	...
2017/7/1 18:35	AW159	LATITUDE: 35.70 LONGITUDE: 139.98

FIG. 8

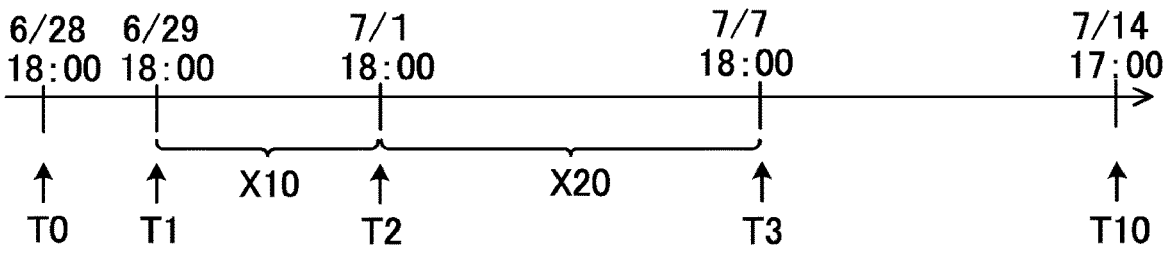


FIG. 9

R11

URL	WALKING SPEED	CELL ID	POSITION INFO
http://abc123・・・	4.1Km/h	AW159	LATITUDE: 35.70 LONGITUDE: 139.98

FIG. 10

R12

URL	WALKING SPEED	CELL ID	POSITION INFO
http://kj859・・・	3.8Km/h	AW159	LATITUDE: 35.70 LONGITUDE: 139.98

FIG. 11

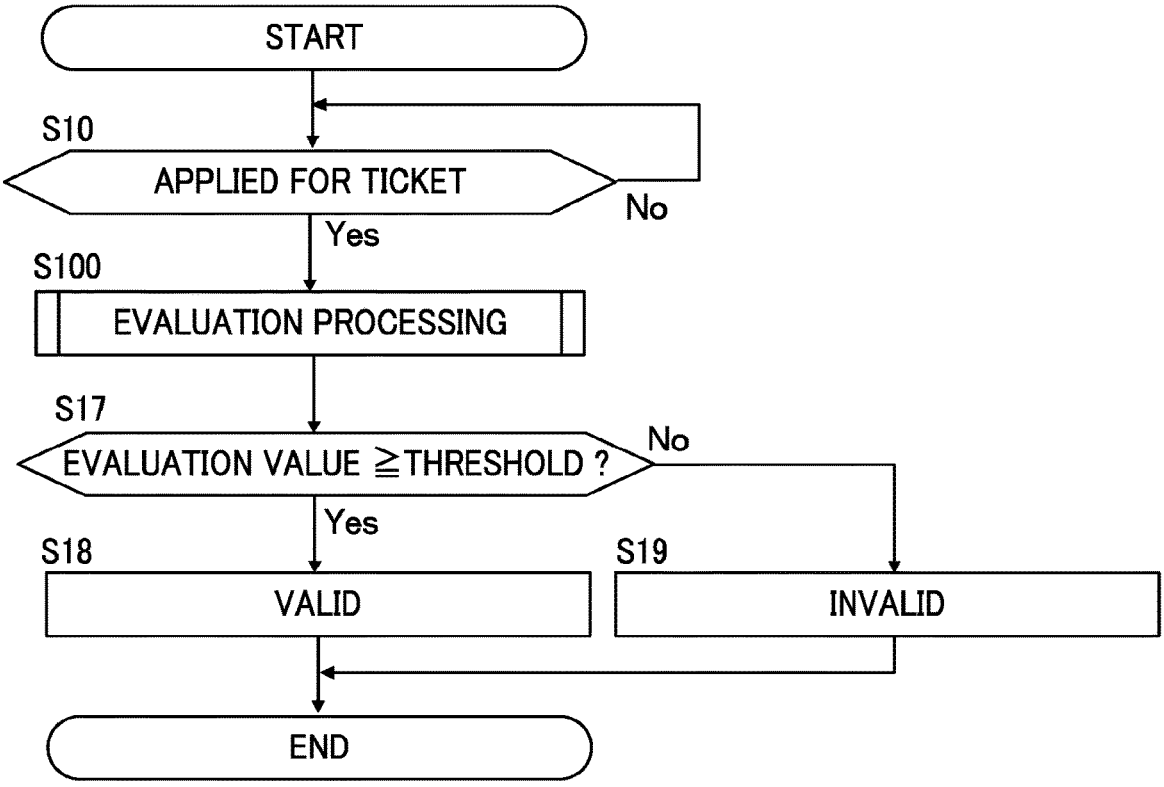


FIG. 12

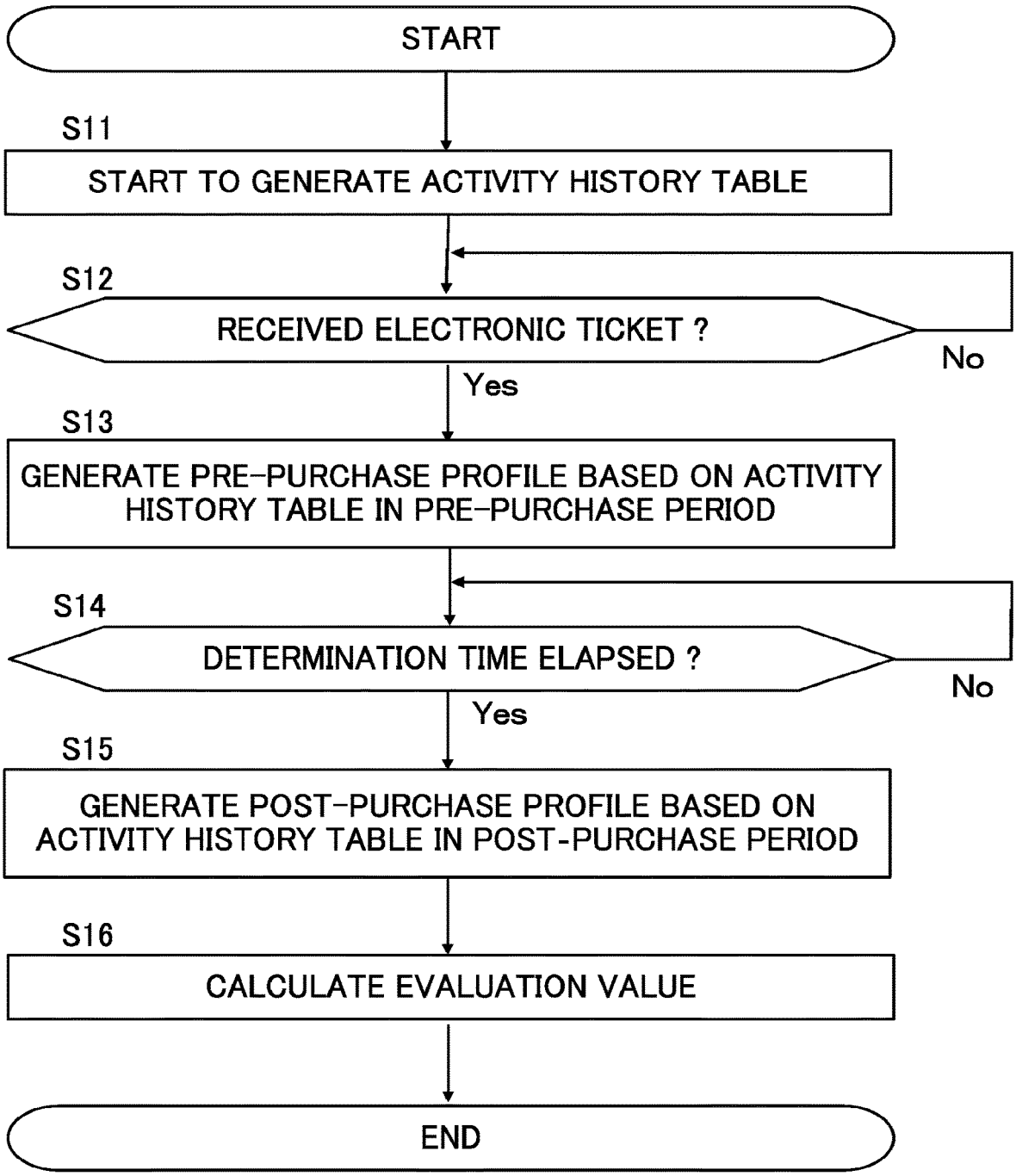

START
S11
START TO GENERATE ACTIVITY HISTORY TABLE
S12
RECEIVED ELECTRONIC TICKET ?
No
Yes
S13
GENERATE PRE-PURCHASE PROFILE BASED ON ACTIVITY HISTORY TABLE IN PRE-PURCHASE PERIOD
S14
DETERMINATION TIME ELAPSED ?
No
Yes
S15
GENERATE POST-PURCHASE PROFILE BASED ON ACTIVITY HISTORY TABLE IN POST-PURCHASE PERIOD
S16
CALCULATE EVALUATION VALUE
END

FIG. 13

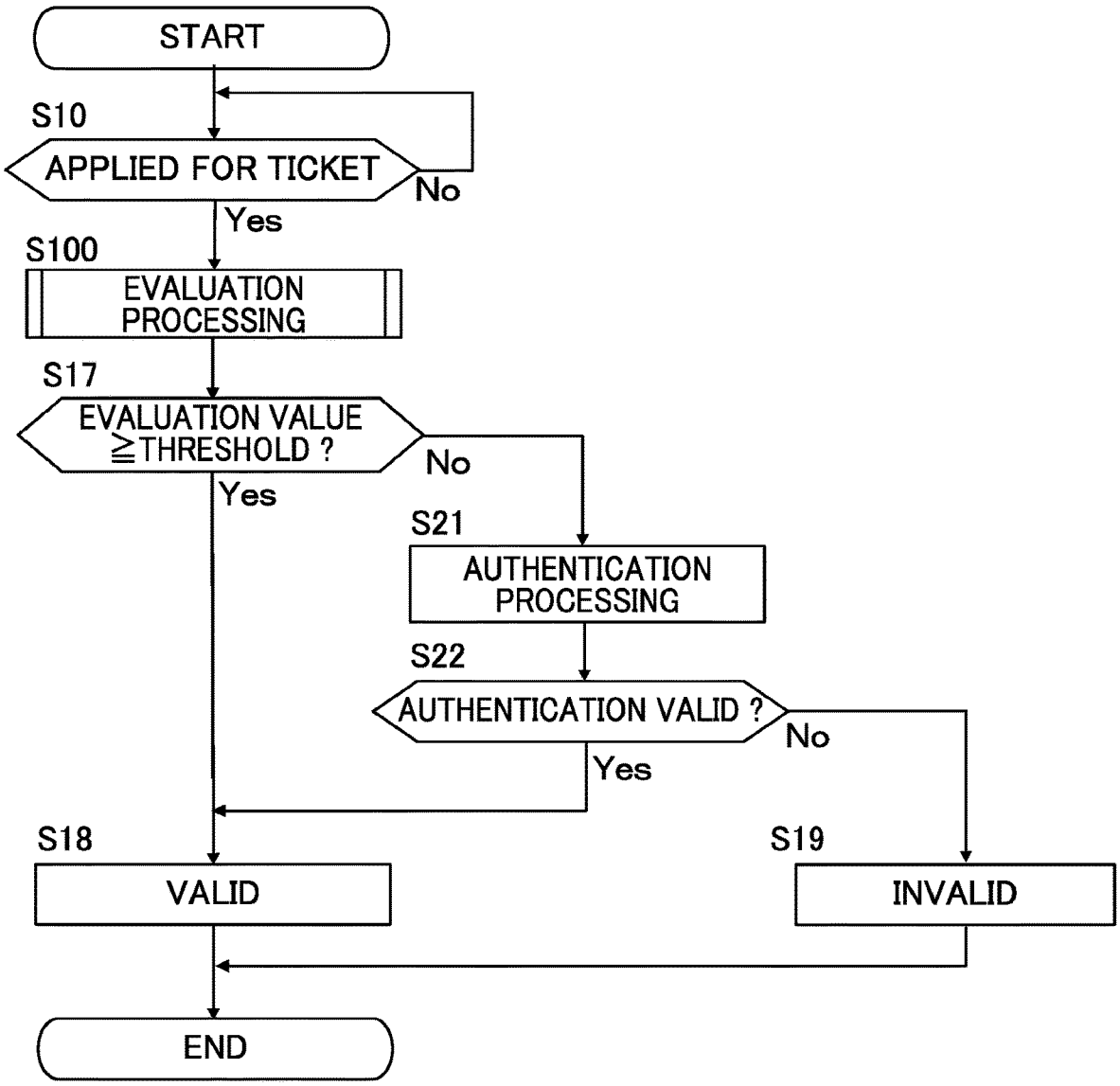

START
S10
APPLIED FOR TICKET
No
Yes
S100
EVALUATION PROCESSING
S17
EVALUATION VALUE ≧THRESHOLD ?
No
Yes
S21
AUTHENTICATION PROCESSING
S22
AUTHENTICATION VALID ?
No
Yes
S18
VALID
S19
INVALID
END

FIG. 14

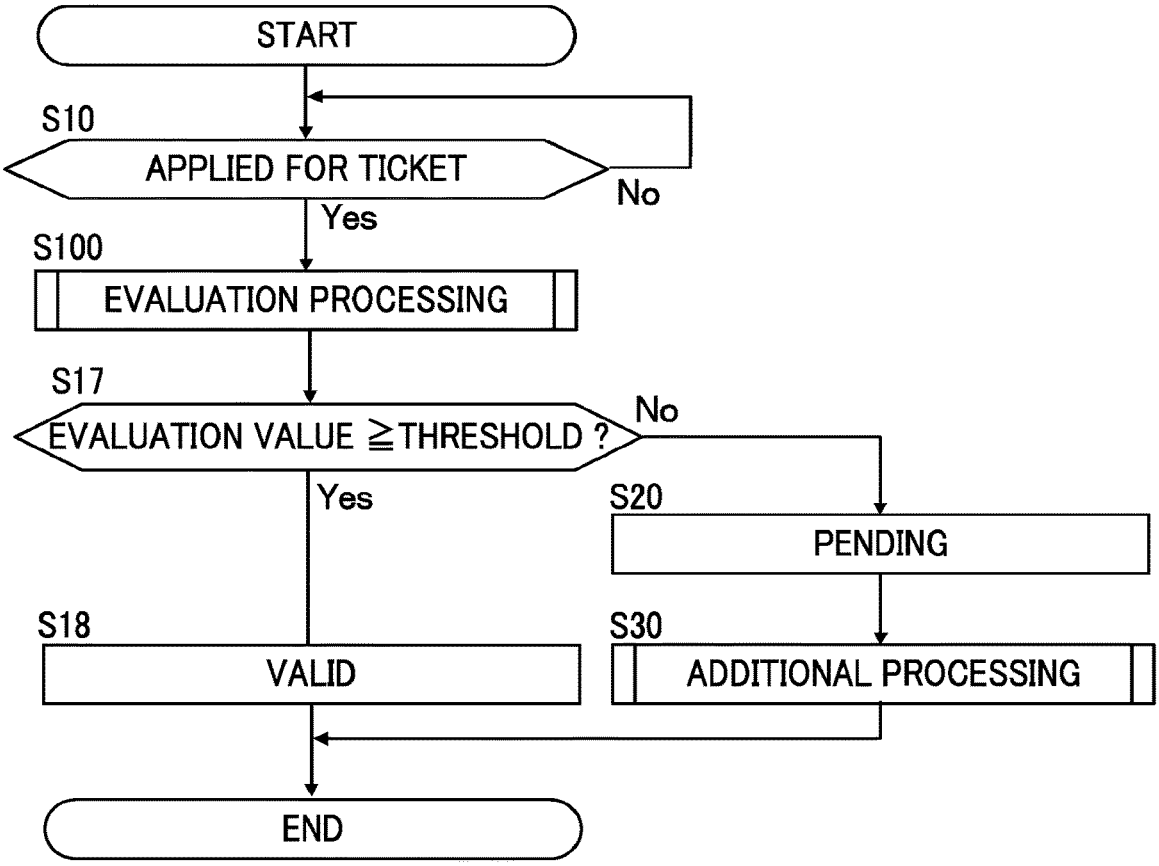

START
S10
APPLIED FOR TICKET
No
Yes
S100
EVALUATION PROCESSING
S17
EVALUATION VALUE ≧THRESHOLD ?
No
Yes
S20
PENDING
S18
VALID
S30
ADDITIONAL PROCESSING
END

FIG. 15

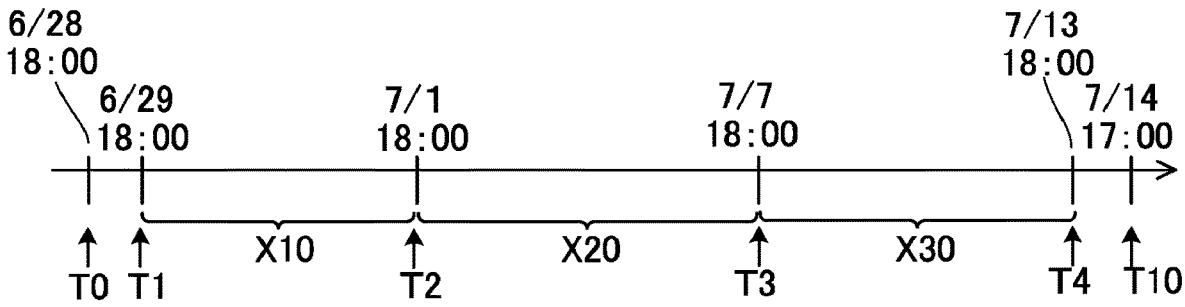

6/28
18:00
6/29
18:00
7/1
18:00
7/7
18:00
7/13
18:00
7/14
17:00
T0
T1
X10
T2
X20
T3
X30
T4
T10

FIG. 16

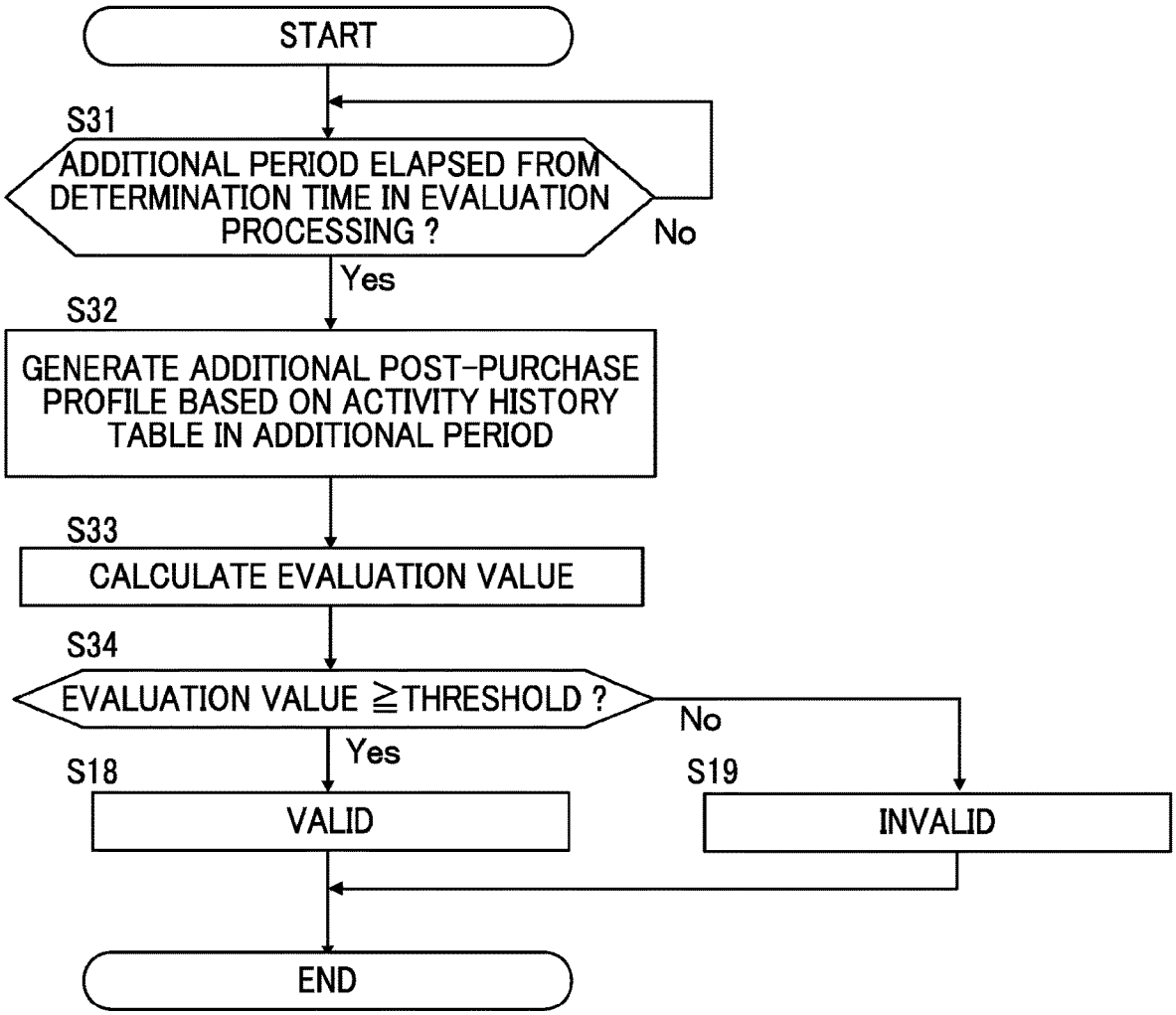

START
S31
ADDITIONAL PERIOD ELAPSED FROM DETERMINATION TIME IN EVALUATION PROCESSING ?
No
Yes
S32
GENERATE ADDITIONAL POST-PURCHASE PROFILE BASED ON ACTIVITY HISTORY TABLE IN ADDITIONAL PERIOD
S33
CALCULATE EVALUATION VALUE
S34
EVALUATION VALUE ≧THRESHOLD ?
No
Yes
S18
VALID
S19
INVALID
END

FIG. 17

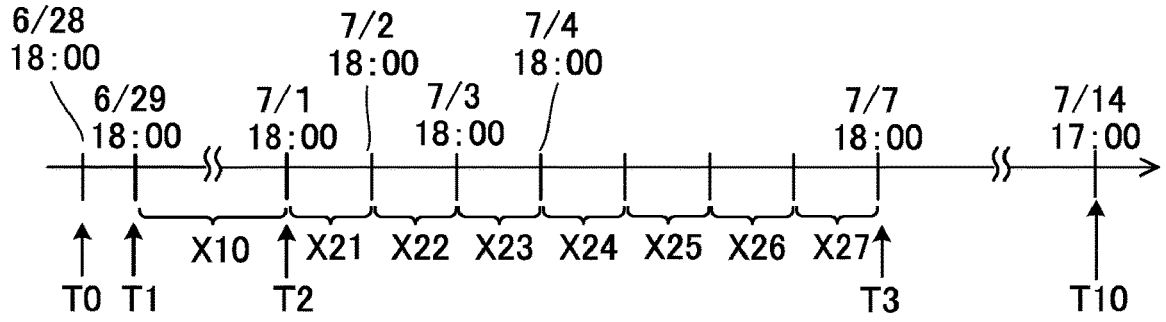

6/28 18:00
6/29 18:00
7/1 18:00
7/2 18:00
7/3 18:00
7/4 18:00
7/7 18:00
7/14 17:00
X10
X21
X22
X23
X24
X25
X26
X27
T0
T1
T2
T3
T10

FIG. 18

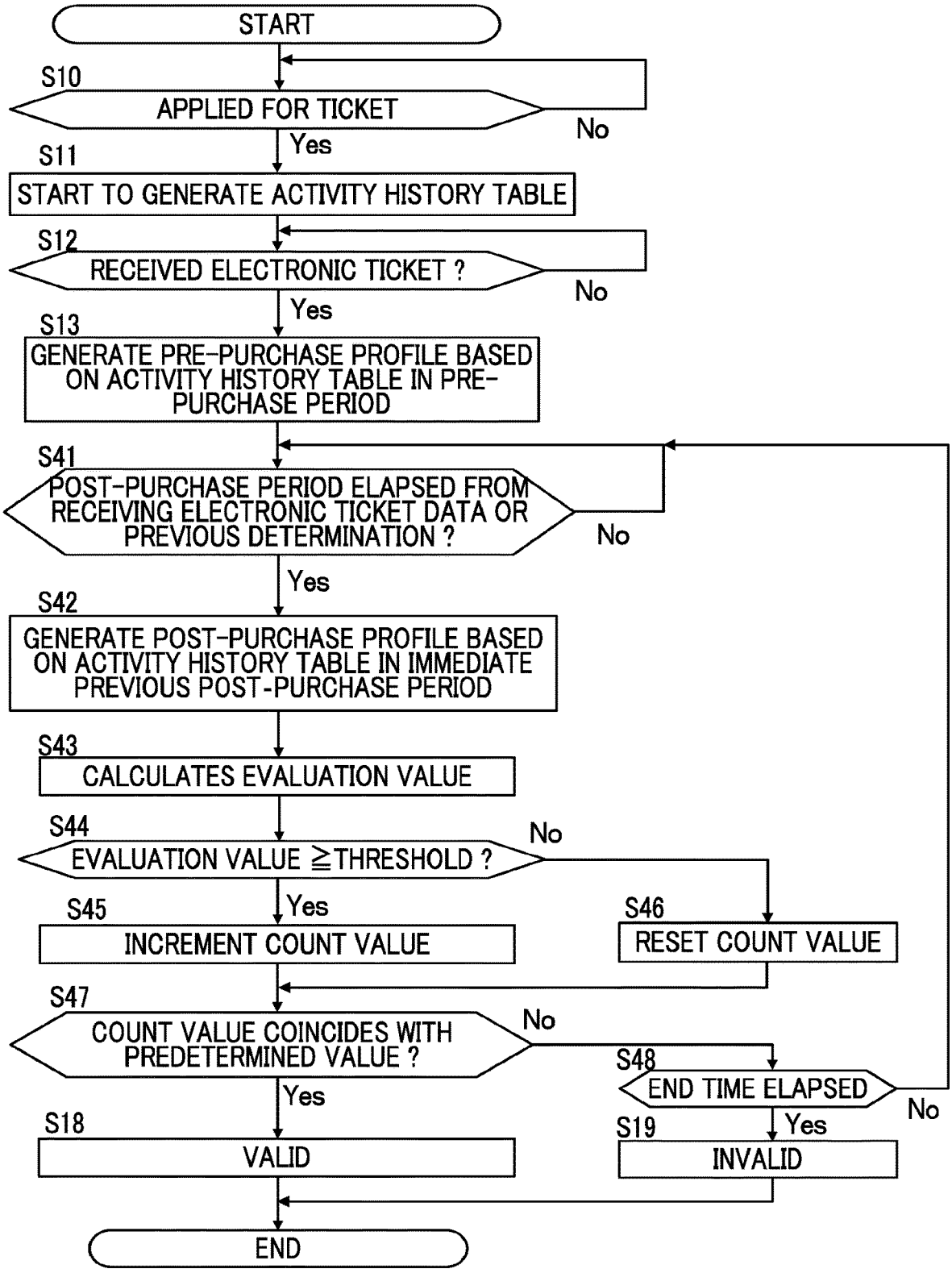

START
S10
APPLIED FOR TICKET
No
Yes
S11
START TO GENERATE ACTIVITY HISTORY TABLE
S12
RECEIVED ELECTRONIC TICKET ?
No
Yes
S13
GENERATE PRE-PURCHASE PROFILE BASED ON ACTIVITY HISTORY TABLE IN PRE-PURCHASE PERIOD
S41
POST-PURCHASE PERIOD ELAPSED FROM RECEIVING ELECTRONIC TICKET DATA OR PREVIOUS DETERMINATION ?
No
Yes
S42
GENERATE POST-PURCHASE PROFILE BASED ON ACTIVITY HISTORY TABLE IN IMMEDIATE PREVIOUS POST-PURCHASE PERIOD
S43
CALCULATES EVALUATION VALUE
S44
EVALUATION VALUE ≧THRESHOLD ?
No
Yes
S45
INCREMENT COUNT VALUE
S46
RESET COUNT VALUE
S47
COUNT VALUE COINCIDES WITH PREDETERMINED VALUE ?
No
Yes
S48
END TIME ELAPSED
No
Yes
S18
VALID
S19
INVALID
END

FIG. 19

FIG. 20

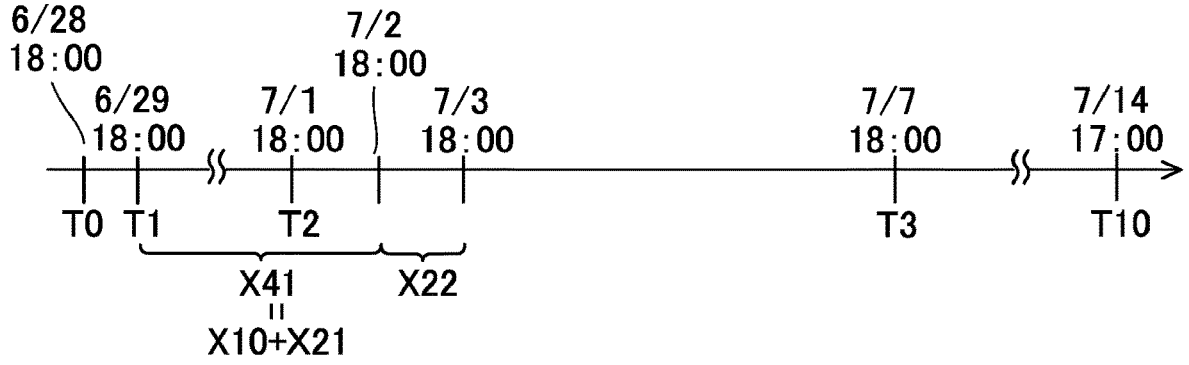


FIG. 21

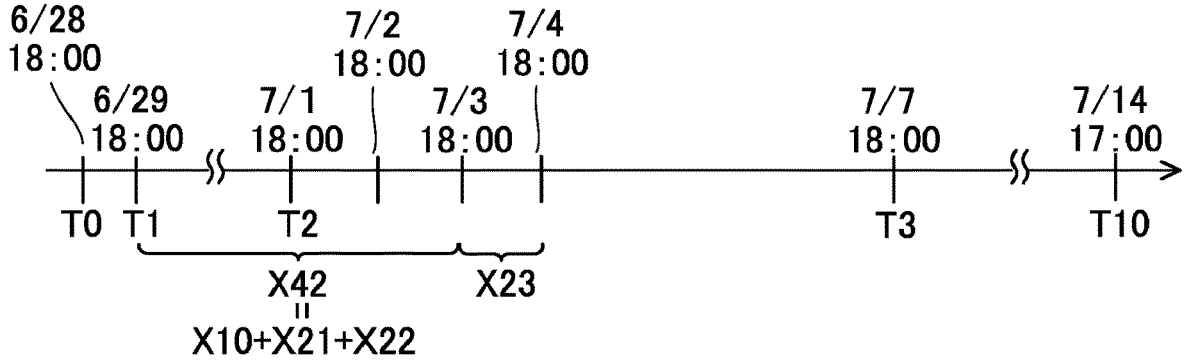


FIG. 22

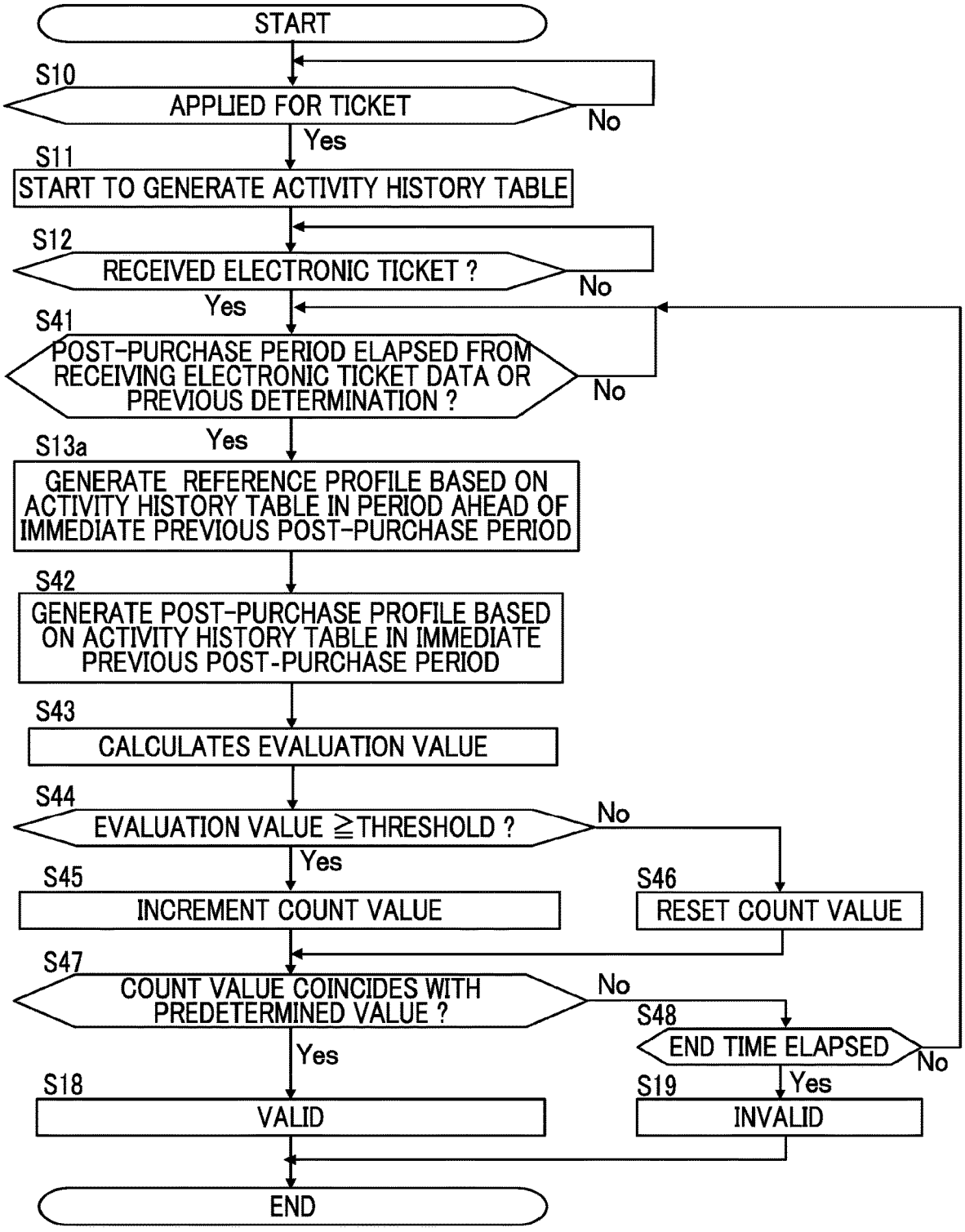

START
S10
APPLIED FOR TICKET
No
Yes
S11
START TO GENERATE ACTIVITY HISTORY TABLE
S12
RECEIVED ELECTRONIC TICKET ?
No
Yes
S41
POST-PURCHASE PERIOD ELAPSED FROM RECEIVING ELECTRONIC TICKET DATA OR PREVIOUS DETERMINATION ?
No
Yes
S13a
GENERATE REFERENCE PROFILE BASED ON ACTIVITY HISTORY TABLE IN PERIOD AHEAD OF IMMEDIATE PREVIOUS POST-PURCHASE PERIOD
S42
GENERATE POST-PURCHASE PROFILE BASED ON ACTIVITY HISTORY TABLE IN IMMEDIATE PREVIOUS POST-PURCHASE PERIOD
S43
CALCULATES EVALUATION VALUE
S44
EVALUATION VALUE ≧THRESHOLD ?
No
Yes
S45
INCREMENT COUNT VALUE
S46
RESET COUNT VALUE
S47
COUNT VALUE COINCIDES WITH PREDETERMINED VALUE ?
No
Yes
S48
END TIME ELAPSED
No
Yes
S18
VALID
S19
INVALID
END

FIG. 23

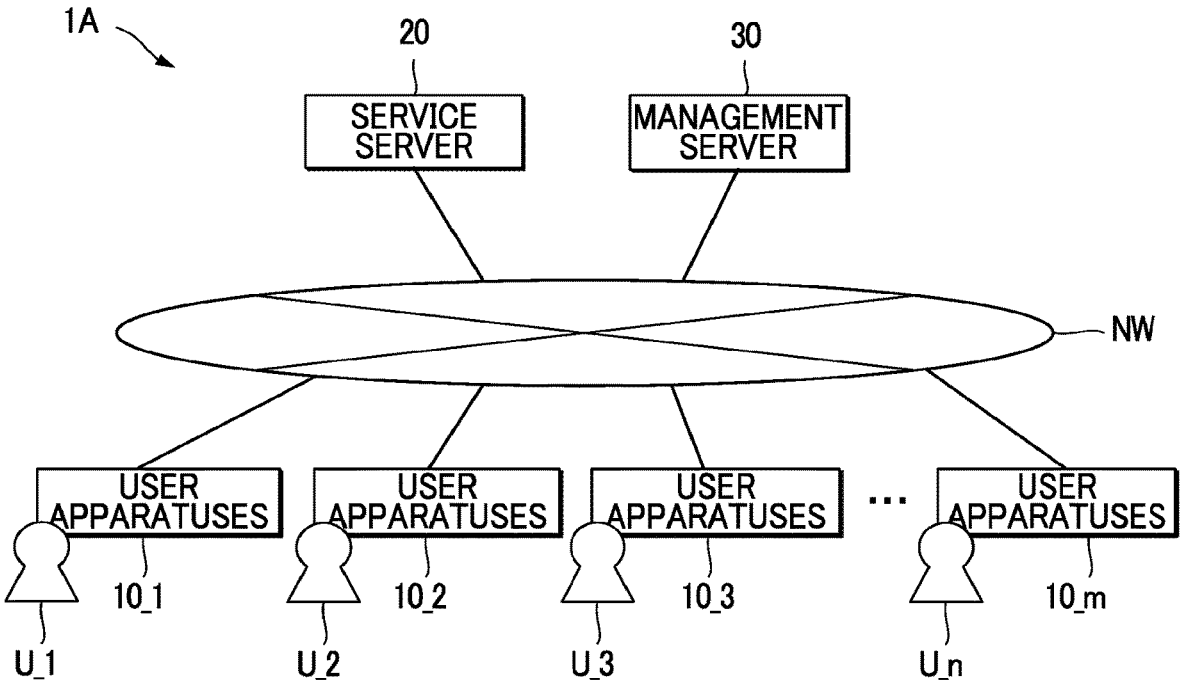

1A
20
30
SERVICE SERVER
MANAGEMENT SERVER
NW
USER APPARATUSES
USER APPARATUSES
USER APPARATUSES
USER APPARATUSES
10_1
10_2
10_3
10_m
U_1
U_2
U_3
U_n

FIG. 24

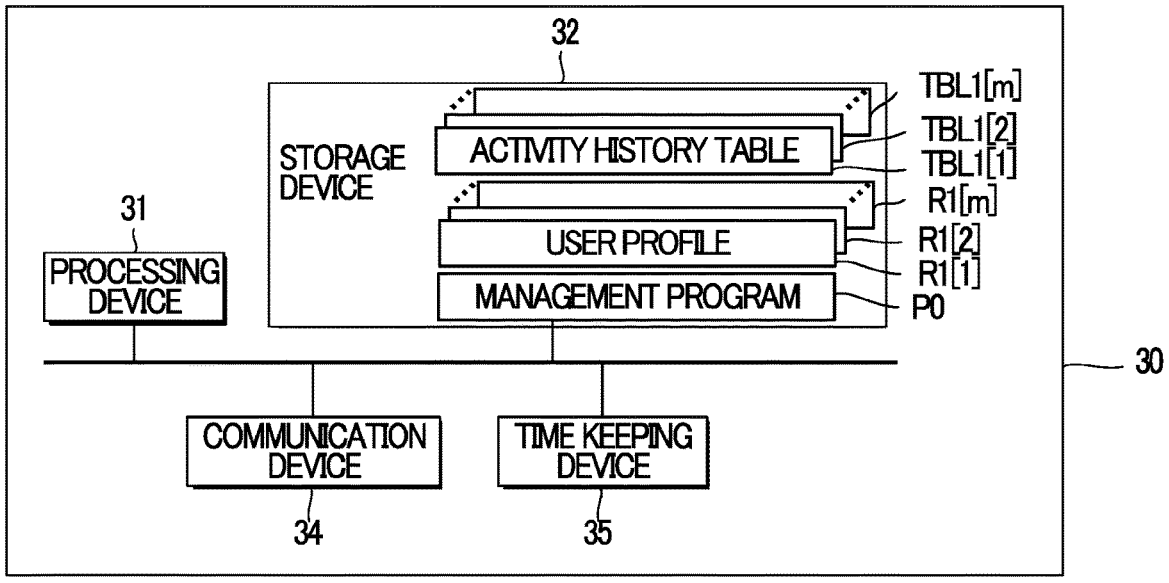

32
STORAGE DEVICE
ACTIVITY HISTORY TABLE
USER PROFILE
MANAGEMENT PROGRAM
TBL1[m]
TBL1[2]
TBL1[1]
R1[m]
R1[2]
R1[1]
P0
31
PROCESSING DEVICE
COMMUNICATION DEVICE
TIME KEEPING DEVICE
34
35
30

FIG. 25

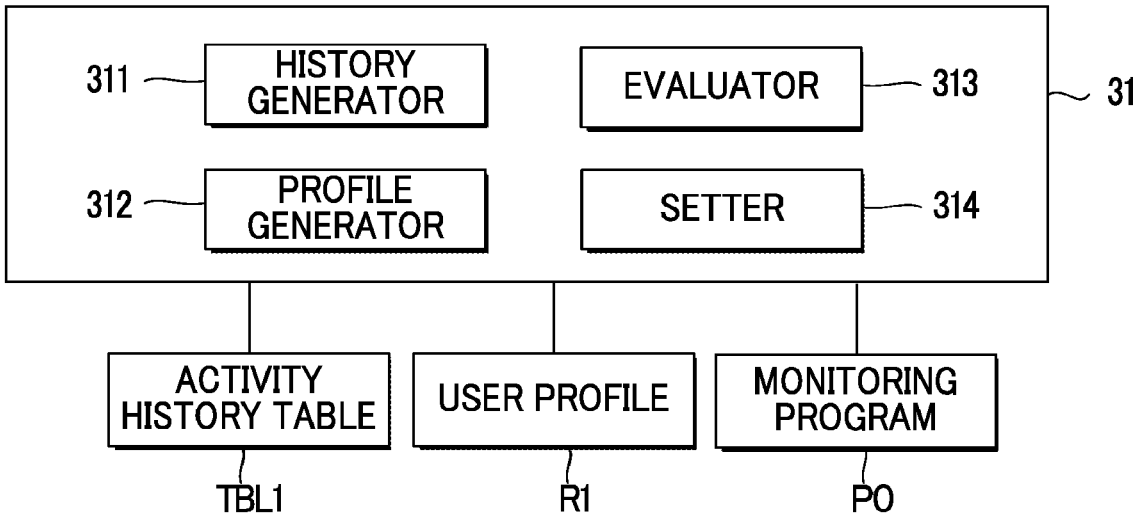
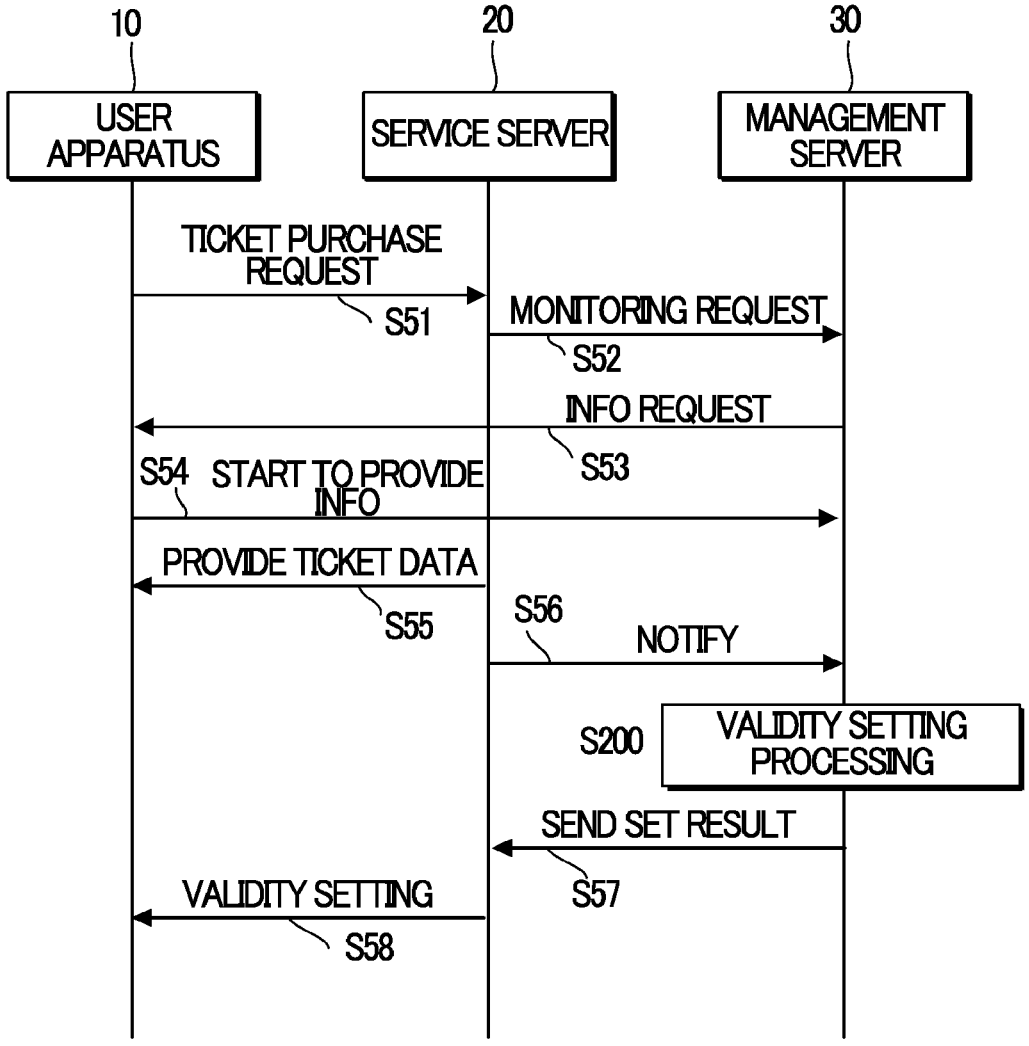

311
HISTORY GENERATOR
EVALUATOR
313
31
312
PROFILE GENERATOR
SETTER
314
ACTIVITY HISTORY TABLE
USER PROFILE
MONITORING PROGRAM
TBL1
R1
P0

FIG. 26


10
20
30
USER APPARATUS
SERVICE SERVER
MANAGEMENT SERVER
TICKET PURCHASE REQUEST
S51
MONITORING REQUEST
S52
INFO REQUEST
S53
S54
START TO PROVIDE INFO
PROVIDE TICKET DATA
S55
S56
NOTIFY
S200
VALIDITY SETTING PROCESSING
SEND SET RESULT
S57
VALIDITY SETTING
S58

MOBILE TERMINAL APPARATUS AND MANAGEMENT APPARATUS

TECHNICAL FIELD

The present invention relates to mobile terminal apparatuses and to management apparatuses.

BACKGROUND ART

As mobile terminal apparatuses such as smartphones have come into widespread use, electronic tickets are being used.

For example, Patent Document 1 discloses a smartphone that downloads an electronic ticket. A user operates such a smartphone to offer the electronic ticket for sale at a ticket sale site and clicks a URL (Uniform Resource Locator) on an incoming mail to acquire the electronic ticket.

In addition, as a countermeasure against illegal resale, an electronic ticket is generally associated with the smartphone by which the user applied for purchase of the electronic ticket, so that only that smartphone can be used.

RELATED ART DOCUMENT

Patent Document

Patent Document 1: Japanese Patent Application Laid-Open Publication No. 2015-197866

SUMMARY OF THE INVENTION

Problem to be Solved by the Invention

However, in recent years, due to lending of a smartphone itself on which an electronic ticket has been downloaded, resale of electronic tickets occurs in which an electronic ticket is illegally resold. Conventionally, the illegal resale of the electronic ticket due to lending or transfer of the smartphone itself has not been considered. The smartphone disclosed in Patent Document 1 can hardly cope with illegal resale.

Means of Solving the Problem

In order to solve the above problem, a mobile terminal apparatus according to a preferred aspect of the present invention includes: an evaluator configured to, based on pre-purchase information relating to activities of a user during a pre-purchase period before purchase of an electronic ticket, and post-purchase information relating to activities of a user during a post-purchase period after the purchase of the electronic ticket, evaluate the identicalness of the user during the post-purchase period and a person who purchased the electronic ticket; and a setter configured to set a state relating to validity of the electronic ticket based on a result of evaluation by the evaluator.

In order to solve the above problem, a management apparatus according to a preferred aspect of the present invention includes: an evaluator configured to, based on pre-purchase information relating to activities of a user during a pre-purchase period before purchase of an electronic ticket, and post-purchase information relating to activities of a user during a post-purchase period after the purchase of the electronic ticket, evaluate identicalness of the user during the post-purchase period and a person who purchased the electronic ticket, wherein the evaluator carries out the evaluation in a case in which the management apparatus receives information that the electronic ticket was purchased by a mobile terminal apparatus carried by a user, and a setter configured to set a state relating to validity of the electronic ticket based on a result of evaluation by the evaluator.

Effect of the Invention

In the present invention, it is possible to reduce or prevent illegal resale of electronic tickets by lending or transfer of a mobile terminal apparatus itself.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram showing an overall configuration of a service system according to a first embodiment.

FIG. **2** is a block diagram showing a configuration example of hardware of a user apparatus shown in FIG. **1**.

FIG. **3** is a block diagram showing a configuration example of hardware of a service server shown in FIG. **1**.

FIG. **4** is a functional block diagram showing a functional configuration example of the user apparatus shown in FIG. **1**.

FIG. **5** is a diagram showing an example of Web history information.

FIG. **6** is a diagram showing an example of walking history information.

FIG. **7** is a diagram showing an example of position history information.

FIG. **8** is a diagram showing a time flow regarding a purchase of an electronic ticket.

FIG. **9** is a diagram showing an example of a pre-purchase profile.

FIG. **10** is a diagram showing an example of a post-purchase profile.

FIG. **11** is a flowchart showing an example of validity setting processing of an electronic ticket in a user apparatus.

FIG. **12** is a flowchart showing an example of evaluation processing showing in FIG. **11**.

FIG. **13** is a flowchart showing a modification of the validity setting processing.

FIG. **14** is a flowchart showing an example of validity setting processing according to a second embodiment.

FIG. **15** is a diagram showing a time flow regarding a purchase of an electronic ticket according to the second embodiment.

FIG. **16** is a flowchart showing an example of additional processing shown in FIG. **14**.

FIG. **17** is a diagram showing a time flow regarding a purchase of an electronic ticket according to a third embodiment.

FIG. **18** is a flowchart showing an example of validity setting processing according to the third embodiment.

FIG. **19** is a diagram illustrating a post-purchase period according to a fourth embodiment.

FIG. **20** is a diagram illustrating a post-purchase period according to the fourth embodiment.

FIG. **21** is a diagram illustrating a post-purchase period according to the fourth embodiment.

FIG. **22** is a flowchart showing an example of validity setting processing according to the fourth embodiment.

FIG. **23** is a block diagram showing an overall configuration of a service system according to a fifth embodiment.

FIG. **24** is a block diagram showing a configuration example of hardware of a management server shown in FIG. **23**.

FIG. **25** is a functional block diagram showing a functional configuration example of the management server shown in FIG. **23**.

FIG. **26** is a sequence chart showing an operation of the system shown in FIG. **23**.

MODES FOR CARRYING OUT THE INVENTION

1. First Embodiment

FIG. **1** is a block diagram showing an overall configuration of a service system according to a first embodiment. A service system **1** shown in FIG. **1** provides a service relating to electronic tickets.

The service system **1** includes user apparatuses **10_1** to **10_*m*** (m is an integer of 1 or more) owned by respective users U_**1** to U_n (n is an integer of 1 or more), a network NW, and a service server **20**. Each of the user apparatuses **10** is an example of a mobile terminal apparatus. As each user apparatus **10**, a portable information terminal such as a smartphone or a tablet terminal is assumed. However, any portable information processing device can be adopted as each user apparatus **10**, which may be, for example, a notebook PC or a wearable terminal.

In the following description, unless the n users U_**1** to U_n need to be distinguished from each other, any one user is simply referred to as "user U". Similarly, unless the in user apparatuses **10_1** to **10_*m*** need to be distinguished from each other, any one user apparatus is simply referred to as "user apparatus **10**". In addition, the electronic ticket is a ticket using electronic information. For example, electronic information acquired from the service server **20** is displayed on the user apparatus **10** as an electronic ticket. The electronic ticket is associated with the user apparatus **10**. The user apparatus **10** itself storing the electronic ticket is treated as a ticket.

In the service system **1**, a user U is able to purchase an electronic ticket from the service server **20** by operating a user apparatus **10**. In addition, the user apparatus **10** has a function capable of setting validity of the purchased electronic ticket as a countermeasure against illegal resale due to lending or transfer of the user apparatus **10** itself. Specifically, the user apparatus **10** evaluates the identity of the person who owns the user apparatus **10**, using differences in each individual activity after and before purchase of the electronic ticket, and sets a state regarding the validity of the electronic ticket based on the result of the evaluation. In the description, the state regarding the validity of the electronic ticket includes validity of the electronic ticket and invalidity of the electronic ticket. The status "valid" or "invalid" of the electronic ticket can be determined when any preconditions necessary for the determination are satisfied, but the determination of the "valid" or "invalid" status is disabled in a state in which the preconditions are not satisfied. Accordingly, in the description, the state regarding "valid" or "invalid" status of the validity of the electronic ticket may include "pending" in which the determination of the "valid" or "invalid" status is disabled, in addition to the "valid" or "invalid" status.

FIG. **2** is a block diagram illustrating a configuration of hardware of the user apparatus. The user apparatus **10** is realized by a computer system including a processing device **11**, a storage device **12**, a communication device **13**, a display device **14**, an operation device **15**, a GPS (Global Positioning System) device **16**, a time keeping device **17**, and a motion sensor **18**. The components of the user apparatus **10** are connected to each other by a single bus or a plurality of buses. The term "device" denoted in the components of the user apparatus **10** may be replaced with another term such as "circuit", "device", or "unit". In addition, each of the components of the user apparatus **10** includes a single device or a plurality of devices, and some components of the user apparatus **10** may not be provided.

The processing device **11** is a processor that controls the entire user apparatus **10** and includes a single chip or a plurality of chips, for example. The processing device **11** is configured by a central processing unit (CPU) including, for example, an interface with peripheral devices, an arithmetic device, and register. Some or all of functions of the processing device **11** may be realized by hardware such as DSP (Digital Signal Processor), ASIC (Application Specific Integrated Circuit), PLD (Programmable Logic Device), or FPGA (Field Programmable Gate Array). The processing device **11** executes various processing in parallel or sequentially.

The storage device **12** is a recording medium that can be read by the processing device **11**, and stores programs executed by the processing device **11** and various data used by the processing device **11**. The storage device **12** includes, for example, one or more types of storage circuits such as ROM (Read Only Memory), EPROM (Erasable Programmable ROM), EEPROM (Electrically Erasable Programmable ROM), and RAM (Random Access Memory).

Specifically, the storage device **12** stores programs including a ticket program P**1** (ticket application) executed by the processing device **11**. The ticket program P**1** is downloaded in advance from the service server **20** or the like when a user U purchases an electronic ticket. The ticket program P**1** may be provided from external devices (not shown) other than the service server **20**. In addition, the storage device **12** stores various data such as an activity history table TBL**1**, a user profile R**1**, and electronic ticket data D**1**. The activity history table TBL**1**, the user profile R**1**, and the electronic ticket data D**1** are data acquired or generated when the processing device **11** executes the ticket program P**1**, and are used by the processing device **11** at the time of execution of the ticket program P**1**.

The communication device **13** is a device that communicates with other devices via a network NW such as a mobile communication network or the Internet. The communication device **13** may also be called, for example, a network device, a network controller, a network card, or a communication module. The communication device **13** is communicable with, for example other user apparatuses **10** and the service server **20** via the network NW.

The display device **14** displays various images under the control of the processing device **11**. For example, various display panels such as a liquid crystal display panel and an organic EL (electro-luminescence) display panel are preferably used as the display device **14**.

The operation device **15** is a device for inputting information used by the user apparatus **10** to the processing device **11**. The operation device **15** receives an operation from the user U. Specifically, the operation device **15** receives an operation for inputting symbols such as numbers or characters and an operation for selecting icons displayed on the display device **14**. For example, the operation device **15** preferably includes a touch panel that detects contact with a display screen of the display device **14**. The operation device **15** may include operators that can be operated by the user U.

The GPS device **16** receives radio waves from satellites and generates position information from the received radio

waves. The position information may be in any format as long as a position is specified. The position information indicates, for example, latitude and longitude of the user apparatus **10**. As illustrated in the present embodiment, the position information is obtained from the GPS device **16**, but the user apparatus **10** may acquire position information using any method. For example, the user apparatus **10** acquires, as position information, a cell ID allocated to a base station serving as a communication destination of the user apparatus **10**. The cell ID is identification information for uniquely identifying the base station. Furthermore, when the user apparatus **10** communicates with an access point of a wireless LAN, the user apparatus acquires position information with reference to a database in which an identification address (Media Access Control (MAC) address) on a network allocated to the access point is associated with an actual address (position).

The time keeping device **17** generates time information representative of the current time. Specifically, the time keeping device **17** counts pulse signals obtained by division of a clock signal generated by a crystal oscillator or the like, to generate time information.

The motion sensor **18** detects acceleration and inclination of the user apparatus **10**. The motion sensor **18** is configured by a combination of an acceleration sensor and a gyro sensor, for example.

FIG. **3** is a block diagram showing a configuration example of hardware of the service server shown in FIG. **1**. The service server **20** is realized by a computer system including a processing device **21**, a storage device **22**, a communication device **23**, and a time keeping device **25**. The components of the service server **20** are connected to each other by a single bus or a plurality of buses. The term "device" denoted in the components of the service server **20** may be replaced with another term such as "circuit", "device", or "unit". In addition, each of the components of the service server **20** includes a single device or a plurality of devices, and some components of the service server **20** may not be provided.

The processing device **21** has a configuration similar to that of the processing device **11**. The storage device **22** has a configuration similar to that of the storage device **12**. The communication device **23** has a configuration similar to that of the communication device **13**. The time keeping device **25** has a configuration similar to that of the time keeping device **17**. However, the storage device **22** differs from the storage device **12** in terms of storing a ticket issue program P**2** executed by the processing device **21**. The processing device **21** executes the ticket issue program P**2**, and issues an electronic ticket to a user apparatus **10** that has transmitted a purchase request indicating an application for purchase of the electronic ticket.

FIG. **4** is a functional block diagram showing a functional configuration example of the user apparatus shown in FIG. **1**. The processing device **11** of the user apparatus **10** reads and executes the ticket program P**1** from the storage device **12**, thereby functioning as a history generator **111**, a profile generator **112**, an evaluator **113**, a setter **114**, and a ticket processor **115**.

The history generator **111** generates an activity history of the user U, and stores the generated activity history in an activity history table TBL**1**. The activity history table TBL**1** includes Web history information TBL**11**, walking history information TBL**12**, and position history information TBL**13**. The Web history information TBL**11**, the walking history information TBL**12**, and the position history information TBL**13** are examples of the plurality types of activity history information included in the activity history table TBL**1**.

FIG. **5** is a diagram showing an example of the Web history information. The Web history information TBL**11** shown in FIG. **5** is information in which URL of a webpage browsed by the user U, start time information indicating time (date and time) when the browsing of the webpage starts, and end time information indicating time when the browsing of the webpage ends, are associated with each other. The URL of the web page is acquired from, for example, a web browser. The time information is output from the time keeping device **17**. FIG. **5** shows an example in which a user U browses a webpage of URL "http://abc123 . . . " from the time "2017/6/29 18:01" indicated by the start time information to the time "2017/6/29 18:25" indicated by the end time information.

FIG. **6** is a diagram showing an example of walking history information. The walking history information TBL**12** shown in FIG. **6** is information in which a walking speed of a user U is associated with time information indicating time during walking. The walking speed is calculated based on a signal indicating acceleration output from the motion sensor **18**. The time information is output from the time keeping device **17**. FIG. **6** shows an example in which the user U is moving at a walking speed of "4.1 k/m" at time "2017/6/29 8:05" indicated by the time information. FIG. **6** exemplifies the walking speed, but does not exemplify information relating to movement of vehicles such as cars and trains. However, information relating to such movement may be generated. In other words, instead of the walking history information, movement history information may be used in which a moving speed of the user U and time information indicating time when the user is moving are associated with each other.

FIG. **7** is a diagram showing an example of position history information. The position history information TBL**13** shown in FIG. **7** is information in which a position of a place at which the user U stays and time information indicating time at which the user stays at the place at which the user stays, are associated with each other. The position of the place at which the user stays is output from the GPS device **16** or the like, and the time information is output from the time keeping device **17**. FIG. **7** shows an example in which the user U is located in a cell ID "AW159" at time "2017/6/29 18:05" indicated by the time information and is staying at a position latitude: 35.70, longitude: 139.98" indicated by the position information.

In the activity history table TBL**1**, any one of the web history information TBL**11**, the walking history information TBL**12**, and the position history information TBL**13** may not be presented, and the activity history table TBL**1** may include the activity history information as well as these types of information.

Here, an example of a flow related to purchase of an electronic ticket of a user U will be described with reference to FIG. **8**. FIG. **8** is a diagram showing a time flow regarding purchase of an electronic ticket. In FIG. **8**, "TO" indicates download time of a ticket program P**1**, "T**1**" indicates application time for an electronic ticket, "T**2**" indicates acquisition time of electronic ticket data D**1**, and "T**10**" indicates use time of the electronic ticket. FIG. **8** shows an example in which the user U downloads a user profile R**1** at the download time TO "2017/6/28 18:00" and applies for a desired electronic ticket at the application time T**1** "2017/6/29 18:00". In addition, an example is shown in which the user U acquires electronic ticket data D**1** from the service

server **20** at the acquisition time T**2** "2017/7/1 18:00" and uses the electronic ticket at the use time T**10** "2017/7/14 17:00".

The purchase of the electronic ticket is completed when the user U receives the electronic ticket under the condition of having paid the price. The payment of the price includes payment in real time and so-called deferred payment, in which the price is paid on a predetermined date after agreement about payment of the price. In the description, "purchase time of the electronic ticket" means acquisition time T**2** at which the user apparatus **10** acquires the electronic ticket data D**1** from the service server **20**. In other words, the payment of the price may be real-time settlement or settlement by deferred payment, regardless of the settlement time.

In FIG. **8**, "X**10**" indicates a pre-purchase period from the application time T**1** to the acquisition time T**2**, and "X**20**" indicates a post-purchase period from the acquisition time T**2** to determination time T**3**. The determination time T**3** is a timing to determine identicalness of a user in the post-purchase period X**20**, which will be described below, and a person who purchased the electronic ticket. The determination time T**3** is freely selectable, and is one week prior to the use time T**10** in the example shown in FIG. **8**.

The profile generator **112** shown in FIG. **4** generates the user profile R**1** based on the activity history table TBL**1**. The user profile R**1** is an activity history indicating a characteristic of a user U. The user profile R**1** includes a pre-purchase profile R**11** indicating an activity characteristic of a user U in the pre-purchase period X**10** and a post-purchase profile R**12** indicating activity characteristic of a user U in the post-purchase period X**20**. In the following description, a user U who owns a certain user apparatus **10** before purchasing the electronic ticket is referred to as "user Ux", and a user U who owns the user apparatus **10** after purchasing the electronic ticket is referred to as "user Uy". It is assumed that the user Ux may be a same person as the user Uy, or may be a different person other than the same person as the user Uy.

FIG. **9** is a diagram showing an example of a pre-purchase profile. The pre-purchase profile R**11** shown in FIG. **9** is an example of "pre-purchase information" relating to activities of a user Ux. The pre-purchase profile R**11** is generated based on contents stored in the activity history table TBL**1** in the pre-purchase period X**10**. In addition, the pre-purchase profile R**11** includes the characteristics of the user Ux. In the example shown in FIG. **9**, the pre-purchase profile R**11** includes, for example, a webpage that is frequently browsed by the user Ux, an average walking speed of the user Ux, a cell ID of a cell in which the user apparatus **10** of the user Ux is most frequently located, and position information on a place where the user Ux visits most frequently. Therefore, the pre-purchase profile R**11** is also an example of "pre-purchase characteristic information" indicating the characteristic of the user Ux. In the example shown in the drawing, the pre-purchase profile R**11** includes four types of characteristics. However, any number of types of characteristics may be selected as long as the included contents represent characteristics of the user Ux. The webpage may be a URL with the largest number of pageviews, instead of the URL that is browsed most frequently.

FIG. **10** is a diagram showing an example of a post-purchase profile. The post-purchase profile R**12** shown in FIG. **10** is an example of "post-purchase information" relating to activities of a user Uy. The post-purchase profile R**12** is generated based on contents stored in the activity history table TBL**1** in the post-purchase period X**20**. In addition, the post-purchase profile R**12** includes the characteristics of the user Uy. In the example shown in FIG. **9**, the post-purchase profile R**12** includes, for example, a webpage that is frequently browsed by the user Uy, an average walking speed of the user Uy, a cell ID of a cell in which the user apparatus **10** of the user Uy is most frequently located, and position information at a place the user Uy visits most frequently. Therefore, the post-purchase profile R**12** is also an example of "post-purchase characteristics information" indicating the characteristics of the user Uy. It is of note that the number of types of characteristics may be any selected as long as the contents included in the post-purchase profile R**12** represent characteristics of the user Uy. Furthermore, the webpage may be a URL with the greatest number of pageviews, instead of the URL that is browsed most frequently.

The evaluator **113** shown in FIG. **4** evaluates the identicalness of the user Uy and the person who purchased the electronic ticket based on the pre-purchase profile R**11** and the post-purchase profile R**12**. As described above, the user Ux is the user U who owns the user apparatus **10** before purchasing the electronic ticket. Therefore, the person who purchased the electronic ticket is the user Ux. Thus, the identicalness of the user Uy and the person who purchased the electronic ticket can be evaluated by comparison between the pre-purchase profile R**11** and the post-purchase profile R**12**.

The setter **114** sets a state relating to validity of the electronic ticket based on a result of the evaluation by the evaluator **113**. Examples of the state relating to the validity of the electronic ticket include a valid state of the electronic ticket and an invalid state of the electronic ticket. When the electronic ticket becomes valid, the user Uy can use the electronic ticket. For example, when the electronic ticket is a ticket for admission to a concert, the user Uy can enter a concert hall using the valid electronic ticket. On the other hand, when the electronic ticket is invalid, the user Uy cannot use the electronic ticket. In this case, the user Uy cannot enter the concert hall using the invalid electronic ticket. The state in which the electronic ticket is invalid includes, for example, a state in which the electronic ticket data D**1** is deleted, or a state in which the electronic ticket is not settled and cannot be used.

The ticket processor **115** performs various processing related to the electronic ticket. The ticket processor **115** performs, for example, application for purchase of the electronic ticket to the service server **20**, acquisition of the electronic ticket data D**1**, settlement relating to the purchase of the electronic ticket, and a display of the electronic ticket on the display device **14**. Furthermore, the display device **14** displays an image indicating information included in the electronic ticket. For example, the image is an image of a two-dimensional code such as a QR code (registered trademark).

An operation of the user apparatus **10** will be described below. FIG. **11** is a flowchart showing an example of validity setting processing of an electronic ticket in a user apparatus **10**. When processing device **11** executes the ticket program P**1** read from the storage device **12**, the validity setting processing is executed.

First, the ticket processor **115** determines whether user U has applied for an electronic ticket using the operation device **15** (S**10**). The determination is repeated until an application is made. For example, when the user U activates the ticket program P**1** and taps an application button displayed on the display device **14**, the ticket processor **115**

determines that the application for the electronic ticket has been made based on a signal indicating the operation of the user U output from the operation device **15**. When the user U applies for the electronic ticket using the operation device **15**, the processing device **11** executes evaluation processing (S**100**).

FIG. **12** is a flowchart showing an example of the evaluation processing shown in FIG. **11**. When the evaluation processing is started, the history generator **111** starts generating the activity history table TBL**1** (S**11**). The history generator **111** classifies activities of the user U for each type of the user's activity based on signals from the GPS device **16**, the time keeping device **17**, and the motion sensor **18**, thereby generating the web history information TBL**11**, the walking history information TBL**12**, and the position history information TBL**13**, which are described above. It is assumed that the generation processing of the activity history table TBL**1** is executed by the history generator **111** until the validity setting processing ends.

Next, the profile generator **112** determines whether the communication device **13** has received the electronic ticket data D**1** from the service server **20** (S**12**). The determination is repeated until the communication device **13** receives the electronic ticket data D**1**. When the communication device **13** receives the electronic ticket data D**1** (S**12**: Yes), the profile generator **112** generates a pre-purchase profile R**11** based on the activity history table TBL**1** (S**13**). Specifically, the profile generator **112** extracts the activity history information in the pre-purchase period X**10** from the activity history table TBL**1** in the pre-purchase period X**10**, and identifies the activity representing the characteristic of the user Ux. More specifically, the profile generator **112** identifies the URL of the webpage that is browsed most frequently, the cell ID that is communicated most frequently, and the position information that was most frequent in the pre-purchase period X**10**, for example. In addition, the profile generator **112** calculates the average walking speed of the user Ux in the pre-purchase period X**10**. Then, the profile generator **112** generates the pre-purchase profile R**11** using the specified information.

Next, the profile generator **112** determines, based on the signal from the time keeping device **17**, whether the determination time T**3** has elapsed (S**14**). The determination is repeated until the determination time T**3** elapses. When the determination time T**3** has elapsed (S**14**: Yes), the profile generator **112** generates the post-purchase profile R**12** based on the activity history table TBL**1** (S**15**). Specifically, the profile generator **112** extracts the activity history information in the post-purchase period X**20** from the activity history table TBL**1** in the post-purchase period X**20**, and identifies the activity representing the characteristics of the user Uy. The profile generator **112** identifies the URL of the webpage that is browsed most frequently, the cell ID that is communicated most frequently, and the position information that is stayed at most frequently in the post-purchase period X**20**, for example. In addition, the profile generator **112** calculates the average walking speed of the user Uy in the post-purchase period X**20**. Then, the profile generator **112** generates the post-purchase profile R**12** using the specified information.

Subsequently, the evaluator **113** evaluates the identicalness of the user Uy and the person who purchased electronic ticket based on the pre-purchase profile R**11** and the post-purchase profile R**12**. First, the evaluator **113** calculates an evaluation value indicating the degree of similarity between the pre-purchase profile R**11** and the post-purchase profile R**12** (S**16**). For example, an evaluation value F is given by an evaluation function indicated in Equation 1.

$$F=\alpha 1*f1(x1,y1)+\alpha 2*f2(x2,y2)+\alpha 3*f3(x3,y3) \quad \text{Equation 1}$$

Where, $\alpha 1$, $\alpha 2$, $\alpha 3$ are coefficients; x1 and y1 are parameters related to the URL of the webpage; x2 and y2 are parameters related to the walking speed; and x3 and y3 are parameters related to the cell ID. The function f1(x1, y1) has a value of "1" when x1 and y1 match, and has a value of "0" when they do not match. The function f2(x2, y2) has a value of "1" when $2.05>(x2^2+y2^2)/(x2y2)>1.95$, has a value of "0.8" when $2.1>(x2^2+y2^2)/x2y2\geq 2.05$ or $1.95\geq(x2^2+y2^2)/x2y2>1.9$, and has a value of "0" in other cases. The function f3(x3, y3) has a value of "1" when x3 and y3 match, has a value of "0.8" when x3 and y3 are cell IDs of cells adjacent to each other, and has a value of "0" in other cases.

Here, it is assumed that (A is equal to 0.8, $\alpha 2$ is equal to 1.2, and $\alpha 3$ is equal to 1. In this case, the evaluation value F is calculated based on the pre-purchase profile R**11** shown in FIG. **9** and the post-purchase profile R**12** shown in FIG. **10**. Since f1(x1, y1) is equal to 0, f2(x2, y2) is equal to 1, and f3(x3, y3) is equal to 1, the evaluation value F has a value of "2.2" (F=0.8*0+1.2*1+1*1). The calculation method of the evaluation value is not particularly limited to the example described above, and any evaluation function may be used.

Returning to FIG. **11**, the evaluator **113** determines whether the evaluation value obtained in step S**16** is equal to or greater than a threshold (S**17**). When the evaluation value is equal to or greater than the threshold and the determination result is affirmative (S**17**: Yes), the setter **114** makes the electronic ticket valid (S**18**). In other words, the setter **114** makes the electronic ticket valid when the identicalness of the person who purchased the electronic ticket and the user Uy is high. On the other hand, when the evaluation value is less than the threshold and the determination result is negative (S**17**: No), the setter **114** invalidates the electronic ticket (S**19**). In other words, the setter **114** invalidates the electronic ticket when the identicalness of the person who purchased the electronic ticket and the user Uy is low.

Although no flowchart is shown, when the electronic ticket is set to be valid by the setter **114** (S**18**), the ticket processor **115** causes the display device **14** to display the electronic ticket, for example. When the electronic ticket is displayed, the user U can use the electronic ticket. For example, the dedicated terminal provided in an entrance gate of a concert hall reads the electronic ticket displayed on the user's display device whereby the user U can enter the concert hall. On the other hand, when the electronic ticket is set to be invalid by the setter **114** (S**19**), the ticket processor **115** deletes or disables the electronic ticket data D**1**, for example. When the electronic ticket data D**1** is deleted or disabled, the user U cannot use the electronic ticket.

As described above, the user apparatus **10**, that is, an example of the "mobile terminal apparatus" includes: the evaluator **113** that evaluates the identicalness of user Uy and a person who purchased an electronic ticket in the post-purchase period X**20**; and the setter **114** that sets a state related to the validity of the electronic ticket based on a result of the evaluation of the evaluator **113**. As described above, when the electronic ticket is purchased, the evaluator **113** evaluates the above-described identity based on the pre-purchase profile R**11** as "pre-purchase information" relating to activities of a user Ux in the pre-purchase period X**10** and the post-purchase profile R**12** as "post-purchase information" relating to activities of the user Uy in the post-purchase period X**20**.

In the user apparatus **10**, since the evaluator **113** is provided, it is possible to evaluate the identicalness of the person who purchased the electronic ticket (a subscriber of the user apparatus **10**) and the user Uy in the post-purchase period X**20**, using different activities for the individuals. Further, in the user apparatus **10**, since the setter **114** is provided, for example, it is possible to make the electronic ticket invalid when it is determined that the person who purchased the electronic ticket has lent or transferred the user apparatus **10** itself to a person other than the purchaser, after purchasing the electronic ticket. Therefore, it is possible to reduce or prevent illegal resale of the electronic ticket by lending or transfer of the user apparatus **10** itself. When the user apparatus **10** determines that the identicalness of the person who purchased the electronic ticket and the user Uy is high, as described above, the electronic ticket is validated. In this case, the user Uy can use the electronic ticket.

As described above, the evaluator **113** calculates the evaluation value based on the pre-purchase profile R**11** as "pre-purchase information" and the post-purchase profile R**12** as "post-purchase information". In addition, the setter **114** compares the evaluation value with the threshold and sets the state relating to the validity of the electronic ticket.

The identicalness of the person who purchased the electronic ticket and the user Uy can be quantitatively determined by comparison between the evaluation value and the threshold. In addition, the threshold, which is an evaluation criterion for identicalness, is freely selectable depending on the type of electronic ticket, for example. For example, a high-priced electronic ticket may have a higher threshold than a low-priced electronic ticket. In step S**17**, the setter **114** validates the electronic ticket when the evaluation value exceeds the threshold and the evaluation value is equal to the threshold in the determination of the evaluator **113**. However the setter **114** may validate the electronic ticket only when the evaluation value exceeds the threshold.

As described above, the setter **114** invalidates the electronic ticket when the evaluation value is less than the threshold. When the evaluation value is less than the threshold, examples of the state relating to the validity of the electronic ticket set by the setter **114** include a pending state as well as the invalid state. When the identity is not clear by the comparison between the evaluation value and the threshold, the setter sets the electronic ticket to be in the invalid state rather than in the pending state. Thus, illegal resale can be properly reduced or prevented.

Furthermore, in the present embodiment, the pre-purchase profile R**11** is the pre-purchase characteristics information that is generated based on the activities of the user Ux in the pre-purchase period X**10** to characterize the user Ux.

Since the pre-purchase profile R**11**, which is the pre-purchase characteristics information, reflects the characteristics of the user Ux, it is possible to evaluate the identicalness of the user Uy in the post-purchase period and the person who purchased the electronic ticket, depending on whether the activity after the purchase of the electronic ticket corresponds to the characteristics of the user Ux. As a result, the identicalness can be evaluated with high accuracy.

In addition, in the present embodiment, the post-purchase profile R**12** is the post-purchase characteristics information that is generated based on the activities of the user Uy in the post-purchase period X**20** to characterize the user Uy. The identity is evaluated by the comparison between the pre-purchase profile R**11**, which is the pre-purchase characteristic information, and the post-purchase profile R**12** which is the post-purchase characteristic information. Thus, the identity can be evaluated with higher accuracy.

In the present embodiment, the identity is evaluated based on the pre-purchase profile R**11** and the post-purchase profile R**12**. However, the identicalness may be evaluated based on the activity history table TBL**1** in the pre-purchase period X**10** and the activity history table TBL**1** in the post-purchase period X**20**. In this case, the activity history information relating to the pre-purchase period X**10** in the activity history table TBL**1** corresponds to the "pre-purchase information". The activity history information relating to the post-purchase period X**20** in the activity history table TBL**1** corresponds to the "post-purchase information".

The first embodiment has been described above. The first embodiment can be variously modified. A specific modification applicable to the first embodiment described above will be exemplified below. In the modification described below, differences from the first embodiment described above will mainly be described, and similar matters will not be described. In the drawings referred to in the following modification, the same reference numerals are given to the same components as those in the above-described embodiment.

Modifications

FIG. **13** is a flowchart showing validity setting processing according to a first modification. In the validity setting processing shown in FIG. **13**, when the evaluator **113** determines in step S**17** that the evaluation value is not equal to or greater than the threshold (No), the setter **114** executes authentication processing for the user U (S**21**). Examples of the authentication processing include authentication processing accompanied by input of an ID and a password and authentication processing such as fingerprint authentication using biometric information. Then, the setter **114** determines whether the authentication is successful (S**22**), and the setter validates the electronic ticket (S**18**) when the authentication is valid (S**22**: Yes). When the authentication fails (S**22**: No), the setter invalidates the electronic ticket (S**19**).

As described above, the setter **114** executes user authentication of the user U when the evaluation value is less than the threshold, and validates the electronic ticket when the user authentication is successful. With such setting, it is possible to avoid invalidating the electronic ticket despite the fact that the person who purchased the electronic ticket and the user U in the post-purchase period X**20** are the same person. In the first embodiment, when a possibility that a user Ux and a user Uy are the same person is low, the electronic ticket will be invalidated. In this case, for example, when a person who purchased an electronic ticket goes on a trip after acquiring the electronic ticket data D**1** and the person behaves differently from normal days, the electronic ticket may be invalidated, despite the person being the same person. However, according to the first modification, such a problem can be solved.

An example of the authentication processing includes processing for asking a user Uy a question regarding activities in the pre-purchase period X**10**. Specifically, the setter **114** generates a correct answer of the user Uy for one or more questions regarding the activities in the pre-purchase period X**10** when the evaluation value is less than the threshold. The setter **114** acquires the answer of the user Uy and compares the acquired answer with the correct answer, thereby determining whether the answer is correct or incorrect. Thereafter, the setter **114** sets the state relating to the validity of the electronic ticket depending on the determination result obtained by the determination.

For example, the setter **114** generates one question, validates the electronic ticket when the answer from the user Uy is correct, and invalidates the electronic ticket when the answer from the user Uy is incorrect. In addition, for example, the setter **114** generates questions, validates the electronic ticket when a right answer rate from the user Uy is equal to or greater than a predetermined value. The setter **114** invalidates the electronic ticket when the right answer rate from the user Uy is less than the predetermined value. The predetermined value is freely selectable depending on the type of electronic ticket, for example.

A person who knows the activities of the user Ux in the pre-purchase period X**10** has a high probability of being the same as the user Ux in the pre-purchase period X**10**. Therefore, in the modification described above, even when the evaluation value is less than the threshold, since the state regarding the validity of the electronic ticket is set depending on the answer to the question regarding the activities of the user Ux in the pre-purchase period X**10**, it is possible to avoid invalidating the electronic ticket despite the fact that the person who purchased the electronic ticket and the user Uy are the same person.

2. Second Embodiment

A second embodiment of the present invention will be described below. A user apparatus **10** according to the present embodiment is mainly similar to the user apparatus **10** according to the first embodiment except that the state regarding the validity of the electronic ticket is pending and additional processing is performed when the evaluation value is less than the threshold. In the following description, differences of the second embodiment from the first embodiment described above will be mainly described, and similar matters will not be described. Although the description is given below with reference to FIGS. **14**, **15**, and **16**, in these drawings, the same reference numerals are given to the same components as those in the above-described embodiment. The matters in the above-described modification are also applicable to the present embodiment.

FIG. **14** is a flowchart showing an example of validity setting processing according to the second embodiment. In the present embodiment, when the evaluator **113** determines that the evaluation value is not equal to or greater than the threshold (S**17**: No), the setter **114** sets the state regarding the validity of the electronic ticket to a pending state (S**20**). Next, the processing device **11** executes additional processing (S**30**).

Here, an example of a flow related to the purchase of the electronic ticket by the user U in the present embodiment will be described with reference to FIG. **15**. FIG. **15** is a diagram showing a time flow regarding purchase of an electronic ticket in the second embodiment. In FIG. **15**, "T**4**" indicates additional determination time in the additional processing (S**30**), and "X**30**" indicates an additional period that is a period from the determination time T**3** to the additional determination time T**4**. The additional period X**30** is freely selectable. In the example shown in FIG. **15**, the additional period X**30** is six days from the determination time T**3**. Therefore, the additional determination time T**4** is six days after the determination time T**3**. In the following description, a "user Uz" is a user U who owns the user apparatus **10**, which is owned by the user Ux in the pre-purchase period X**10**, in the additional period X**30**.

FIG. **16** is a flowchart showing an example of the additional processing shown in FIG. **14**. First, the history generator **111** determines whether the additional period X**30** has elapsed from the determination time T**3** in the evaluation processing (S**100** in FIG. **14**) (S**31**). The determination is repeated until the additional period X**30** elapses. When the additional period X**30** has elapsed (S**31**: Yes), the profile generator **112** generates an additional post-purchase profile R**12** based on an activity history table TBL**1** in the additional period X**30** (S**32**). Next, the evaluator **113** calculates an evaluation value for evaluating identicalness of the user Uz and the person who purchased the electronic ticket based on a pre-purchase profile R**11** and the additional post-purchase profile R**12** (S**33**). The method of calculating the evaluation value is not particularly limited, and for example, the method described in the evaluation processing S**100** can be used.

Next, the evaluator **113** determines whether the evaluation value is equal to or greater than the threshold (S**34**). When the evaluator **113** determines that the evaluation value is equal to or greater than the threshold (S**34**: Yes), the setter **114** validates the electronic ticket (S**18**). On the other hand, when the evaluator **113** determines that the evaluation value is not equal to or greater than the threshold (S**34**: No), the setter **114** invalidates the electronic ticket (S**19**). The threshold used in step S**34** may be equal to or different from the threshold used in step S**17** shown in FIG. **14**.

As described above, according to the present embodiment, when the evaluator **113** determines (S**17**: No) that identicalness of the user Uy and the person who purchased an electronic ticket is not clear in the determination (S**17**) of the evaluation value after the evaluation processing (S**100**), the setter **114** sets the state regarding the validity of the electronic ticket to a pending state (S**20**). For example, the setter **114** sets the electronic ticket to a pending state. Then, the processing device **11** executes the additional processing, and validates the electronic ticket when the identicalness of the user Uz and the person who purchased the electronic ticket becomes clear. For example, the settlement of the electronic ticket is completed, and the electronic ticket can be used. With such additional processing, for example, even when the person who purchased the electronic ticket behaves differently from normal days immediately after acquiring the electronic ticket data D**1**, the electronic ticket may be validated when the identity is again clarified. Therefore, it is possible to reduce the probability that an electronic ticket will be invalidated despite the person being the same.

In the second embodiment as described above, similarly to the first embodiment, it is possible to reduce or prevent illegal resale of the electronic ticket by lending or transfer of the user apparatus **10** itself.

3. Third Embodiment

A third embodiment of the present invention will be described below. A user apparatus **10** according to the present embodiment is mainly similar to the user apparatus **10** according to the first embodiment except that post-purchase profile generation and evaluation of identity are repeated multiple times. In the following description, differences of the third embodiment from the first embodiment described above will be mainly described, and similar matters will not be described. Moreover, although the description is given below with reference to FIGS. **17** and **18**, in these drawings, the same reference numerals are given to the same components as those in the above-described embodiment. The matters in the modification and the second embodiment described above are also applicable to the present embodiment.

An example of a flow related to purchase of an electronic ticket of the user U according to the present embodiment will be described with reference to FIG. **17**. FIG. **17** is a diagram showing a time flow regarding purchase of an electronic ticket according to the third embodiment. In the example shown in FIG. **17**, identity is evaluated after each of post-purchase periods X**21**, X**22**, X**23**, X**24**, X**25**, X**26**, and X**27** from acquisition time T**2**, which is purchase time, to determination time T**3** has elapsed. Each of the post-purchase periods X**21** to X**27** can be set as appropriate, and it is one day in the example shown in FIG. **17**.

FIG. **18** is a flowchart showing an example of validity setting processing according to the third embodiment. The profile generator **112** generates a pre-purchase profile R**11** (S**13**), and then determines whether the post-purchase period X**21** has elapsed from the acquisition time T**2** at which electronic ticket data D**1** is received (S**41**). The determination is repeated until the post-purchase period X**21** elapses. The profile generator **112** generates a post-purchase profile R**12** based on an activity history table TBL**1** in the post-purchase period X**21** (S**42**) when the post-purchase period X**21** has elapsed (S**41**: Yes).

Subsequently, the evaluator **113** calculates an evaluation value for evaluating identicalness of the user Uy and the person who purchased the electronic ticket based on the pre-purchase profile R**11** and the post-purchase profile R**12** (S**43**). Subsequently, the evaluator **113** determines whether the evaluation value is equal to or greater than a threshold (S**44**). When determining that the evaluation value is equal to or greater than the threshold (S**44**: Yes), the evaluator **113** increments a count value compared with a predetermined value in a determination in step S**47**, to be described below (S**45**). The count value is reset when a ticket program P**1** is activated. On the other hand, the evaluator **113** resets the count value when determining that the evaluation value is not equal to or greater than the threshold (S**44**: No) (S**46**).

Subsequently, the evaluator **113** determines whether the count value coincides with the predetermined value (S**47**). When the evaluator **113** determines that the count value coincides with the predetermined value (S**47**: Yes), the setter **114** validates the electronic ticket (S**18**). The predetermined value is freely selectable. In the example shown in FIG. **18**, the predetermined value is "3". Therefore, even when the evaluation value is equal to or greater than the threshold twice consecutively, the count value is reset to zero when the evaluation value is less than the threshold in a third determination. In other words, when the evaluation value is equal to or greater than the threshold three times or more consecutively, the setter **114** validates the electronic ticket.

On the other hand, when the evaluator **113** determines that the count value does not match the predetermined value (S**47**: No), the evaluator **113** determines whether determination time T**3** has elapsed (S**48**). When the determination time T**3** has elapsed (S**48**: Yes), the setter **114** invalidates the electronic ticket (S**19**). In other words, the setter **114** invalidates the electronic ticket, because the determination result of the identity is not affirmed consecutively in the post-purchase periods X**21** to X**27** even though the identity is evaluated multiple times.

When the evaluator **113** determines that the determination time T**3** has not elapsed (S**48**: No), the process returns to step S**41**. Then, the profile generator **112** determines whether the next post-purchase period X**22** has elapsed from the previous determination time, that is, the determination time in the previous step S**44** (S**41**). In step S**41**, for example, when the previous determination time is after the elapse of the post-purchase period X**22**, it is determined whether the next post-purchase period X**23** has elapsed. Similarly, for example, when the previous determination time is after the elapse of the post-purchase period X**23**, it is determined whether the next post-purchase period X**24** has elapsed. Accordingly, when the above-described evaluation value is determined until the determination time T**3** in the example of FIG. **17** (S**44**), seven post-purchase profiles R**12** are generated.

In the example shown in FIG. **17**, the post-purchase periods X**21** to X**27** have the same length of time, but the post-purchase periods X**21** to X**27** may have different lengths of time. Therefore, in the example shown in FIG. **18**, the post-purchase profile R**12** is periodically generated with lapse of time, but the post-purchase profile R**12** may be irregularly generated with lapse of time. The number of post-purchase periods X**21** to X**27** is not limited to seven, and may be freely selected.

As described above, the post-purchase profile R**12**, which is "post-purchase information", is repeatedly generated over time. In addition, as described above, every time the post-purchase profile R**12** is repeatedly generated, the evaluator **313** evaluates identicalness of a user U in the post-purchase periods X**21** to X**27** and a person who purchased the electronic ticket, based on the pre-purchase profile R**11** and the newly generated post-purchase profile R**12**.

Since the identity is evaluated using the post-purchase profile R**12** that is repeatedly generated over time, it is possible to invalidate the electronic ticket even when the person who purchased the electronic ticket lends or transfers the electronic ticket to another person immediately after the purchase or after a while. Thus, illegal resale can be reduced or prevented, regardless of the lending or transfer time.

In the third embodiment as described above, similarly to the first embodiment, it is also possible to reduce or prevent the illegal resale of the electronic ticket due to lending or transfer of the user apparatus **10** itself.

4. Fourth Embodiment

A fourth embodiment of the present invention will be described below. A user apparatus **10** according to the present embodiment is mainly similar to the user apparatus **10** according to the third embodiment, except that reference information profile is mainly used. In the following description, differences of the fourth embodiment from the third embodiment described above will be mainly described, and similar matters will not be described. Although the description is given below with reference to FIGS. **19** to **22**, in these drawings, the same reference numerals are given to the same components as those in the above-described embodiment. The matters in the modification, the first embodiment, and the second embodiment described above are also applicable to the present embodiment.

In the present embodiment as in the third embodiment, the evaluation of identity is also sequentially repeated multiple times over time. However, the present embodiment differs from the third embodiment in terms of a period to be compared in an evaluation value calculation (S**43**).

Each of FIGS. **19**, **20**, and **21** is a diagram illustrating a post-purchase period according to the fourth embodiment. In the present embodiment, as shown in FIG. **19**, periods to be compared in a first evaluation value calculation are a pre-purchase period X**10** and a post-purchase period X**21**. In addition, as shown in FIG. **20**, periods to be compared in a second evaluation value calculation are a reference period X**41** and a post-purchase period X**22**. The reference period X**41** is a period obtained by addition of the pre-purchase

period X10 and the post-purchase period X21. Furthermore, as shown in FIG. 21, periods to be compared in a third evaluation value calculation are a reference period X42 and a post-purchase period X23. The reference period X42 is a period obtained by addition of the pre-purchase period X10, the post-purchase period X21, and the post-purchase period X22.

FIG. 22 is a flowchart showing an example of validity setting processing according to the fourth embodiment. In the example shown in FIG. 19, when electronic ticket data D1 is received (S12: Yes), the profile generator 112 determines whether the post-purchase period X21 has elapsed (S41). When the post-purchase period X21 has elapsed (S41: Yes), the profile generator 112 generates a pre-purchase profile R11 based on an activity history table TBL1 in the pre-purchase period X10, which is a period ahead of the immediate previous post-purchase period X21 (S13*a*). Subsequently, the profile generator 112 generates a post-purchase profile R12 in the post-purchase period X21 based on the activity history table TBL1 in the post-purchase period X21 (S42). Then, the evaluator 113 calculates an evaluation value based on the pre-purchase profile R11 and the post-purchase profile R12 in the post-purchase period X21 (S43), and compares the evaluation value with a threshold (S44). The evaluator 113 evaluates identicalness based on such comparison.

In the example of FIG. 20, when the next post-purchase period X22 has elapsed from the previous determination time, that is, the determination time in preceding step S44 (S41: Yes), the profile generator 112 generates a reference profile based on the activity history table TBL1 in the reference period X41 which is a period ahead of the post-purchase period X22 (S13*a*). In this example, the reference profile is a profile (not shown) representing characteristics of the user U in the reference period X41. Subsequently, the profile generator 112 generates a post-purchase profile R12 in the post-purchase period X22 based on the activity history table TBL1 in the post-purchase period X22 (S42). Then, the evaluator 113 calculates an evaluation value based on the reference profile in the reference period X41 and the post-purchase profile R12 in the post-purchase period X22 (S43), and then compares the evaluation value with the threshold (S44). The evaluator 113 evaluates the identity based on such comparison.

In the example of FIG. 21, when the next post-purchase period X23 has elapsed from the previous determination time, that is, the determination time in preceding step S44 (S41: Yes), the profile generator 112 generates a reference profile based on the activity history table TBL1 in the reference period X42 which is a period ahead of the post-purchase period X23 (S13*a*). In this example, the reference profile is a profile (not shown) representing characteristics of the user U in the reference period X42. Subsequently, the profile generator 112 generates a post-purchase profile R12 in the post-purchase period X23 based on the activity history table TBL1 in the post-purchase period X23 (S42). Then, the evaluator 113 calculates an evaluation value based on the reference profile in the reference period X42 and the post-purchase profile R12 in the post-purchase period X23 (S43), and then compares the evaluation value with the threshold (S44). The evaluator 113 evaluates the identicalness based on such comparison.

As described above, in the example shown in FIG. 20, the evaluator 113 evaluates the identicalness based on the reference profile (reference information) relating to activities of a user U in the reference period X41 and the post-purchase profile R12 relating to activities of a user U in the post-purchase period X22 that is newer than the post-purchase period X21. In the example shown in FIG. 20, the reference period X41 includes the pre-purchase period X10 and the post-purchase period X21, and the post-purchase period X21 corresponds to a "post-purchase reference period of the electronic ticket". In the example of FIG. 21, the evaluator 113 evaluates the identity based on the reference profile relating to activities of a user U in the reference period X42 and the post-purchase profile R12 relating to activities of a user U in the post-purchase period X23 that is newer than the post-purchase periods X21 and X22. In the example shown in FIG. 20, the reference period X42 includes the pre-purchase period X10, the post-purchase period X21, and the post-purchase period X22. Each of the post-purchase periods X21 and X22 corresponds to "post-purchase reference periods of the electronic ticket".

In the present invention, it is possible to reduce or prevent illegal resale regardless of the lending or transfer time of the user apparatus 10 by comparing, over the lapse of time, the reference profile in the reference period X41 or X42 including the characteristics of the user U in the post-purchase period with the latest post-purchase profile R12.

In the fourth embodiment as described above, similarly to the first embodiment, it is also possible to reduce or prevent illegal resale of the electronic ticket due to lending or transfer of the user apparatus 10 itself.

5. Fifth Embodiment

A fifth embodiment of the present invention will be described below. A service system 1A according to the present embodiment is similar to the user apparatus 10 according to the first embodiment except that validity setting processing is performed by a management server 30 instead of the user apparatus 10. In the following description, differences of the fifth embodiment from the first embodiment described above will be mainly described, and similar matters will not be described. Although the description is given below with reference to FIGS. 23 to 26, in these drawings, the same reference numerals are given to the same components as those in the above-described embodiment.

FIG. 23 is a block diagram showing an overall configuration of a service system according to a fifth embodiment. A service system 1A shown in FIG. 23 includes user apparatuses 10 owned by users U, a network NW, a service server 20, and a management server 30 which is an example of a "management apparatus".

FIG. 24 is a block diagram showing a configuration of hardware of the management server 30 shown in FIG. 23. The management server 30 is realized by a computer system including a processing device 31, a storage device 32, a communication device 34, and a time keeping device 35. The components of the management server 30 are connected to each other by a single bus or a plurality of buses. The term "device" denoted in the components of the management server 30 may be replaced with another term such as "circuit", "device", or "unit". In addition, each of the components of the management server 30 includes a single device or a plurality of devices, and some components of the management server 30 may not be provided.

The processing device 31 has a configuration similar to that of the processing device 11, the storage device 32 has a configuration similar to that of the storage device 12, the communication device 34 has a configuration similar to that of the communication device 13, and the time keeping device 35 has a configuration similar to that of the time keeping device 17. However, the storage device 32 differs

from the storage device **12** in terms of storing a management program P**0** related to validity setting processing S**200** (see FIG. **26**). The storage device **32** stores user profiles R**1**[**1**] to R[m] of users U and activity history tables TBL**1**[**1**] to TBL**1**[m] of users U. In the following description, unless the m user profiles R**1**[**1**] to R[m] need to be distinguished from each other, any one user profile is represented as a user profile R**1**. When N activity history tables TBL**1**[**1**] to TBL**1**[m] need to be distinguished from each other, any one activity history table is represented as an activity history table TBL**1**.

FIG. **25** is a functional block diagram showing a functional configuration example of the management server **30** shown in FIG. **23**. The processing device **31** of the management server **30** reads and executes the management program P**0** from the storage device **32**, thereby functioning as a history generator **311**, a profile generator **312**, an evaluator **313**, and a setter **314**. The history generator **311** has a configuration similar to that of the history generator **111**, the profile generator **312** has a configuration similar to that of the profile generator **112**, the evaluator **313** has a configuration similar to that of the evaluator **113**, and the setter **314** has a configuration similar to that of the setter **114**. The setter **314** only determines a state regarding validity of the electronic ticket, and does not perform the setting.

An operation of the service system **1**A will be described below. FIG. **26** is a sequence chart showing an example of processing relating to purchase of an electronic ticket in the service system **1**A. First, a user apparatus **10** accepts an operation of a user U, and the user apparatus **10** transmits a purchase request indicating an application for purchase of an electronic ticket to the service server **20** (S**51**). Upon receiving the purchase request, the service server **20** requests the management server **30** to monitor the user apparatus **10** that applied for the electronic ticket (S**52**). The management server **30** requests the user apparatus **10** specified based on the monitoring request from the service server **20** to provide various types of information indicating activities of the user U (S**53**). The user apparatus **10** receives the request from the management server **30** and starts providing various types of information indicating the activities of the user U to the management server **30** (S**54**). Examples of the various types of information indicating the activities of the user U include an URL of a browsed webpage, information relating to walking of the user U, a cell ID in which the user is located, and position information based on a GPS signal.

Then, the service server **20** provides electronic ticket data D**1** to the user apparatus **10** (S**55**), and notifies the management server **30** that the electronic ticket data D**1** is provided to the user apparatus **10** (S**56**). The management server **30** executes validity setting processing when receiving the notification from the service server **20** (S**200**). For example, the validity setting processing described in the first embodiment is applicable to the validity setting processing S**200**.

The management server **30** executes the validity setting processing (S**200**) to set the state regarding the validity of the electronic ticket, and then transmits the set result to the service server **20** (S**57**). Upon receiving the set result of the state regarding the validity of the electronic ticket, the service server **20** executes setting in accordance with the set result for the electronic ticket stored in the user apparatus **10** (S**58**).

The management server **30** according to the present embodiment described above includes the evaluator **313** and the setter **314** that execute the validity setting processing S**200**. Upon receiving information from the service server **20** that the electronic ticket has been purchased by the user apparatus **10** owned by the user U (S**56**), the evaluator **313** evaluates identicalness of the user Uy in the post-purchase period and the person who purchased the electronic ticket, based on the pre-purchase profile R**11** as "pre-purchase information" and the post-purchase profile R**12** as "post-purchase information". In addition, the setter **314** sets the state regarding the validity of the electronic ticket based on the result of the evaluation by the evaluator **313**.

In the management server **30**, since the evaluator **313** is provided, it is possible to evaluate the identicalness of the person who purchased the electronic ticket and the user Uy in the post-purchase period X**20**, using different activities for individuals. In the management server **30**, since the setter **314** is provided, for example, it is possible to invalidate the electronic ticket when it is determined that the person who purchased the electronic ticket has lent or transferred the user apparatus **10** itself to another person other than the person after purchasing the electronic ticket. Therefore, it is possible to reduce or prevent illegal resale of the electronic ticket due to lending or transfer of the user apparatus **10** itself. When the user apparatus **10** determines that the identicalness between the person who purchased the electronic ticket and the user Uy in the post-purchase period X**20** is high, the electronic ticket is validated, for example. In this case, the person who purchased the electronic ticket is able to use the electronic ticket.

The validity setting processing described in the second embodiment, the third embodiment, the fourth embodiment, and the modification may be applied to the validity setting processing S**200** described above.

In the fifth embodiment as described above, similarly to the first embodiment, it is possible to reduce or prevent illegal resale of the electronic ticket due to lending or transfer of the user apparatus **10** itself.

6. Other Matters

In the embodiments described above, the storage device **12** is a recording medium that is able to be read by the processing device **11** and has been exemplified by a ROM, a RAM, and the like. However, examples of the storage device **12** include a flexible disk, a magneto-optical disk (for example, a compact disk, a digital versatile disk, or a Blu-ray (registered trademark) disk), a smart card, a flash memory device (for example, a card, a stick, a key drive), a Compact Disc ROM (CD-ROM), a register, a removable disk, a hard disk, a floppy (registered trademark) disk, and a magnetic strip, a database, a server, and other suitable storage medium. The program may be transmitted from a network via a telecommunication line. The program may be transmitted from a communication network via an electronic communication line.

The above-described embodiments may be applied to a system that utilizes Long Term Evolution (LTE), LTE-Advanced (LTE-A), SUPER 3G, IMT-Advanced, 4G, 5G, Future Radio Access (FRA), W-CDMA (registered trademark), GSM (registered trademark), CDMA2000, Ultra Mobile Broadband (UMB), IEEE 802.11 (Wi-Fi), IEEE 802.16 (WiMAX), IEEE 802.20, Ultra-WideBand (UWB), Bluetooth (registered trademark), or other suitable systems and/or to an enhanced next-generation system that is based on any of these systems.

In the embodiments described above, certain operations (for example, specification of position information by the base station) performed by the base station may be performed by its upper node in some cases. In a network including one or more network nodes having base stations,

various operations performed to communicate with terminals may be apparently performed by the base stations and/or network nodes other than the base stations (for example, an MNME or an S-GW can be assumed, but the network nodes are not limited thereto). Although it has been described that the single network node other than the base stations is used in the above example, combinations of multiple other network nodes (for example, an MME, and an S-GW) may be used.

In the embodiments described above, information, signals, or the like may be presented with use of any of various different techniques. Throughout the above description, for example, data, an instruction, a command, information, a signal, a bit, a symbol, a chip, and so on may be represented by a voltage, a current, an electromagnetic wave, a magnetic field or a magnetic particle, an optical field or a photon, or any combination thereof. It is of note that terms described in the description and/or terms required to understand the description may be replaced with terms having the same or similar meanings.

In the embodiments described above, the input/output information may be stored in a specific location (for example, a memory), or may be managed by a management table. The input/output information can be overwritten, updated, or additionally written. The output information may be deleted. The input information may be transmitted to other devices.

In the embodiments described above, the determination may be performed by a value represented by 1 bit (0 or 1), may be performed by a Boolean value (true or false), or may be performed by numerical comparison (for example, comparison with a predetermined value).

In the sequence chart illustrated in the fifth embodiment described above, the order of the steps may be changed. In other words, the order of the processes in the preferred embodiment of the present invention is not limited to a specific order.

The respective functions illustrated in FIGS. **4** and **25** are realized by any combination of hardware and software. The respective functions may be realized as a single device, or as two or more devices configured separately from each other.

The program illustrated in the embodiments described above should be most widely interpreted to mean an instruction, an instruction set, a code, a code segment, a program code, a subprogram, a software module, an application, a software application, a software package, a routine, a subroutine, an object, an executable file, an execution thread, a procedure, or a function, regardless of the program being referred to as software, a firmware, a middleware, a microcode, a hardware descriptive language, or by other names. Furthermore, the software, the instruction, or the like may be transmitted and received via a transmission medium. For example, when the software is transmitted from a website, a server, or other remote sources using wired techniques such as a coaxial cable, an optical fiber cable, a twisted pair and a digital subscriber line (DSL) and/or wireless techniques such as infrared, radio frequency and microwave, these wired techniques and/or wireless techniques are included within the definition of the transmission medium.

In the embodiments described above, the terms "system" and "network" are interchangeably used.

In the embodiments described above, a base station can accommodate one or more (for example, three) cells (also referred to as sectors). When the base station accommodates multiple cells, the entire coverage area of the base station can be segmented into multiple smaller areas, and the respective smaller areas can provide communication services with a base station subsystem (for example, indoor small base station RRH: Remote Radio Head). The terminology "cell" or "sector" indicates a part or the entirety of the coverage area of the base station providing communication services in the coverage and/or the base station subsystem. Furthermore, the terminologies "base station", "eNB", "cell" and "sector" can be interchangeably used in the description. The base station may be referred to by terms such as a fixed station, a NodeB, an eNodeB (eNB), an access point, a femtocell, and a small cell.

In the embodiments described above, a user apparatus **10** includes a mobile station. The mobile station may also be referred to by those skilled in the art as a subscriber station, a mobile unit, a subscriber unit, a wireless unit, a remote unit, a mobile device, a wireless device, a wireless communication device, a remote device, a mobile subscriber station, an access terminal, a mobile terminal, a wireless terminal, a remote terminal, a handset, a user agent, a mobile client, a client, or any other appropriate term.

In the embodiments described above, the term "connected" or all variations thereof mean any direct or indirect connection or coupling between two or more elements and can include the existence of one or more intermediate elements between two mutually "connected" elements. The connection between elements may be physical, logical, or combinations thereof. If the term is used in the description, it can be considered that two elements are mutually "connected" with use of one or more electrical wires, cables and/or printed electrical connections and as some non-limiting and non-comprehensive examples, with use of electromagnetic energy such as electromagnetic energy having a wavelength in a radio frequency domain, a microwave domain, and an optical (that is, both visible and invisible) domain.

In the embodiments described above, the phrase "based on" does not mean "based only on" unless it is so specified. In other words, the phrase "based on" means both "based only on" and "based at least on".

In the embodiments described above, as long as the terms "including", "comprising" and variations thereof are used in the description or claims, these terms are intended to be inclusive similar to the term "comprising". Furthermore, the term "or" as used in the description or claims is intended not to be an exclusive OR.

Throughout this application, for example, when articles such as "a", "an", and "the" are added in translation into English, such articles refer to including the plural unless otherwise recognized from context.

It will be apparent to those skilled in the art that the present invent is not limited to the embodiments described above. The present invention can be modified and modified without departing from the spirit and scope of the present invention defined based on the description of claims. Accordingly, the description is merely illustrative and the present invention is not limited thereto. The present invention may combine some embodiments selected from the embodiments illustrated in the description.

DESCRIPTION OF REFERENCE SIGNS

1 service system
1A service system
10 user apparatus
20 service server
30 management server
NW network
U user

X10 pre-purchase period
X20 post-purchase period
X21 post-purchase period
X22 post-purchase period
X23 post-purchase period
X24 post-purchase period
X25 post-purchase period
X26 post-purchase period
X27 post-purchase period
X30 additional period
X41 reference period
X42 reference period
T0 download time
T1 application time
T10 use time
T2 acquisition time (purchase time)
T3 determination time
T4 additional determination time

The invention claimed is:

1. A mobile terminal apparatus comprising:

a motion sensor configured to detect an acceleration of the mobile terminal apparatus;

a Global Positioning System (GPS) device configured to acquire a position of the mobile terminal apparatus;

a display;

at least one memory storing:

pre-purchase information relating to activities of a first user of the mobile terminal apparatus during a first period representative of a period before purchase of an electronic ticket;

post-purchase information relating to activities of a second user of the mobile terminal apparatus during a second period that follows the first period and is representative of a period after the purchase of the electronic ticket; and

a program;

at least one processor configured to implement the program to:

calculate a first average walking speed of the first user based on a first acceleration detected by the motion sensor during the first period;

acquire a first position from the GPS device during the first period;

generate the pre-purchase information to be stored in the at least one memory, the pre-purchase information including:

the calculated first average walking speed of the first user; and

the acquired first position;

calculate a second average walking speed of the second user based on a second acceleration detected by the motion sensor during the second period;

acquire a second position from the GPS device during the second period;

generate the post-purchase information to be stored in the at least one memory, the post-purchase information including:

the calculated second average walking speed of the second user; and

the acquired second position;

calculate an evaluation value representing identicalness of whether the second user during the second period is a same person as the first user during the first period, based on:

the generated pre-purchase information including the first average walking speed of the first user and the first position; and

the generated post-purchase information including the second average walking speed and the second position; and

set a state relating to validity of the electronic ticket by comparing the calculated evaluation value with a threshold,

wherein in a third period that follows the second period, the at least one processor is further configured to:

generate reference information relating to activities of the first user during the first and second periods, the reference information including:

the generated pre-purchase information; and

the generate post-purchase information;

generate new post-purchase information relating to activities of the second user during the third period;

calculate a new evaluation value representing identicalness of whether the second user during the third period is a same person as the first user during the first period based on the generated reference information and new post-purchase information; and

automatically set the state relating to validity of the electronic ticket by comparing the calculated new evaluation value with the threshold, and

automatically show the electronic ticket on the display based on the electronic ticket being set to valid.

2. The mobile terminal apparatus according to claim 1, wherein the at least one processor is further configured to implement the program to invalidate the electronic ticket based on the evaluation value being less than the threshold.

3. The mobile terminal apparatus according to claim 1, wherein the at least one processor is further configured to implement the program to:

carry out user authentication based on the evaluation value being less than the threshold; and

validate the electronic ticket based on the user authentication being valid.

4. The mobile terminal apparatus according to claim 1, wherein the at least one processor is further configured to implement the program to:

based on the evaluation value being less than the threshold,

acquire an answer by the second user in the second period, wherein the answer is to one or more questions regarding the activities of the first user during the first period;

determine whether the acquired answer is correct or incorrect; and

set the state relating to validity of the electronic ticket depending on a determination result.

5. The mobile terminal apparatus according to claim 1, wherein the pre-purchase information is pre-purchase characteristics information that characterizes the first user in the first period.

6. The mobile terminal apparatus according to claim 1, wherein:

the post-purchase information is generated repeatedly over time, and

the at least one processor is further configured to implement the program to, each time new post-purchase information is generated, calculate the evaluation value based on the pre-purchase information and the new post-purchase information.

7. The mobile terminal apparatus according to claim 2, wherein the at least one processor is further configured to implement the program to:

carry out user authentication based on the evaluation value being less than the threshold; and

validate the electronic ticket based on the user authentication being valid.

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