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(54) **EXERCISE DIAGNOSIS DEVICE, EXERCISE DIAGNOSIS SYSTEM, PROGRAM, RECORDING MEDIUM, AND EXERCISE DIAGNOSIS METHOD**

(71) Applicant: **SEIKO EPSON CORPORATION**, Tokyo (JP)

(72) Inventor: **Eiji MIYASAKA**, Okaya-shi (JP)

(73) Assignee: **SEIKO EPSON CORPORATION**, Tokyo (JP)

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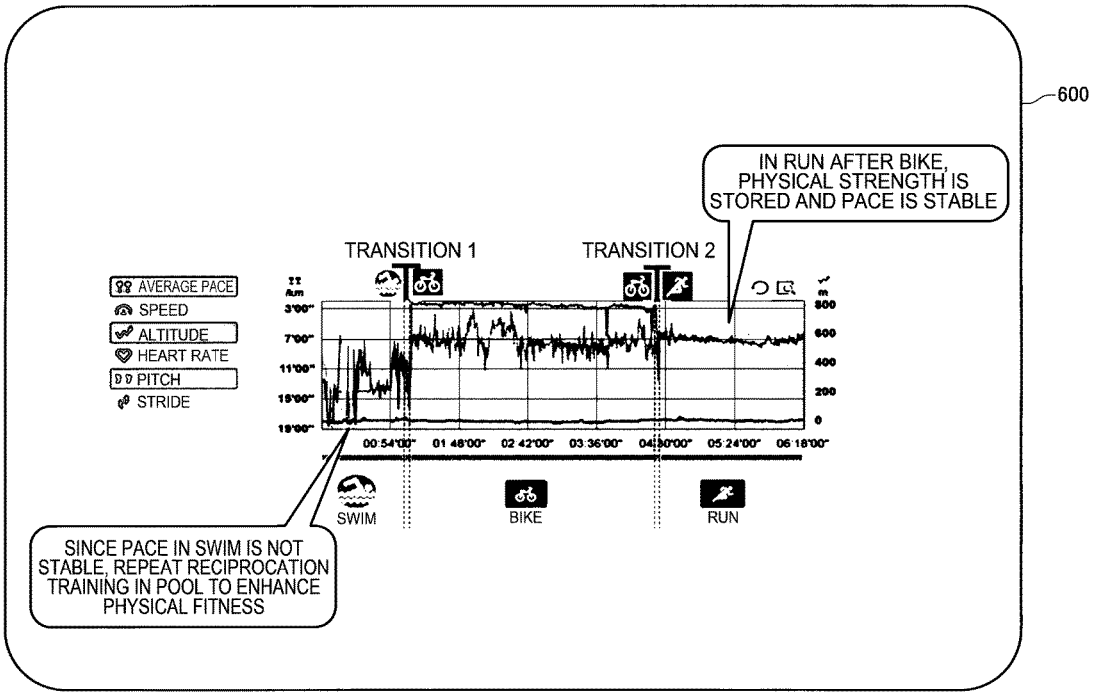
CPC ***A63B 24/0062*** (2013.01); ***A63B 24/0021*** (2013.01); ***A63B 24/0003*** (2013.01); *A63B 2024/0081* (2013.01); *A63B 2024/0071* (2013.01); *A63B 2024/0068* (2013.01); *A63B 2024/0025* (2013.01); ***A63B 24/0075*** (2013.01)

(57) **ABSTRACT**

An exercise diagnosis device receives the exercise information transmitted from an electronic device that is worn on a player and determines a plurality of states including a first exercise state in which the player is executing a first exercise event and a second exercise state in which the player is executing a second exercise event based on a satellite signal transmitted from a positional information satellite, and generates exercise information regarding the player including the determined states, diagnoses an exercise of the player based on the received exercise information, and generates the diagnosis information related to the diagnosis.



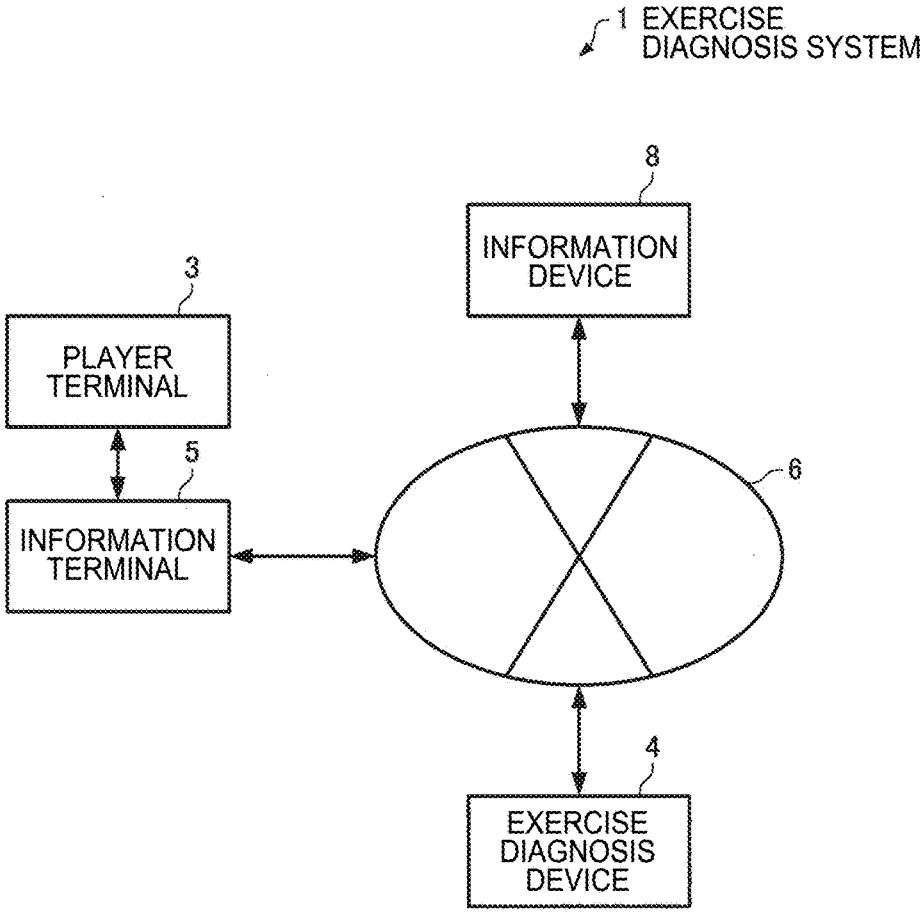

1 EXERCISE DIAGNOSIS SYSTEM
8
INFORMATION DEVICE
3
PLAYER TERMINAL
5
INFORMATION TERMINAL
6
4
EXERCISE DIAGNOSIS DEVICE

FIG. 1

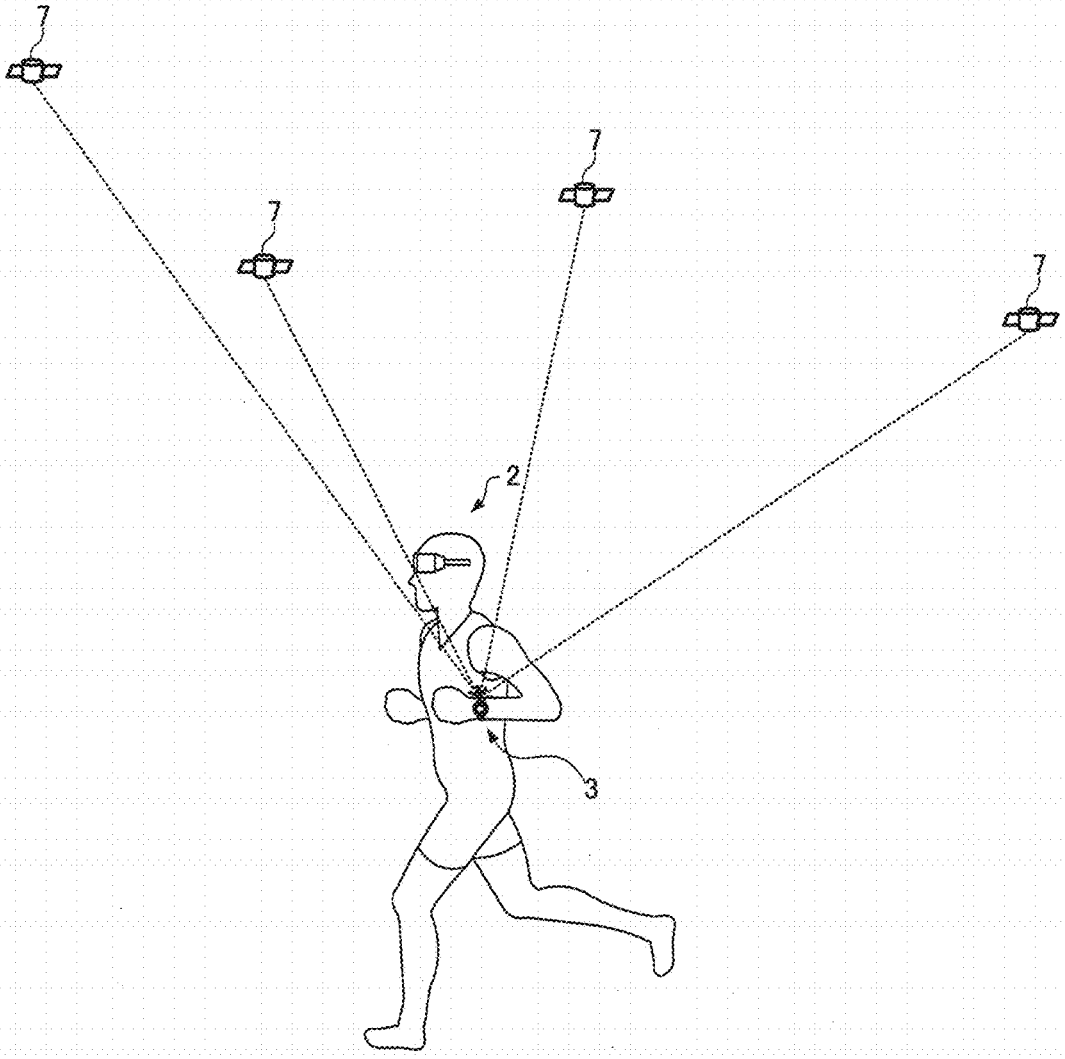


FIG. 2

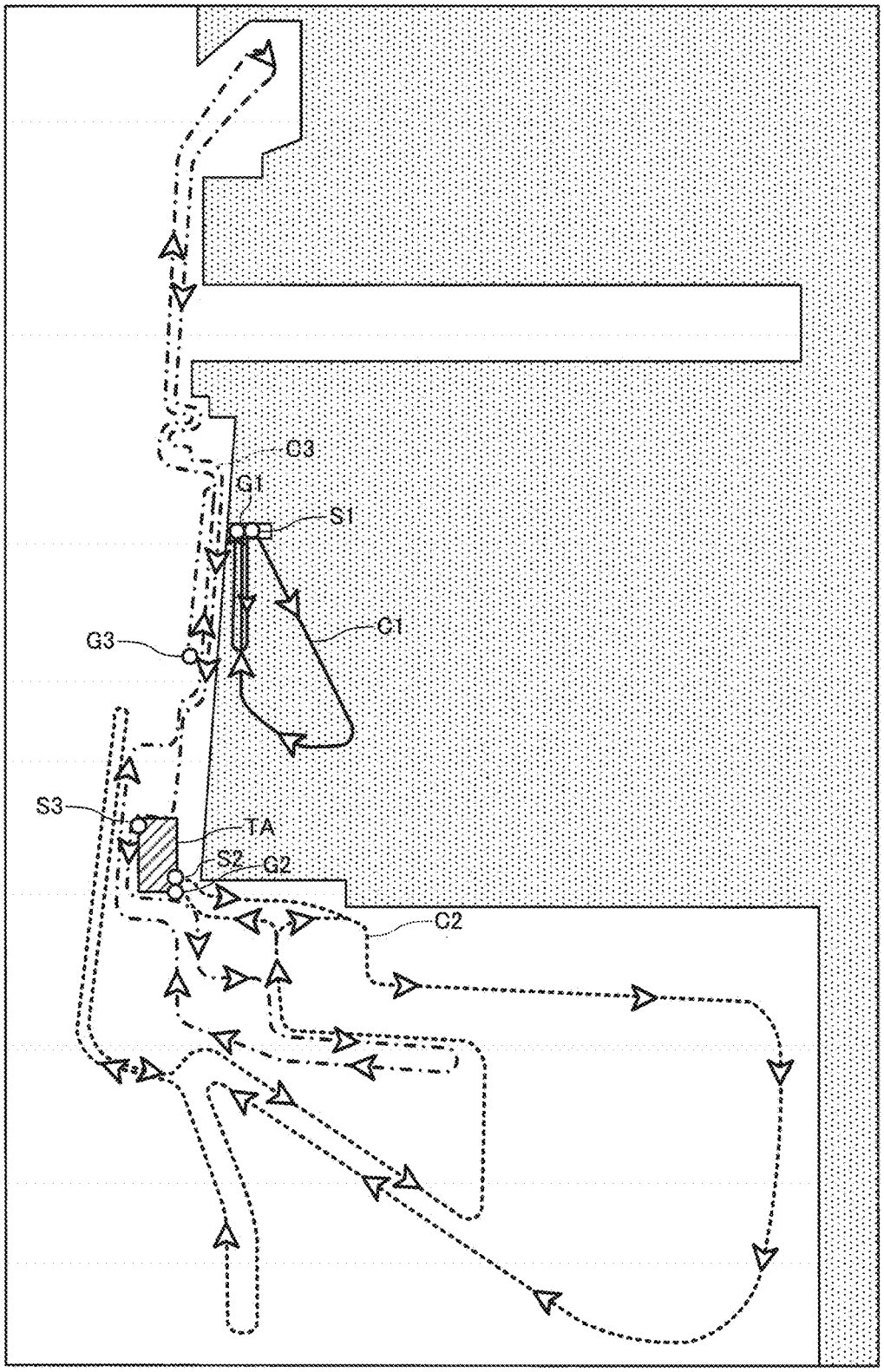


FIG. 3

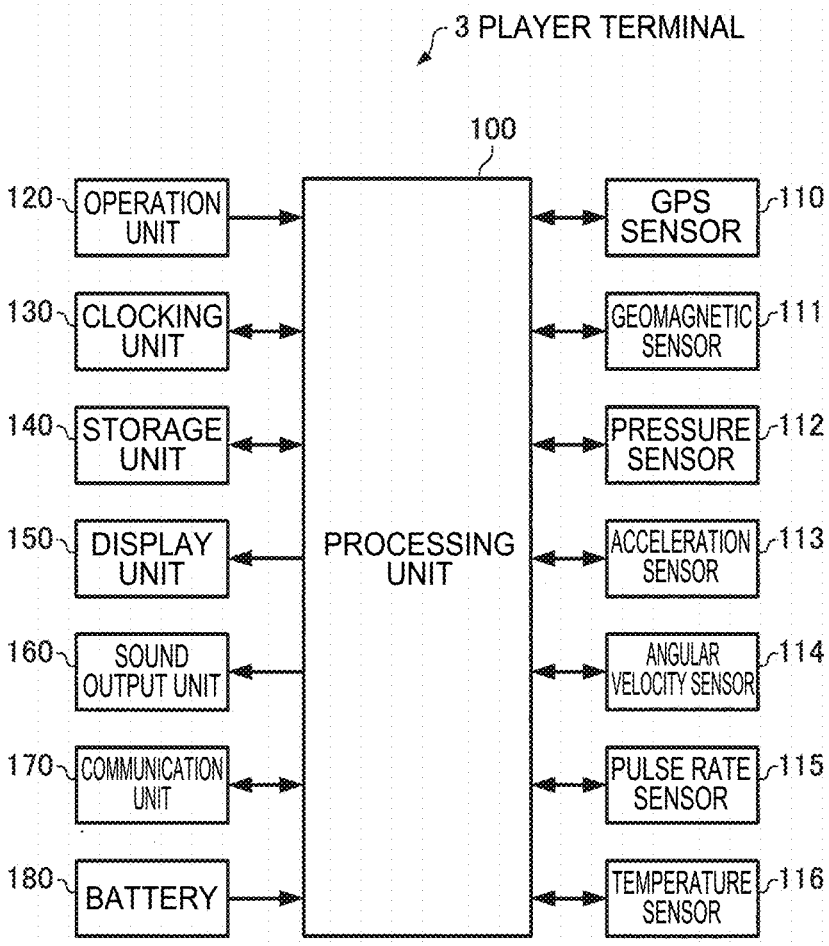

3 PLAYER TERMINAL
100
120
OPERATION UNIT
130
CLOCKING UNIT
140
STORAGE UNIT
150
DISPLAY UNIT
160
SOUND OUTPUT UNIT
170
COMMUNICATION UNIT
180
BATTERY
PROCESSING UNIT
GPS SENSOR
110
GEOMAGNETIC SENSOR
111
PRESSURE SENSOR
112
ACCELERATION SENSOR
113
ANGULAR VELOCITY SENSOR
114
PULSE RATE SENSOR
115
TEMPERATURE SENSOR
116

FIG. 4

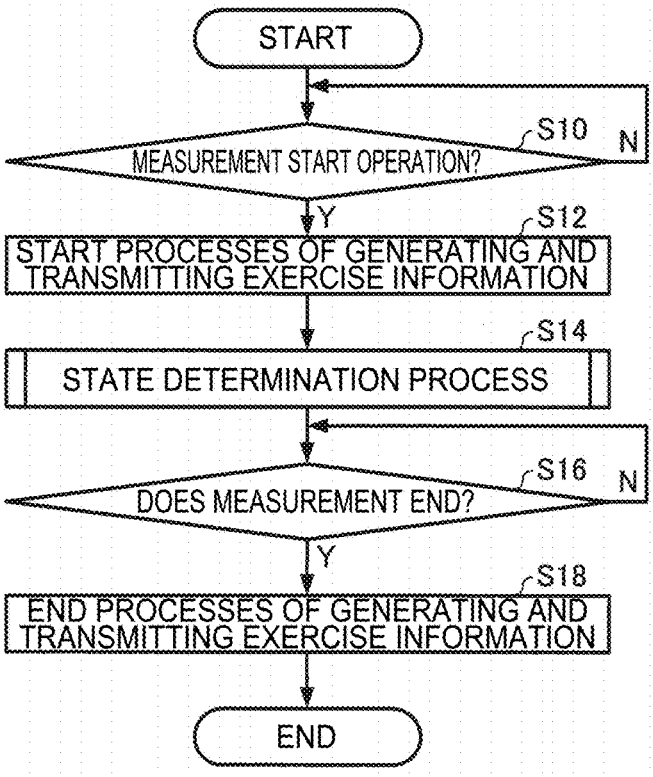

START
S10
MEASUREMENT START OPERATION?
N
Y
S12
START PROCESSES OF GENERATING AND TRANSMITTING EXERCISE INFORMATION
S14
STATE DETERMINATION PROCESS
S16
DOES MEASUREMENT END?
N
Y
S18
END PROCESSES OF GENERATING AND TRANSMITTING EXERCISE INFORMATION
END

FIG. 5

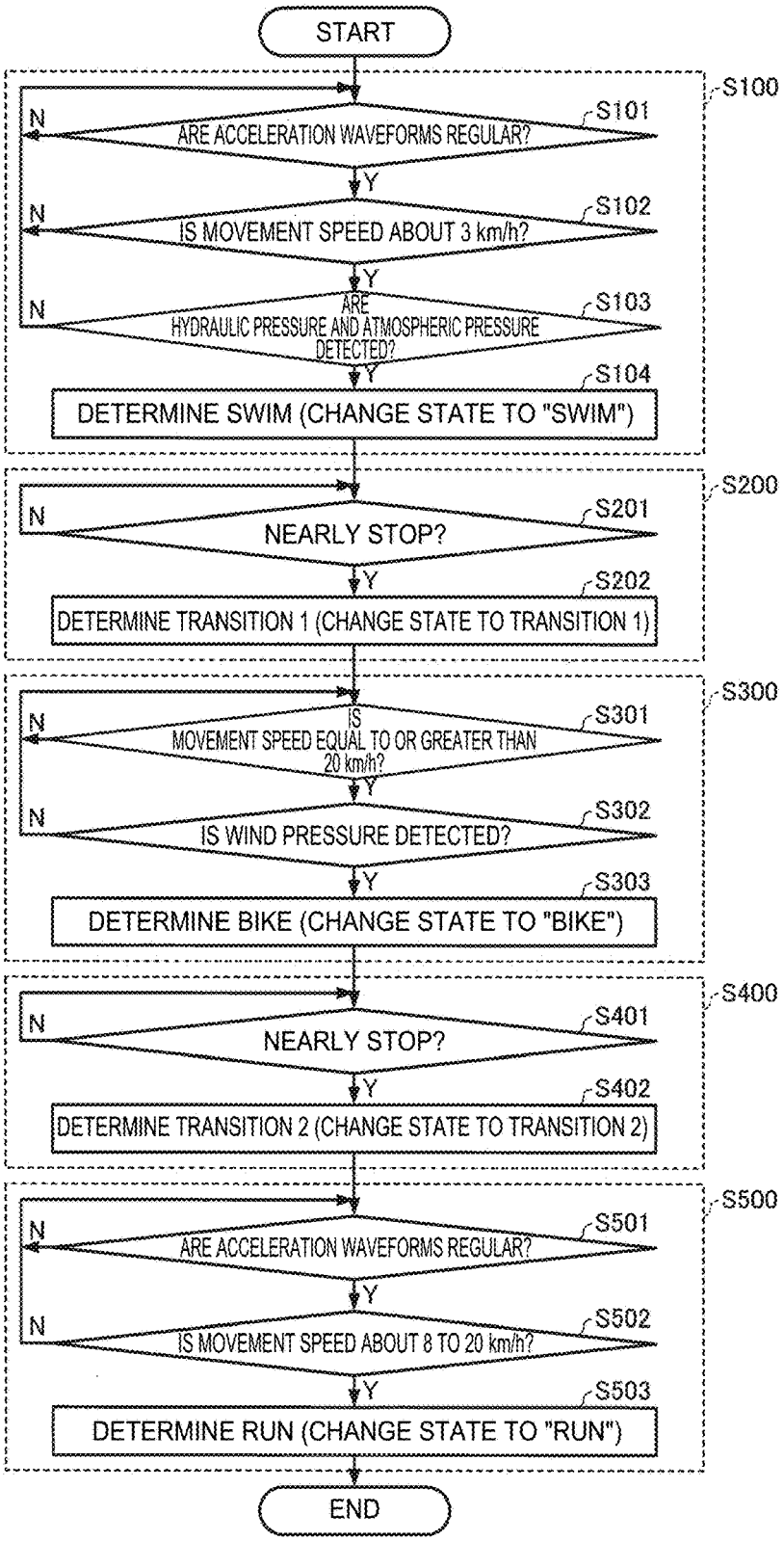

START
S100
S101
ARE ACCELERATION WAVEFORMS REGULAR?
N
Y
S102
IS MOVEMENT SPEED ABOUT 3 km/h?
N
Y
S103
ARE HYDRAULIC PRESSURE AND ATMOSPHERIC PRESSURE DETECTED?
N
Y
S104
DETERMINE SWIM (CHANGE STATE TO "SWIM")
S200
S201
NEARLY STOP?
N
Y
S202
DETERMINE TRANSITION 1 (CHANGE STATE TO TRANSITION 1)
S300
S301
IS MOVEMENT SPEED EQUAL TO OR GREATER THAN 20 km/h?
N
Y
S302
IS WIND PRESSURE DETECTED?
N
Y
S303
DETERMINE BIKE (CHANGE STATE TO "BIKE")
S400
S401
NEARLY STOP?
N
Y
S402
DETERMINE TRANSITION 2 (CHANGE STATE TO TRANSITION 2)
S500
S501
ARE ACCELERATION WAVEFORMS REGULAR?
N
Y
S502
IS MOVEMENT SPEED ABOUT 8 TO 20 km/h?
N
Y
S503
DETERMINE RUN (CHANGE STATE TO "RUN")
END

FIG. 6

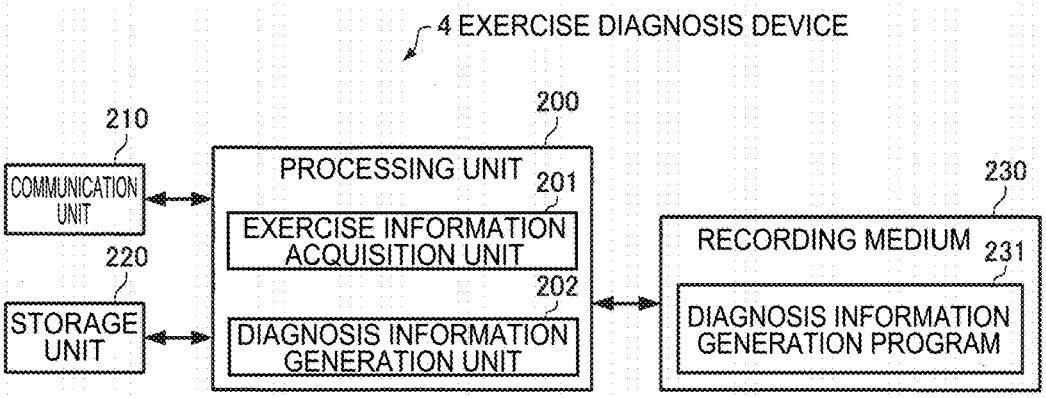

4 EXERCISE DIAGNOSIS DEVICE
210
COMMUNICATION UNIT
220
STORAGE UNIT
200
PROCESSING UNIT
201
EXERCISE INFORMATION ACQUISITION UNIT
202
DIAGNOSIS INFORMATION GENERATION UNIT
230
RECORDING MEDIUM
231
DIAGNOSIS INFORMATION GENERATION PROGRAM

FIG. 7

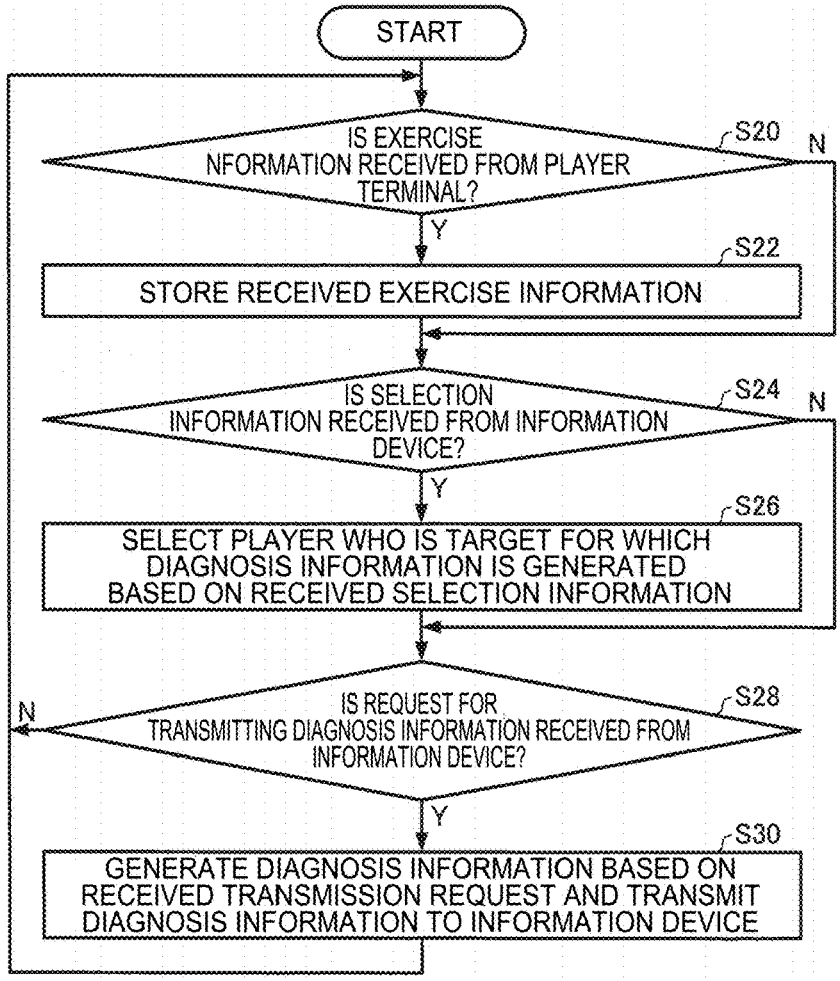

START
IS EXERCISE NFORMATION RECEIVED FROM PLAYER TERMINAL?
S20
N
Y
S22
STORE RECEIVED EXERCISE INFORMATION
IS SELECTION INFORMATION RECEIVED FROM INFORMATION DEVICE?
S24
N
Y
S26
SELECT PLAYER WHO IS TARGET FOR WHICH DIAGNOSIS INFORMATION IS GENERATED BASED ON RECEIVED SELECTION INFORMATION
IS REQUEST FOR TRANSMITTING DIAGNOSIS INFORMATION RECEIVED FROM INFORMATION DEVICE?
S28
N
Y
S30
GENERATE DIAGNOSIS INFORMATION BASED ON RECEIVED TRANSMISSION REQUEST AND TRANSMIT DIAGNOSIS INFORMATION TO INFORMATION DEVICE

FIG. 8

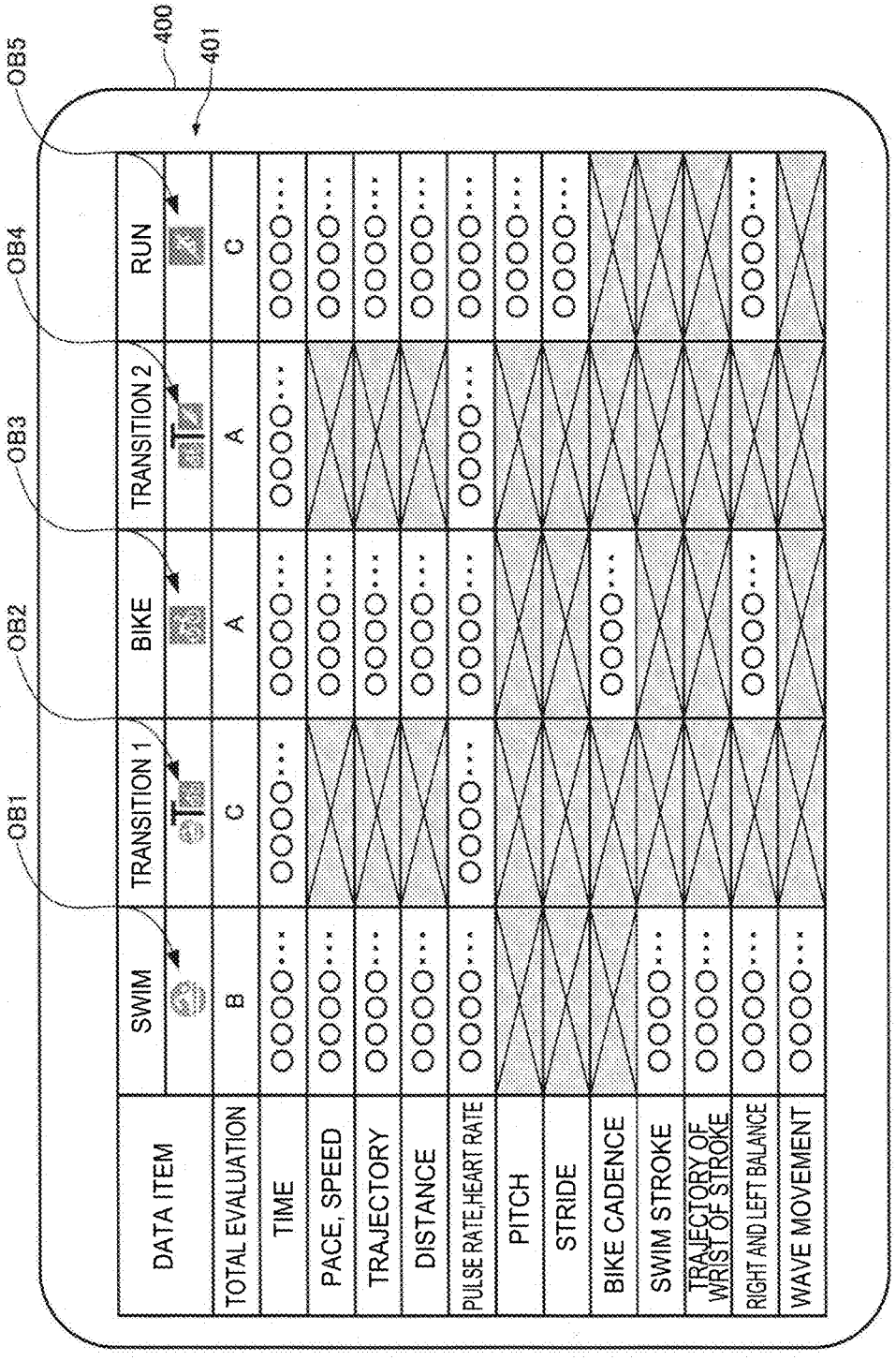

400
401
OB1
OB2
OB3
OB4
OB5
DATA ITEM
SWIM
TRANSITION 1
BIKE
TRANSITION 2
RUN
TOTAL EVALUATION
B
C
A
A
C
TIME
PACE, SPEED
TRAJECTORY
DISTANCE
PULSE RATE,HEART RATE
PITCH
STRIDE
BIKE CADENCE
SWIM STROKE
TRAJECTORY OF WRIST OF STROKE
RIGHT AND LEFT BALANCE
WAVE MOVEMENT

FIG. 9

DATA ITEM	SWIM
	
TOTAL EVALUATION	B
TIME	REASON WHY TIME IS IMPROVED IS THAT PLAYER CAN SMOOTHLY SWIM NEAR BUOYS HEREIN.
PACE, SPEED	SINCE SWIM PACE SLOWS DOWN IN LAST HALF, BE CAREFUL ABOUT PHYSICAL STRENGTH DISTRIBUTION. REFLECT PACE MAKING USE OF WAVE AND TIDAL DIRECTIONS. SINCE PACE IS NOT STABLE, REPEAT RECIPROCATION TRAINING IN POOL TO ENHANCE PHYSICAL FITNESS.
TRAJECTORY	YOU SWIM EFFICIENTLY IN SHORTEST DISTANCE NEAR BUOYS WITHOUT CIRCULATION. HERE, TAKE COURSE OF PROFESSIONAL PLAYER AND TAKE LINE.
DISTANCE	SWIMMING DISTANCE IS SHORTER THAN IN PREVIOUS TIME AND THUS YOU SWIM EFFICIENTLY IN SHORTEST DISTANCE NEAR BUOYS WITHOUT CIRCULATION.
PULSE RATE, HEART RATE	MANAGE PACE SO THAT PULSE RATE IS CONSTANT DURING SWIM.
PITCH	
STRIDE	
BIKE CADENCE	
SWIM STROKE	STROKE HANDS MORE SLOWLY.
TRAJECTORY OF WRIST OF STROKE	STROKE WRISTS MORE DEEPLY.
RIGHT AND LEFT BALANCE	SWIM STRAIGHT BY STROKING RIGHT AND LEFT ARMS WITH SAME STRENGTH.
WAVE MOVEMENT	BE CAREFUL ABOUT WAVE MOVEMENT FROM OFFING IN SEA COURSE.

FIG. 10

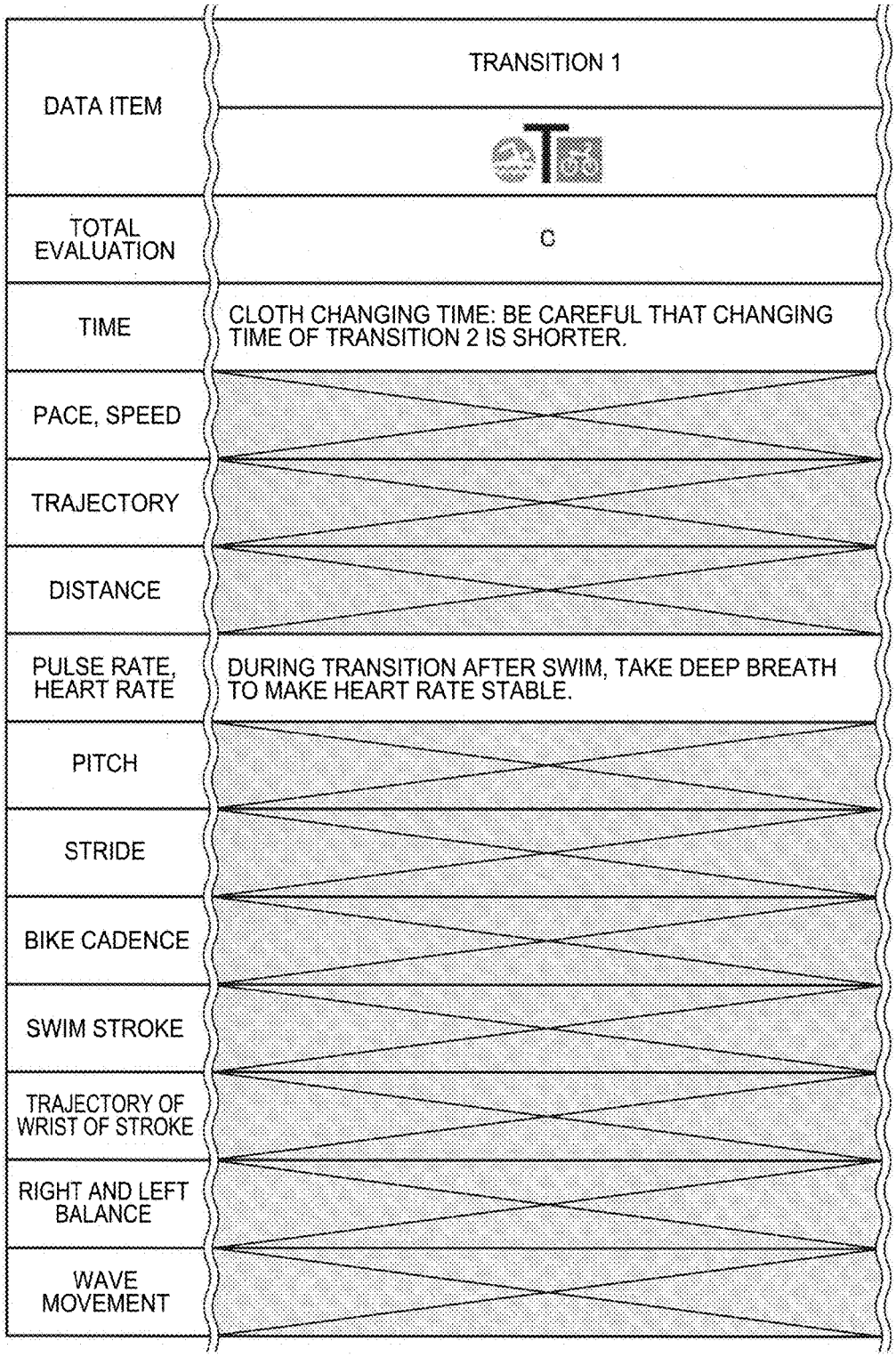

DATA ITEM
TRANSITION 1
TOTAL EVALUATION
C
TIME
CLOTH CHANGING TIME: BE CAREFUL THAT CHANGING TIME OF TRANSITION 2 IS SHORTER.
PACE, SPEED
TRAJECTORY
DISTANCE
PULSE RATE, HEART RATE
DURING TRANSITION AFTER SWIM, TAKE DEEP BREATH TO MAKE HEART RATE STABLE.
PITCH
STRIDE
BIKE CADENCE
SWIM STROKE
TRAJECTORY OF WRIST OF STROKE
RIGHT AND LEFT BALANCE
WAVE MOVEMENT

FIG. 11

DATA ITEM	BIKE
	
TOTAL EVALUATION	A
TIME	REASON WHY TIME IS IMPROVED IS THAT PLAYER CAN BIKE IN THIS REGION MORE SMOOTHLY THAN IN PREVIOUS TIME
PACE, SPEED	MAKE USE OF WIND DIRECTION TO REFLECT IN SPEED. SINCE WIND IS STRONG IN THIS REGION, HOLD GROUP DRIVING (DRAFTING). SINCE PROFESSIONAL PLAYER IS ABSOLUTELY FASTER IN THIS REGION, REFER TO THIS.
TRAJECTORY	IN THIS SHARP CURVE, MINOR COLLISION EASILY OCCURS, AND THUS KEEP GROUP DRIVING STRICTLY. THIS SHARP CURVE IS A MAIN POINT WHICH MAKES PROFESSIONAL PLAYER FEEL FATIGUE. TAKE COURSE OF PROFESSIONAL PLAYER AND TAKE LINE HERE.
DISTANCE	COMPARED TO PROFESSIONAL PLAYER, DIFFERENCE IN DISTANCE IS SMALL AND DRIVING IS STABLE.
PULSE RATE, HEART RATE	DISTRIBUTE PHYSICAL STRENGTH FOR NEXT RUN SO THAT PULSE RATE IS 150 OR LESS DURING BIKE.
PITCH	
STRIDE	
BIKE CADENCE	MANAGE CADENCE SO THAT PULSE RATE IS 150 OR LESS.
SWIM STROKE	
TRAJECTORY OF WRIST OF STROKE	
RIGHT AND LEFT BALANCE	MAKE CADENCES OF RIGHT AND LEFT LEGS WITH SAME STRENGTH SO THAT LOADS ARE EVENLY APPLIED TO PEDALS.
WAVE MOVEMENT	

FIG. 12

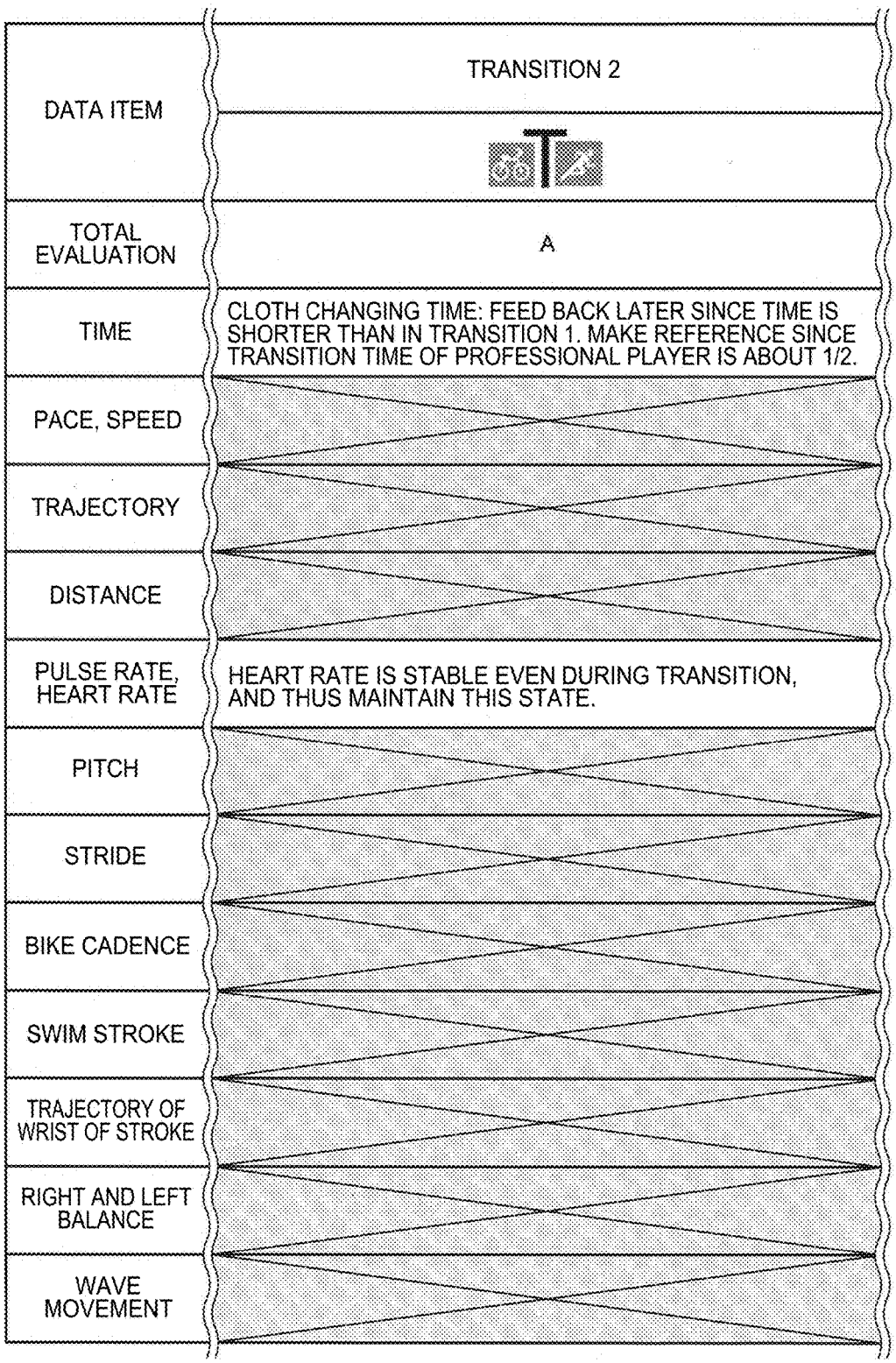

DATA ITEM
TRANSITION 2
TOTAL EVALUATION
A
TIME
CLOTH CHANGING TIME: FEED BACK LATER SINCE TIME IS SHORTER THAN IN TRANSITION 1. MAKE REFERENCE SINCE TRANSITION TIME OF PROFESSIONAL PLAYER IS ABOUT 1/2.
PACE, SPEED
TRAJECTORY
DISTANCE
PULSE RATE, HEART RATE
HEART RATE IS STABLE EVEN DURING TRANSITION, AND THUS MAINTAIN THIS STATE.
PITCH
STRIDE
BIKE CADENCE
SWIM STROKE
TRAJECTORY OF WRIST OF STROKE
RIGHT AND LEFT BALANCE
WAVE MOVEMENT

FIG. 13

DATA ITEM	RUN
	
TOTAL EVALUATION	C
TIME	REASON WHY TIME IS NOT IMPROVED IS THAT TRANSITION IN HEART RATE VALUE IS UNSTABLE IN THIS REGION THAN IN PREVIOUS TIME.
PACE, SPEED	SINCE PHYSICAL STRENGTH FOR RUN IS STORED AFTER BIKE, PACE IS STABLE. MAKE USE OF WIND DIRECTION TO REFLECT IN PACE. SINCE YOU HAVE GOOD MATCH WITH PROFESSIONAL PLAYER, MAINTAIN THIS PACE.
TRAJECTORY	IN THIS CURVE, DO NOT TAKE UNNECESSARY COURSE. PROFESSIONAL PLAYERS PUT ON LAST SPURT IN THIS POSITION.
DISTANCE	IT SEEMS THAT THERE IS DIFFERENCE IN DISTANCE, COMPARED TO PROFESSIONAL PLAYER. THUS, BE CAREFUL SO THAT WASTE DOES NOT OCCUR IN CURVE.
PULSE RATE, HEART RATE	SUPPRESS HEART RATE TO ABOUT 160 TO PREPARE UPHILL GROUND IN LAST HALF AND PRESERVE PHYSICAL STRENGTH.
PITCH	NEAR SUMMIT IN LAST HALF, PHYSICAL STRENGTH IS LOST AND PITCH IS DOWN.
STRIDE	SINCE STRIDE IS STABLE EVEN LAST HALF OF RACE, MAINTAIN THIS STATE.
BIKE CADENCE	
SWIM STROKE	
TRAJECTORY OF WRIST OF STROKE	
RIGHT AND LEFT BALANCE	HAVE KICKS OF RIGHT AND LEFT LEGS WITH SAME STRENGTH SO THAT LOADS ARE EVENLY APPLIED.
WAVE MOVEMENT	

FIG. 14

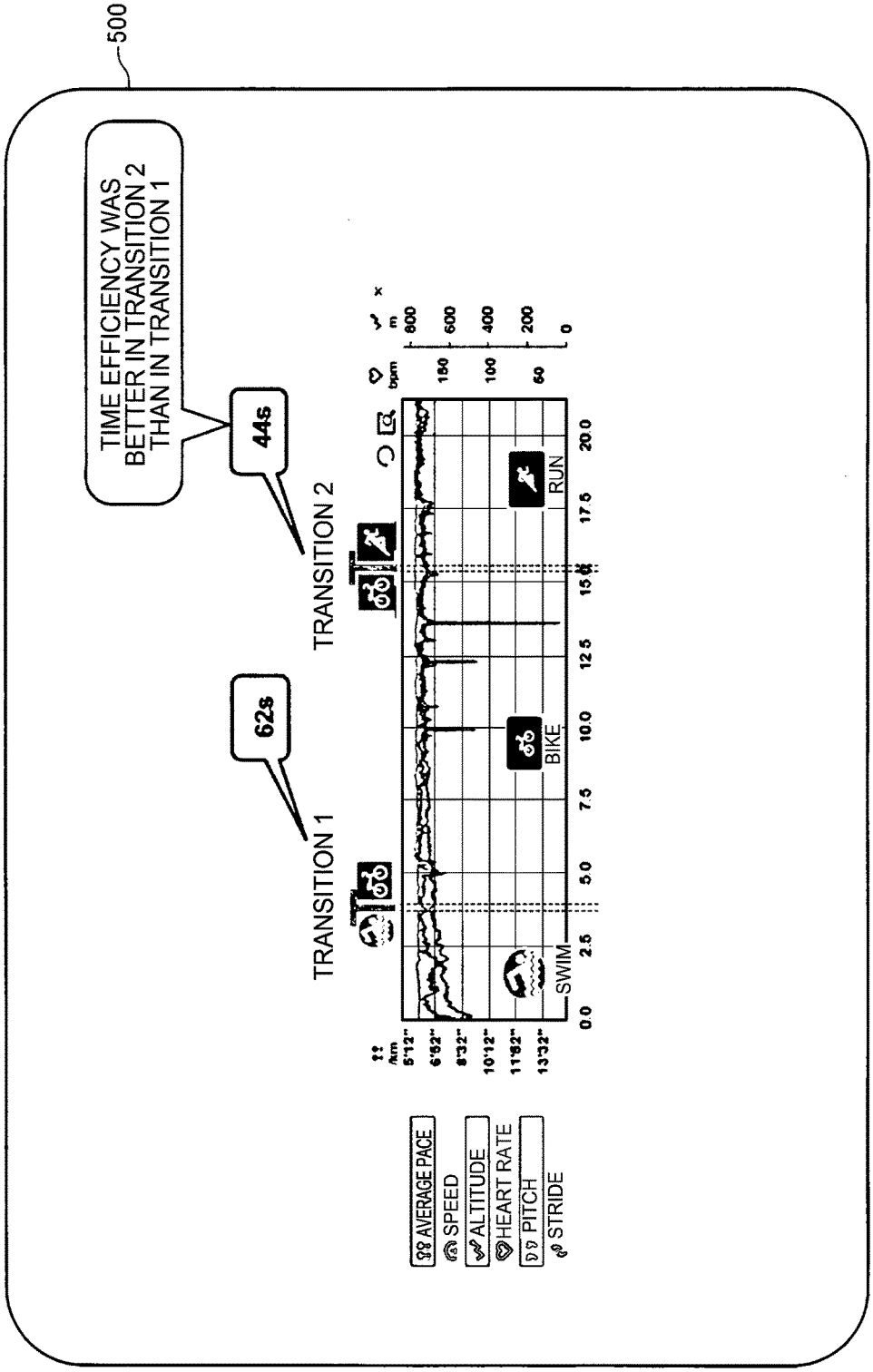

500
TIME EFFICIENCY WAS BETTER IN TRANSITION 2 THAN IN TRANSITION 1
44s
62s
TRANSITION 1
TRANSITION 2
AVERAGE PACE
SPEED
ALTITUDE
HEART RATE
PITCH
STRIDE
SWIM
BIKE
RUN

FIG. 15

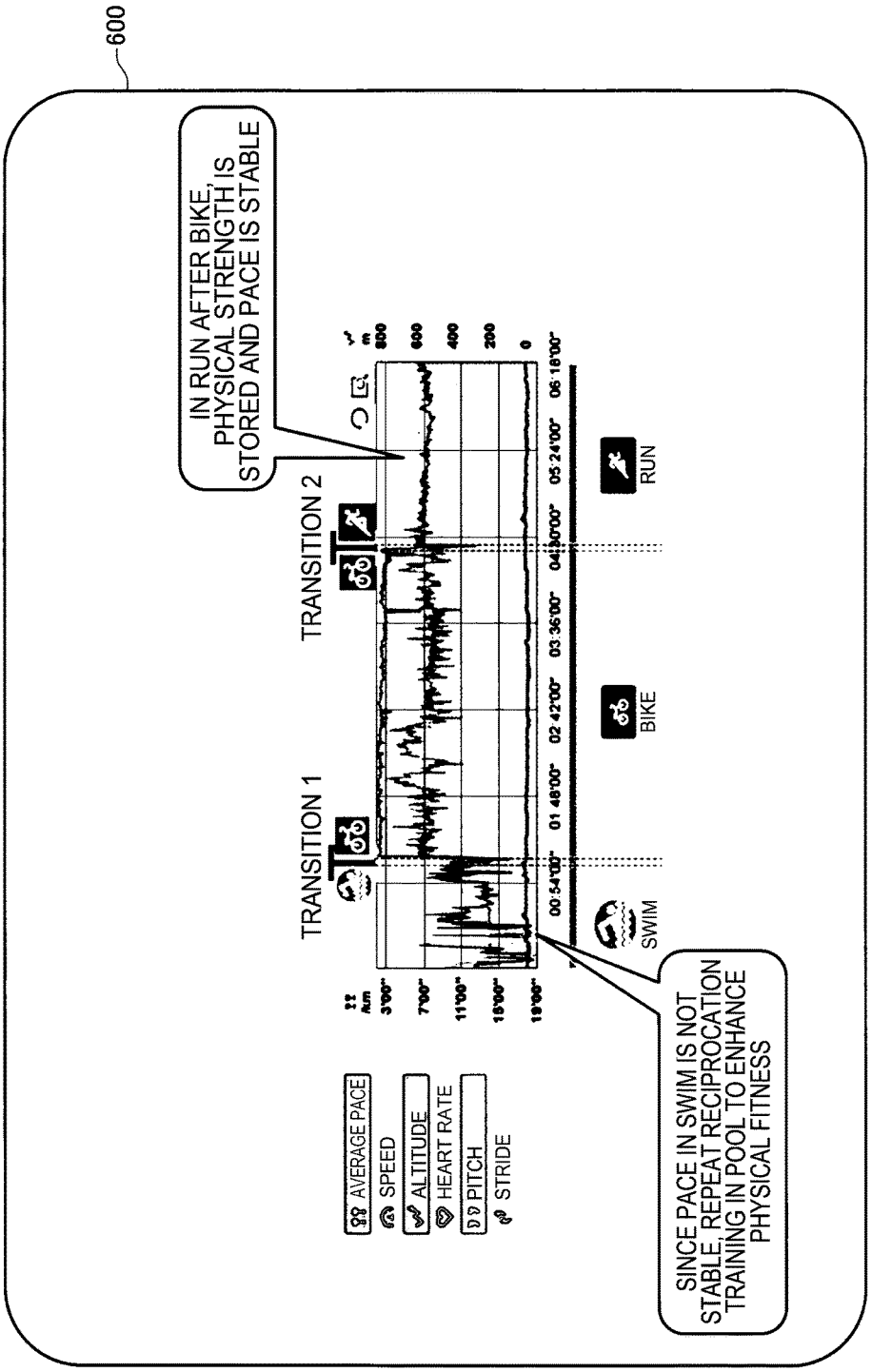

600
IN RUN AFTER BIKE, PHYSICAL STRENGTH IS STORED AND PACE IS STABLE
TRANSITION 1
TRANSITION 2
SWIM
BIKE
RUN
AVERAGE PACE
SPEED
ALTITUDE
HEART RATE
PITCH
STRIDE
SINCE PACE IN SWIM IS NOT STABLE, REPEAT RECIPROCATION TRAINING IN POOL TO ENHANCE PHYSICAL FITNESS

FIG. 16

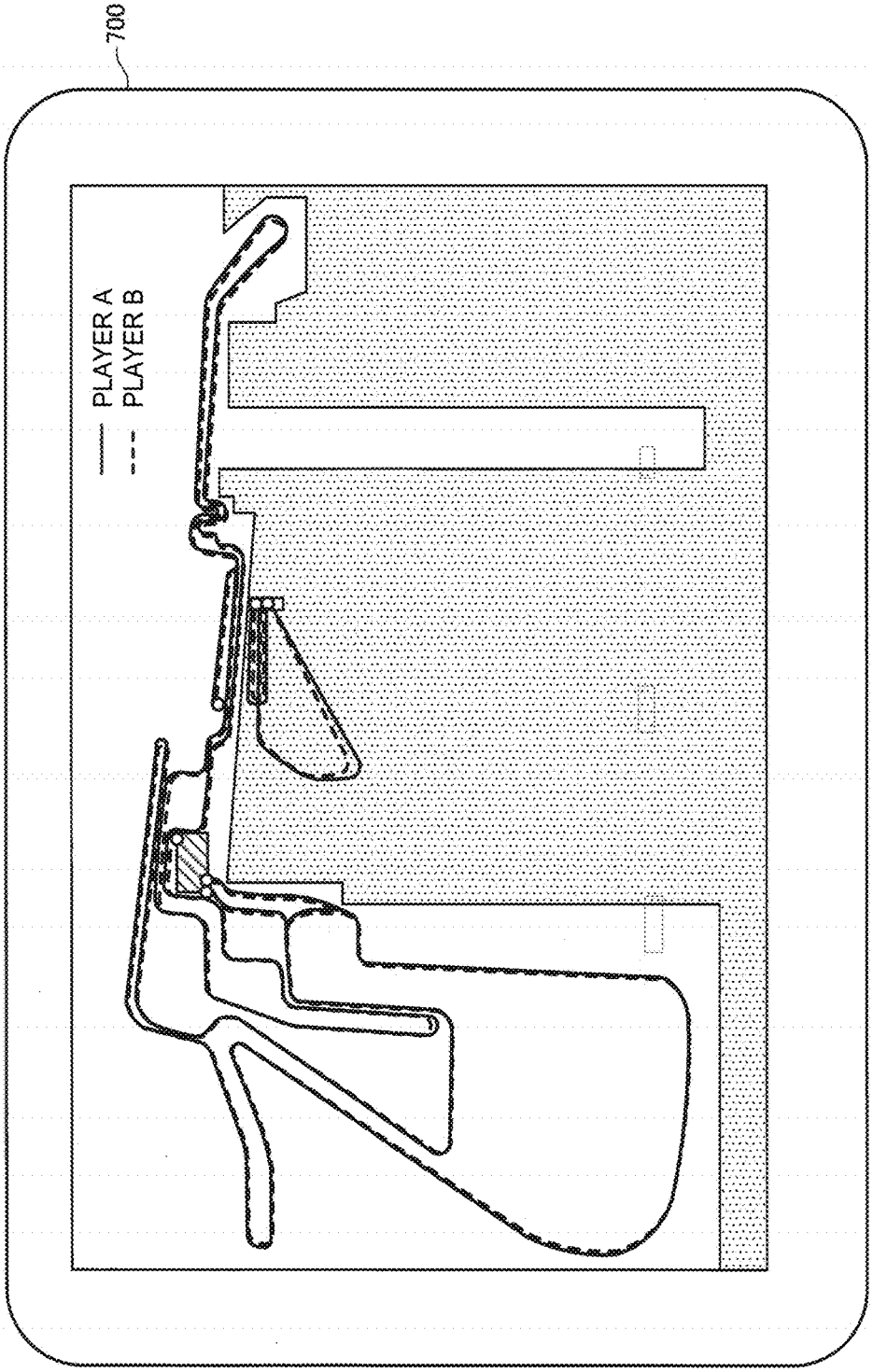


FIG. 17

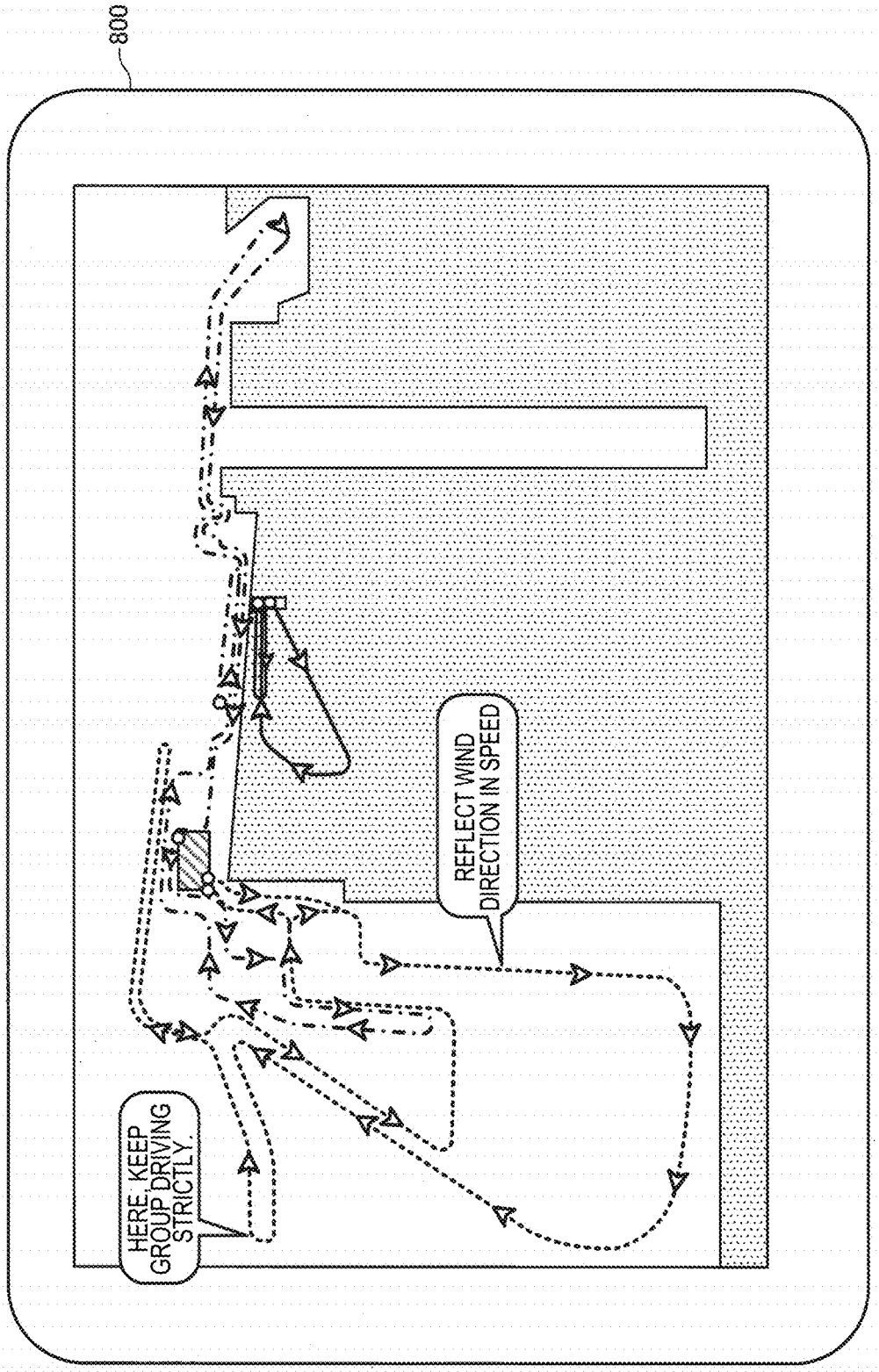

800
HERE KEEP GROUP DRIVING STRICTLY.
REFLECT WIND DIRECTION IN SPEED

FIG. 18

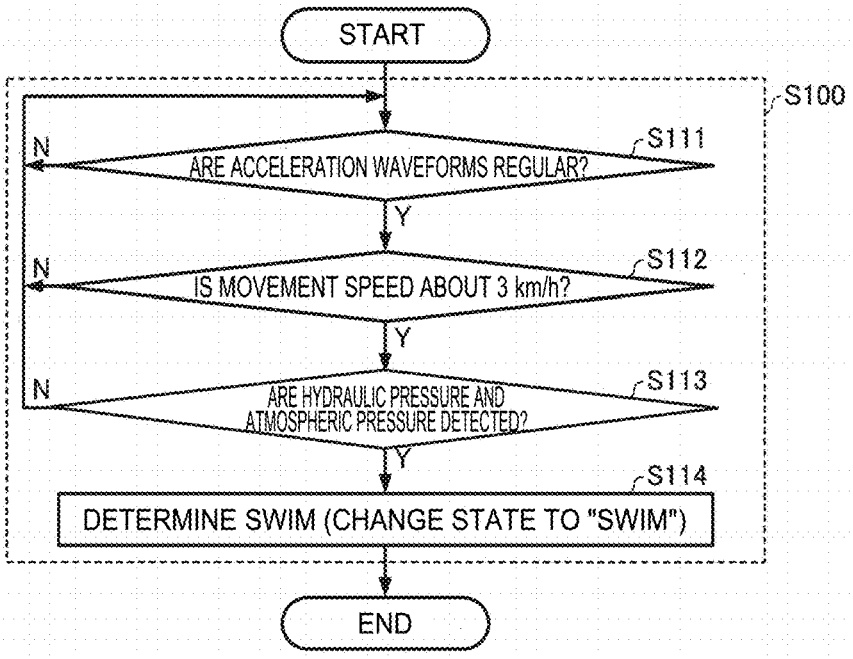

START
S100
S111
ARE ACCELERATION WAVEFORMS REGULAR?
N
Y
S112
IS MOVEMENT SPEED ABOUT 3 km/h?
N
Y
S113
ARE HYDRAULIC PRESSURE AND ATMOSPHERIC PRESSURE DETECTED?
N
Y
S114
DETERMINE SWIM (CHANGE STATE TO "SWIM")
END

FIG. 19

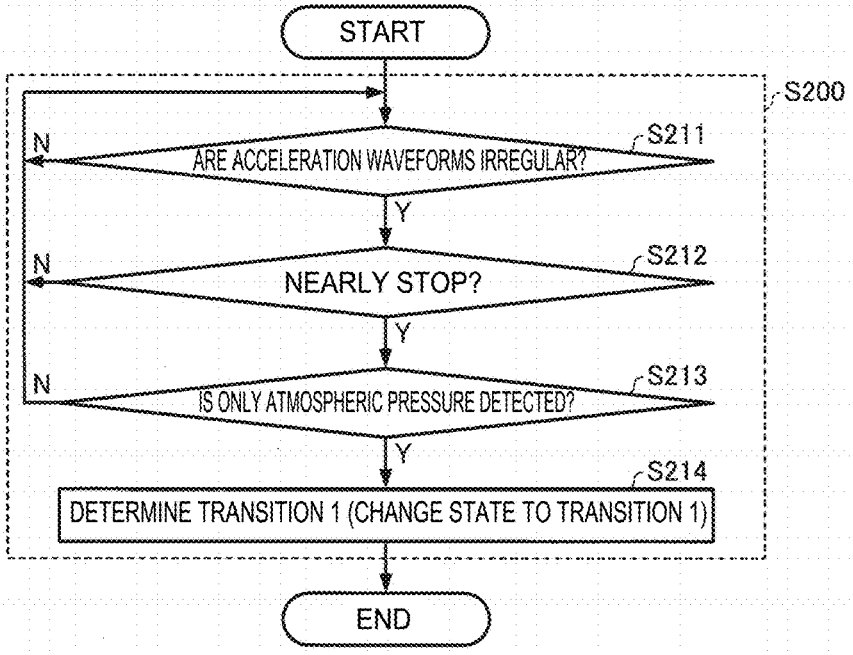

START
S200
S211
ARE ACCELERATION WAVEFORMS IRREGULAR?
N
Y
S212
NEARLY STOP?
N
Y
S213
IS ONLY ATMOSPHERIC PRESSURE DETECTED?
N
Y
S214
DETERMINE TRANSITION 1 (CHANGE STATE TO TRANSITION 1)
END

FIG. 20

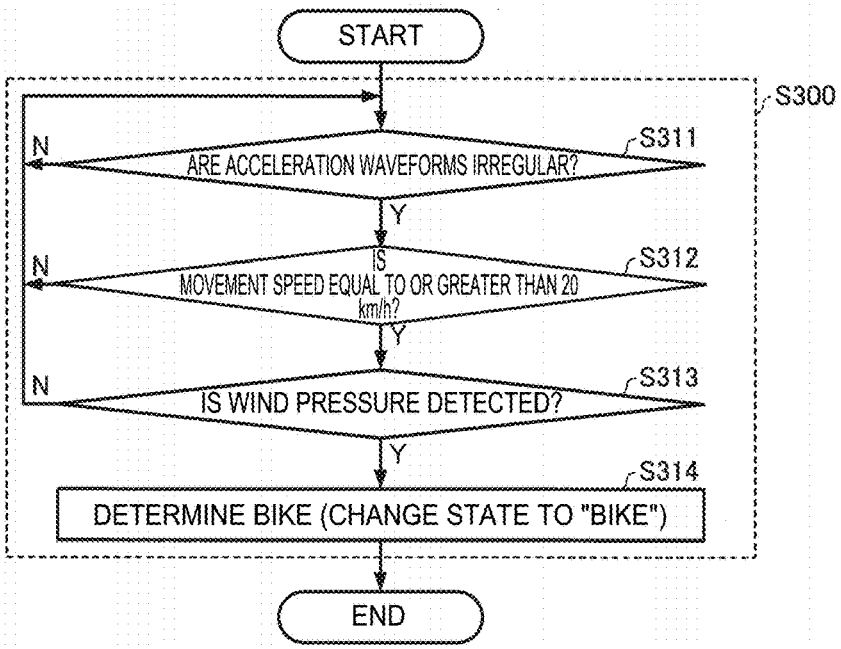

START
S300
S311
ARE ACCELERATION WAVEFORMS IRREGULAR?
N
Y
S312
IS MOVEMENT SPEED EQUAL TO OR GREATER THAN 20 km/h?
N
Y
S313
IS WIND PRESSURE DETECTED?
N
Y
S314
DETERMINE BIKE (CHANGE STATE TO "BIKE")
END

FIG. 21

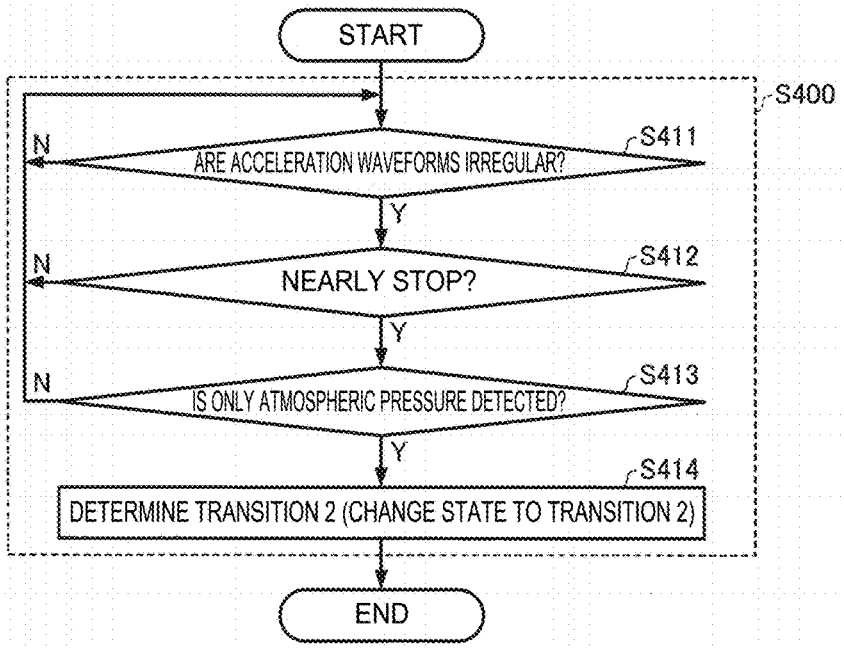

START
S400
S411
ARE ACCELERATION WAVEFORMS IRREGULAR?
N
Y
S412
NEARLY STOP?
N
Y
S413
IS ONLY ATMOSPHERIC PRESSURE DETECTED?
N
Y
S414
DETERMINE TRANSITION 2 (CHANGE STATE TO TRANSITION 2)
END

FIG. 22

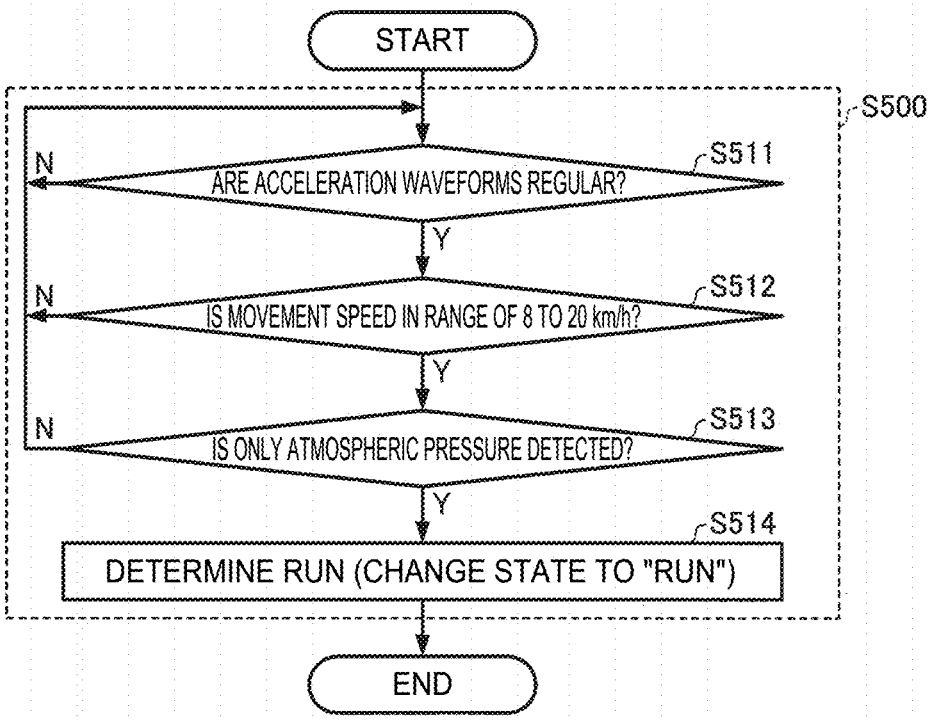

START
S500
S511
N
ARE ACCELERATION WAVEFORMS REGULAR?
Y
S512
N
IS MOVEMENT SPEED IN RANGE OF 8 TO 20 km/h?
Y
S513
N
IS ONLY ATMOSPHERIC PRESSURE DETECTED?
Y
S514
DETERMINE RUN (CHANGE STATE TO "RUN")
END

FIG. 23

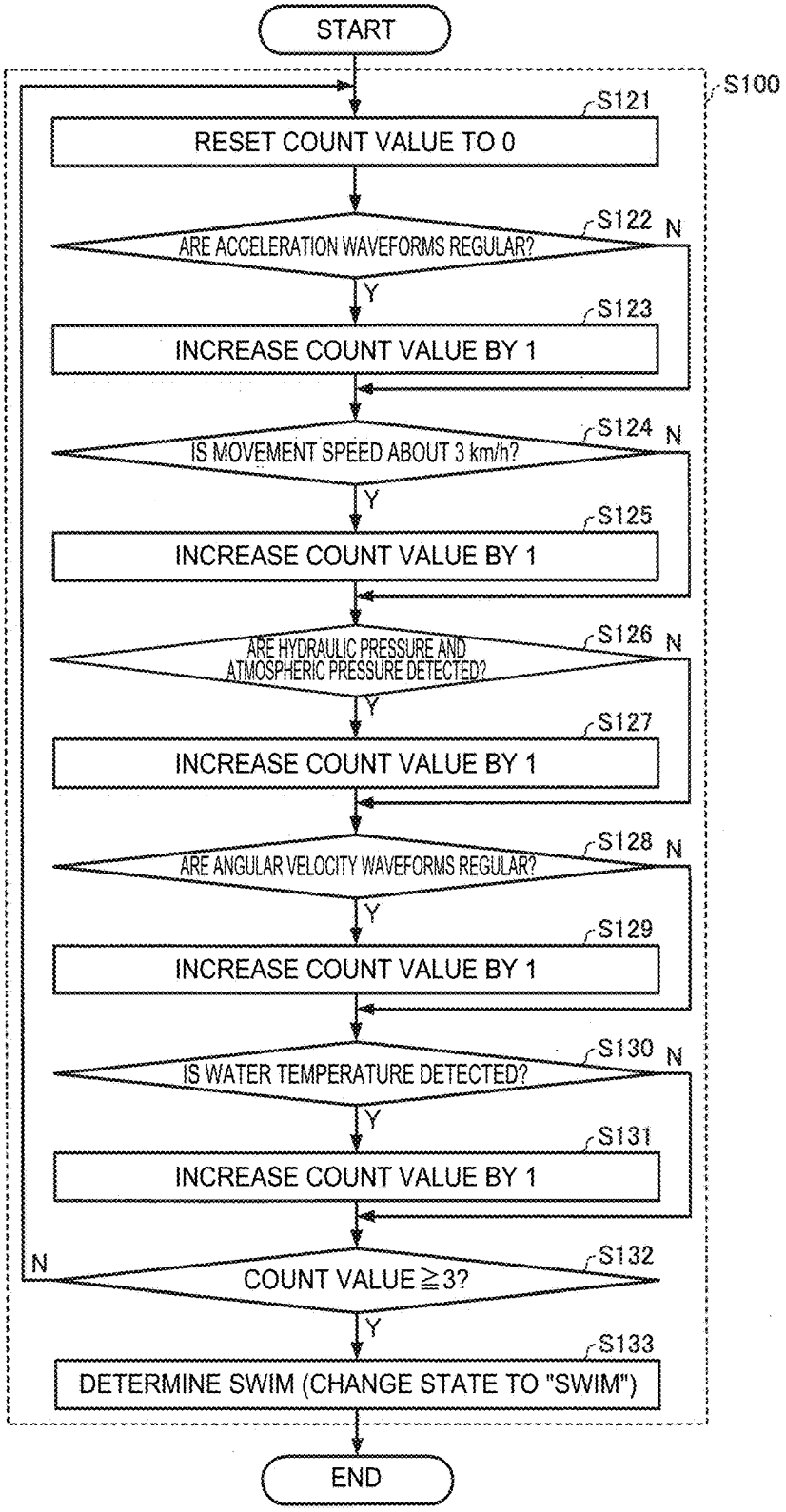

START
S100
S121
RESET COUNT VALUE TO 0
S122
ARE ACCELERATION WAVEFORMS REGULAR?
N
Y
S123
INCREASE COUNT VALUE BY 1
S124
IS MOVEMENT SPEED ABOUT 3 km/h?
N
Y
S125
INCREASE COUNT VALUE BY 1
S126
ARE HYDRAULIC PRESSURE AND ATMOSPHERIC PRESSURE DETECTED?
N
Y
S127
INCREASE COUNT VALUE BY 1
S128
ARE ANGULAR VELOCITY WAVEFORMS REGULAR?
N
Y
S129
INCREASE COUNT VALUE BY 1
S130
IS WATER TEMPERATURE DETECTED?
N
Y
S131
INCREASE COUNT VALUE BY 1
S132
N
COUNT VALUE ≧ 3?
Y
S133
DETERMINE SWIM (CHANGE STATE TO "SWIM")
END

FIG. 24

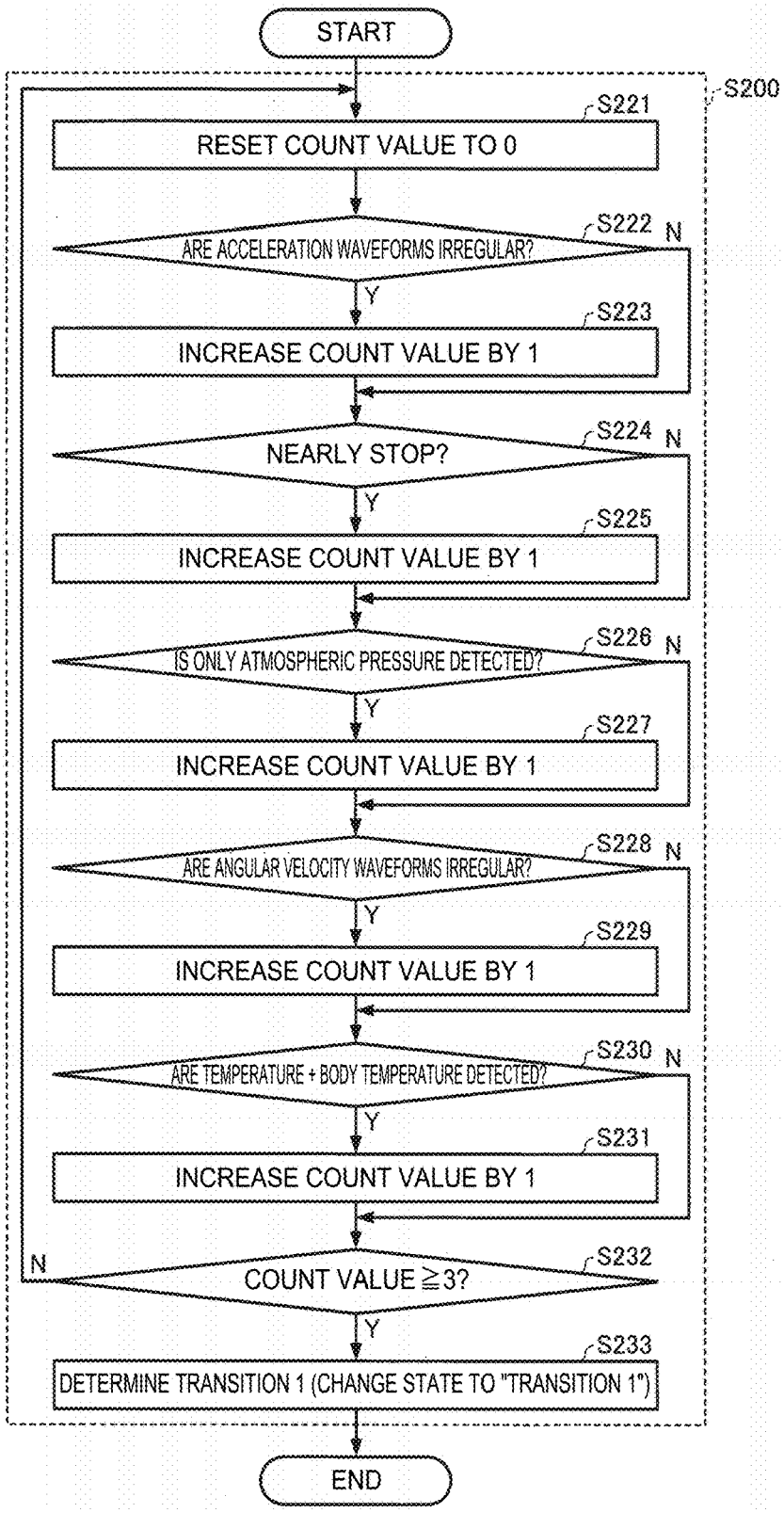

START
S200
S221
RESET COUNT VALUE TO 0
S222
ARE ACCELERATION WAVEFORMS IRREGULAR?
N
Y
S223
INCREASE COUNT VALUE BY 1
S224
NEARLY STOP?
N
Y
S225
INCREASE COUNT VALUE BY 1
S226
IS ONLY ATMOSPHERIC PRESSURE DETECTED?
N
Y
S227
INCREASE COUNT VALUE BY 1
S228
ARE ANGULAR VELOCITY WAVEFORMS IRREGULAR?
N
Y
S229
INCREASE COUNT VALUE BY 1
S230
ARE TEMPERATURE + BODY TEMPERATURE DETECTED?
N
Y
S231
INCREASE COUNT VALUE BY 1
S232
N
COUNT VALUE ≧3?
Y
S233
DETERMINE TRANSITION 1 (CHANGE STATE TO "TRANSITION 1")
END

FIG. 25

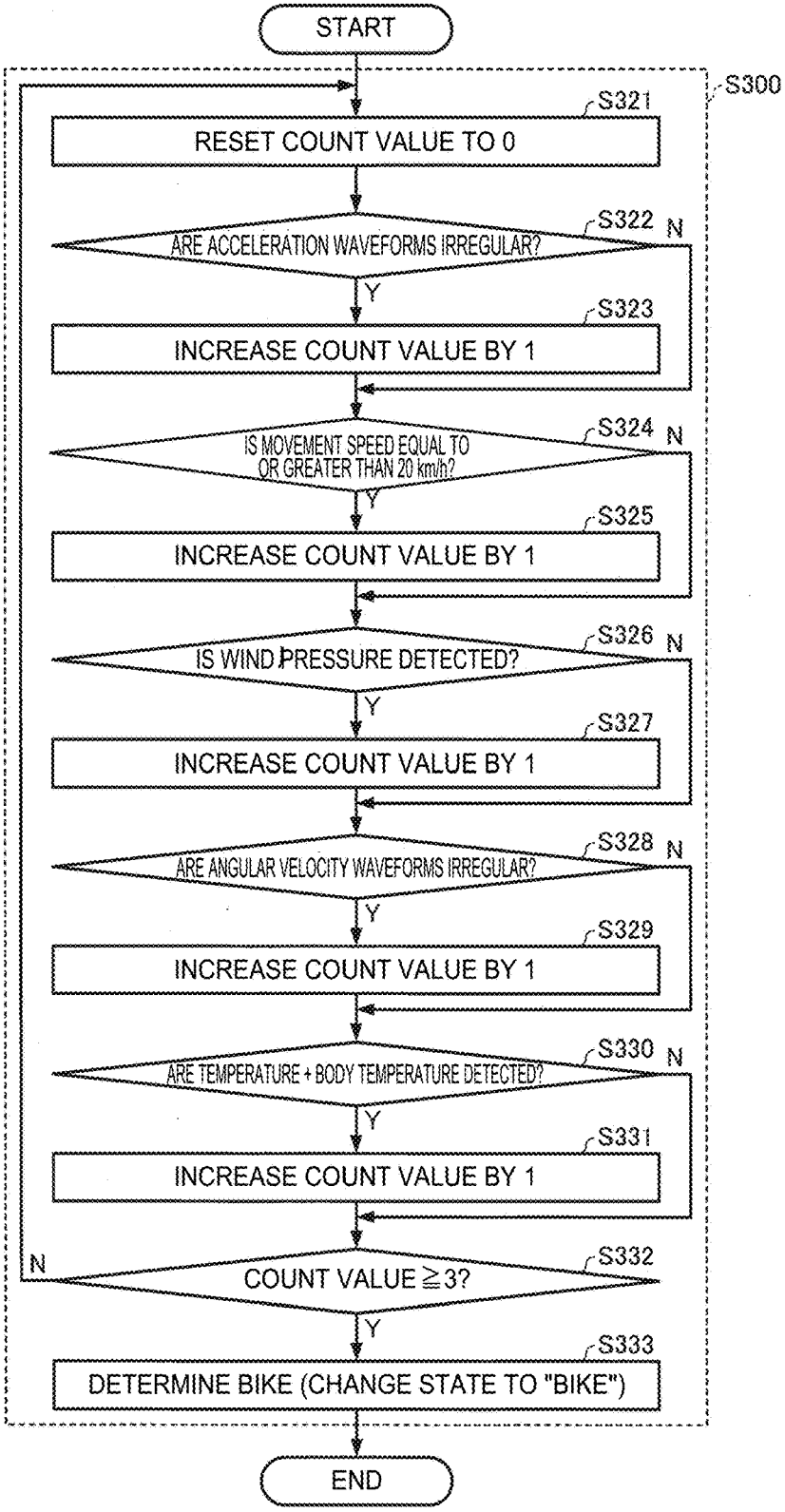

START
S300
S321
RESET COUNT VALUE TO 0
S322
ARE ACCELERATION WAVEFORMS IRREGULAR?
N
Y
S323
INCREASE COUNT VALUE BY 1
S324
IS MOVEMENT SPEED EQUAL TO OR GREATER THAN 20 km/h?
N
Y
S325
INCREASE COUNT VALUE BY 1
S326
IS WIND PRESSURE DETECTED?
N
Y
S327
INCREASE COUNT VALUE BY 1
S328
ARE ANGULAR VELOCITY WAVEFORMS IRREGULAR?
N
Y
S329
INCREASE COUNT VALUE BY 1
S330
ARE TEMPERATURE + BODY TEMPERATURE DETECTED?
N
Y
S331
INCREASE COUNT VALUE BY 1
S332
COUNT VALUE ≧3?
N
Y
S333
DETERMINE BIKE (CHANGE STATE TO "BIKE")
END

FIG. 26

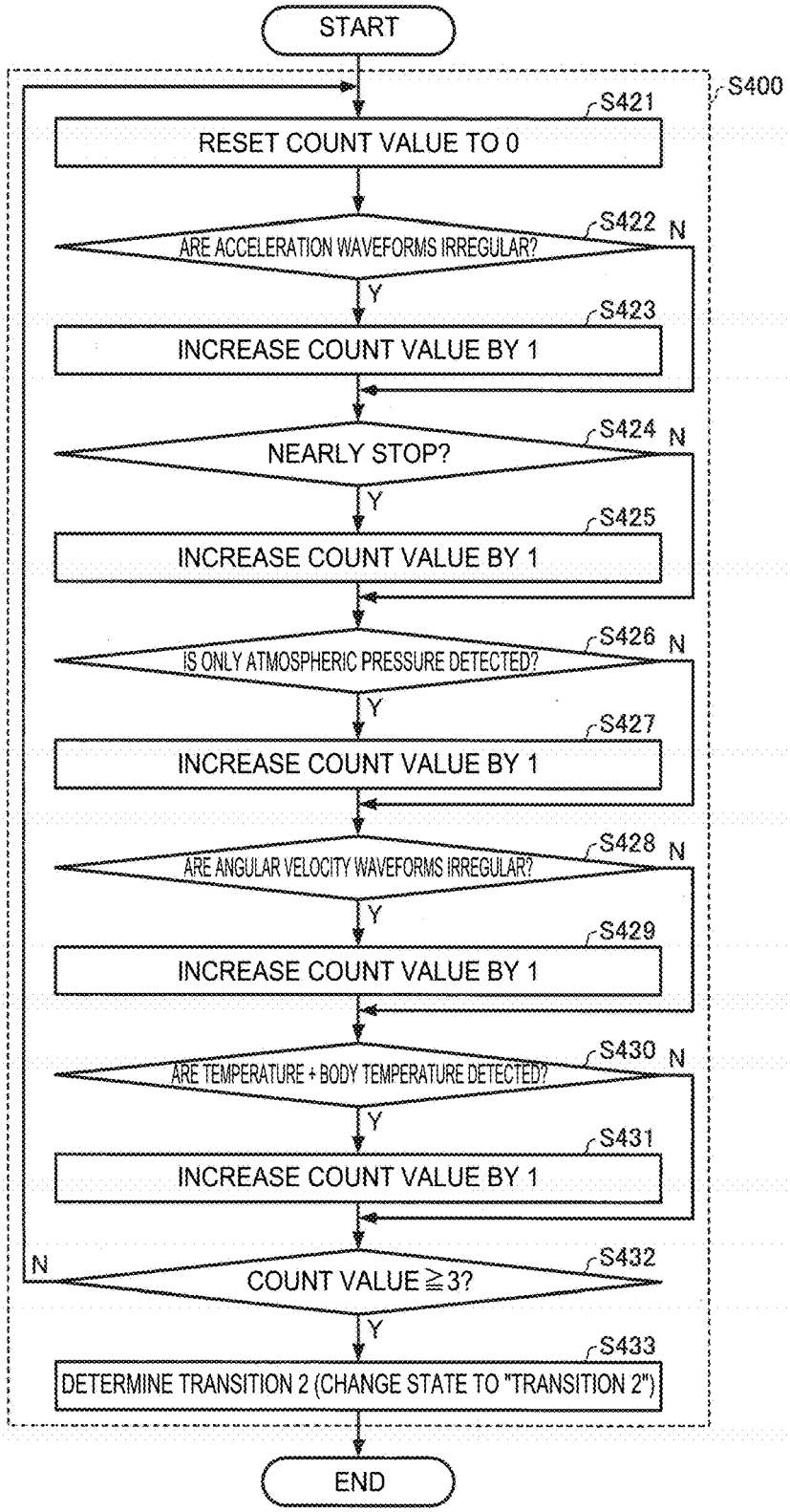

START
S400
S421
RESET COUNT VALUE TO 0
S422
ARE ACCELERATION WAVEFORMS IRREGULAR?
N
Y
S423
INCREASE COUNT VALUE BY 1
S424
NEARLY STOP?
N
Y
S425
INCREASE COUNT VALUE BY 1
S426
IS ONLY ATMOSPHERIC PRESSURE DETECTED?
N
Y
S427
INCREASE COUNT VALUE BY 1
S428
ARE ANGULAR VELOCITY WAVEFORMS IRREGULAR?
N
Y
S429
INCREASE COUNT VALUE BY 1
S430
ARE TEMPERATURE + BODY TEMPERATURE DETECTED?
N
Y
S431
INCREASE COUNT VALUE BY 1
S432
N
COUNT VALUE ≧3?
Y
S433
DETERMINE TRANSITION 2 (CHANGE STATE TO "TRANSITION 2")
END

FIG. 27

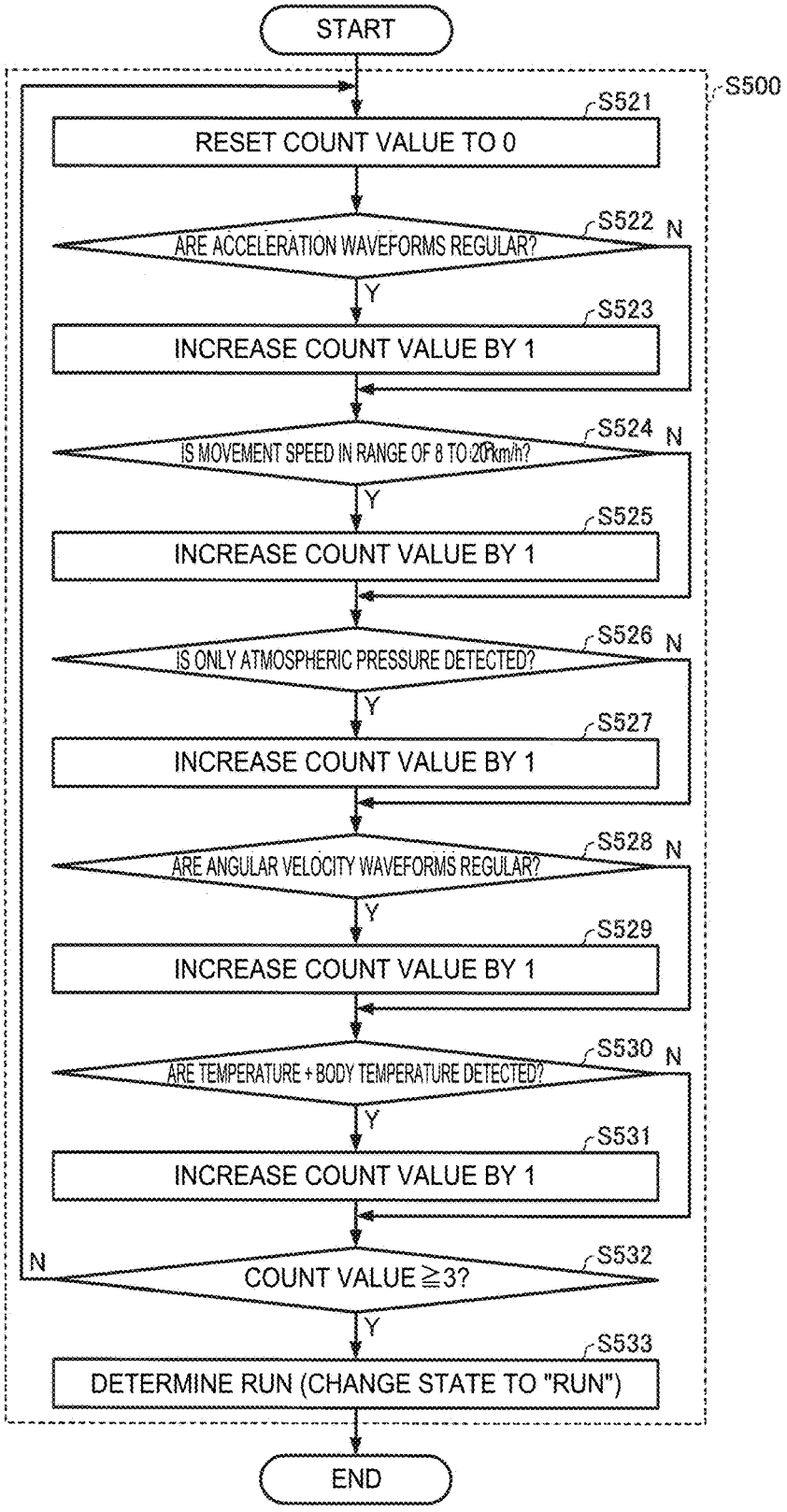

START
S500
S521
RESET COUNT VALUE TO 0
S522
ARE ACCELERATION WAVEFORMS REGULAR?
N
Y
S523
INCREASE COUNT VALUE BY 1
S524
IS MOVEMENT SPEED IN RANGE OF 8 TO 20km/h?
N
Y
S525
INCREASE COUNT VALUE BY 1
S526
IS ONLY ATMOSPHERIC PRESSURE DETECTED?
N
Y
S527
INCREASE COUNT VALUE BY 1
S528
ARE ANGULAR VELOCITY WAVEFORMS REGULAR?
N
Y
S529
INCREASE COUNT VALUE BY 1
S530
ARE TEMPERATURE + BODY TEMPERATURE DETECTED?
N
Y
S531
INCREASE COUNT VALUE BY 1
S532
N
COUNT VALUE ≧3?
Y
S533
DETERMINE RUN (CHANGE STATE TO "RUN")
END

FIG. 28

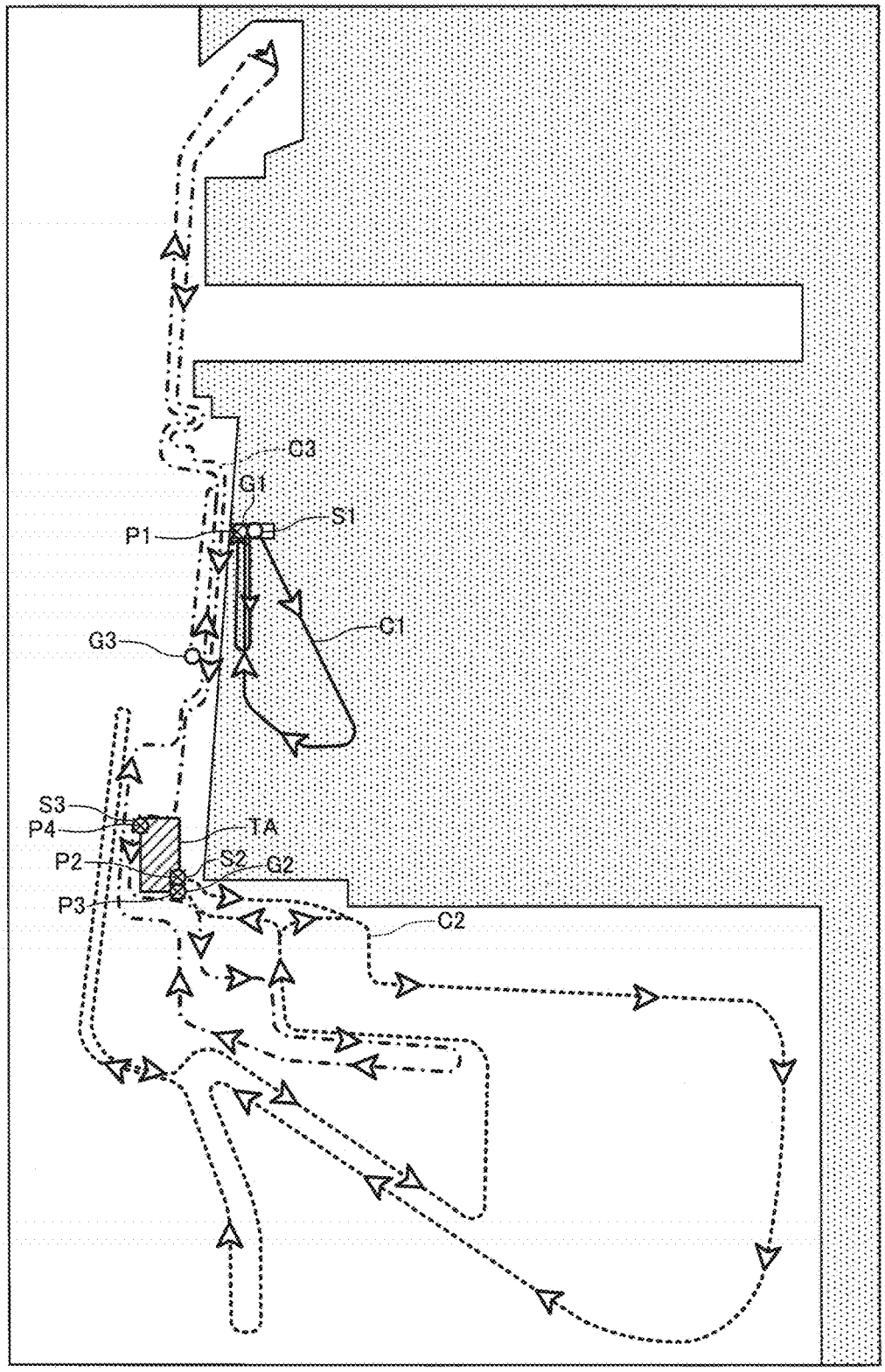


FIG. 29

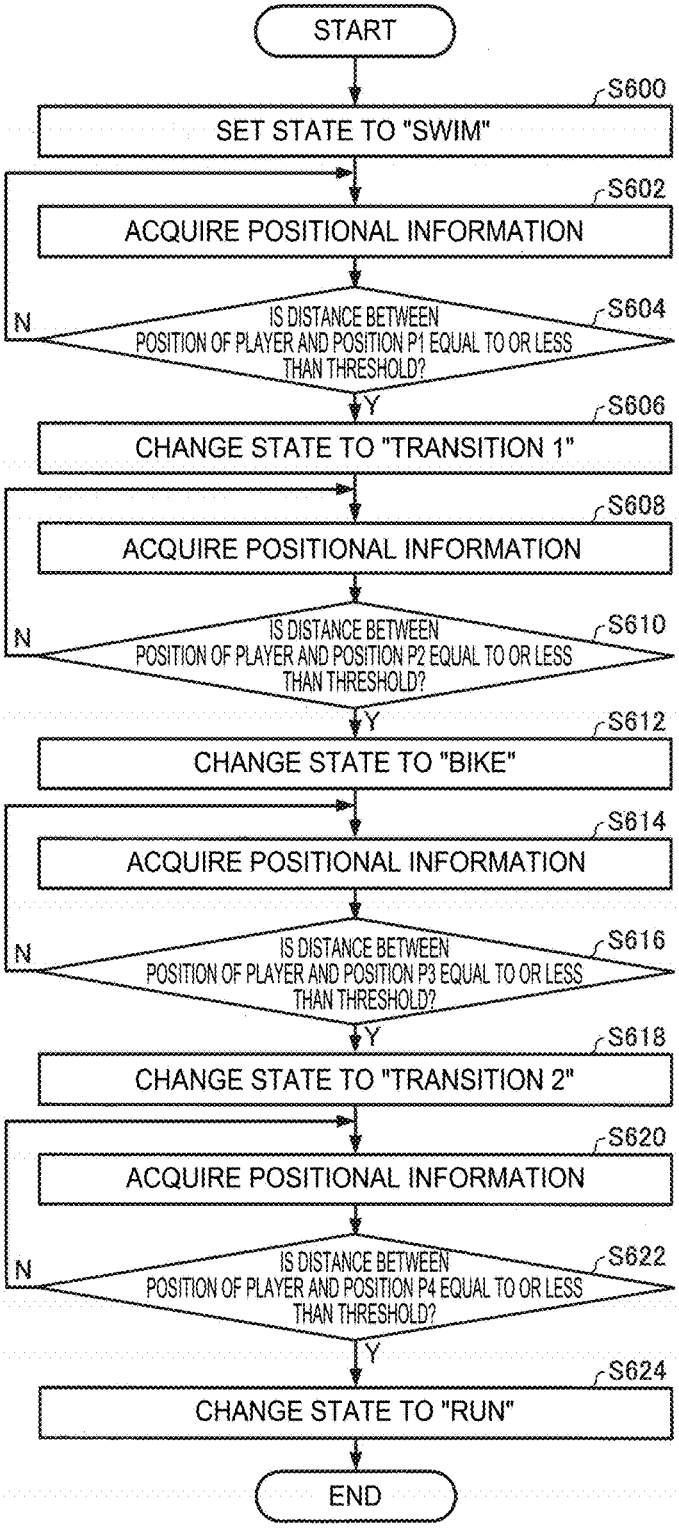

START
S600
SET STATE TO "SWIM"
S602
ACQUIRE POSITIONAL INFORMATION
S604
IS DISTANCE BETWEEN POSITION OF PLAYER AND POSITION P1 EQUAL TO OR LESS THAN THRESHOLD?
N
Y
S606
CHANGE STATE TO "TRANSITION 1"
S608
ACQUIRE POSITIONAL INFORMATION
S610
IS DISTANCE BETWEEN POSITION OF PLAYER AND POSITION P2 EQUAL TO OR LESS THAN THRESHOLD?
N
Y
S612
CHANGE STATE TO "BIKE"
S614
ACQUIRE POSITIONAL INFORMATION
S616
IS DISTANCE BETWEEN POSITION OF PLAYER AND POSITION P3 EQUAL TO OR LESS THAN THRESHOLD?
N
Y
S618
CHANGE STATE TO "TRANSITION 2"
S620
ACQUIRE POSITIONAL INFORMATION
S622
IS DISTANCE BETWEEN POSITION OF PLAYER AND POSITION P4 EQUAL TO OR LESS THAN THRESHOLD?
N
Y
S624
CHANGE STATE TO "RUN"
END

FIG. 30

EXERCISE DIAGNOSIS DEVICE, EXERCISE DIAGNOSIS SYSTEM, PROGRAM, RECORDING MEDIUM, AND EXERCISE DIAGNOSIS METHOD

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority of Japanese Patent Application No. 2016-239665, filed Dec. 9, 2016, which is expressly incorporated herein by reference thereto in its entirety.

BACKGROUND

1. Technical Field

[0002] The present invention relates to an exercise diagnosis device, an exercise diagnosis system, a program, a recording medium, and an exercise diagnosis method.

2. Related Art

[0003] JP-A-2005-288014 discloses a form evaluation system enabling users to precisely understand points to be improved by clearly comparing ideal forms with forms of the users visually.

[0004] However, in the form evaluation system disclosed in JP-A-2005-288014, it is necessary for users to capture moving images of a golf swing and transmit the moving image to an operator side by a transmission method such as an electronic mail, a mail, or data transmission via a network. Accordingly, when the form evaluation system disclosed in JP-A-2005-288014 is applied to a game in which players execute a plurality of exercise events for a long time as in triathlon or the like, it is necessary for users to continuously image exercises of players for each exercise event for a long time. Therefore, there is a problem that burdens on the users are considerably large and the user may not use the form evaluation system simply.

SUMMARY

[0005] An advantage of some aspects of the invention is to provide an exercise diagnosis device, an exercise diagnosis system, a program, a recording medium, and an exercise diagnosis method capable of diagnosing an exercise of a player in a game in which exercise events continuously switch.

[0006] The invention can be implemented as the following forms or application examples.

Application Example 1

[0007] An exercise diagnosis device according to this application example receives exercise information transmitted from an electronic device that is worn on a player, determines a plurality of states including a first exercise state in which the player is executing a first exercise event and a second exercise state in which the player is executing a second exercise event based on a satellite signal transmitted from a positional information satellite, and generates the exercise information regarding the player including the determined states, diagnoses an exercise of the player based on the received exercise information, and generates diagnosis information related to the diagnosis.

[0008] The exercise diagnosis device according to this application example diagnoses the exercise of the player based on the exercise information regarding the player transmitted and received from the electronic device in consideration of the first exercise state in which the player is executing the first exercise event and the second exercise state in which the player is executing the second exercise event and generates the diagnosis information related to the diagnosis. Accordingly, the exercise diagnosis device according to this application example can diagnose the exercise of the player in a game in which the exercise events continuously switch.

[0009] In the exercise diagnosis device according to this application example, the electronic device worn on the player can determine the first and second exercise states of the player. Therefore, manual work of the player is not necessary when the exercise event executed by the player switches from the first exercise event to the second exercise event. Accordingly, the player can focus on the game.

Application Example 2

[0010] In the exercise diagnosis device according to the application example, the plurality of exercise states may include a third exercise state in which the player is executing a third exercise event.

[0011] In the exercise diagnosis device according to this application example, the exercise of the player can be diagnosed based on the exercise information regarding the player transmitted and received from the electronic device in consideration of the first exercise state in which the player is executing the first exercise event, the second exercise state in which the player is executing the second exercise event, and the third exercise state in which the player is executing the third exercise event.

Application Example 3

[0012] The plurality of states may include a first transition state in which the first exercise state is transitioning to the second exercise state and a second transition state in which the second exercise state is transitioning to the third exercise state.

[0013] The exercise diagnosis device according to this application example can diagnose the exercise of the player based on the exercise information regarding the player transmitted and received from the electronic device in consideration of the first exercise state of the player, the first transition state in which the first exercise state is transitioning to the second exercise state, the second exercise state, the second transition state in which the second exercise state is transitioning to the third exercise state, and the third exercise state.

Application Example 4

[0014] In the exercise diagnosis device according to the application example, the first exercise event may be a swim, the second exercise event may be a bicycle, and the third exercise event may be a running.

[0015] The exercise diagnosis device according to this application example can diagnose the exercise of the player in a triathlon.

Application Example 5

[0016] The exercise diagnosis device according to the application example may diagnose the exercise of the player separately in the plurality of exercise states and may generate the plurality of pieces of diagnosis information related to the diagnosis of each of the plurality of exercise states.

[0017] The exercise diagnosis device according to this application example can appropriately diagnose the exercise of the player in each state.

Application Example 6

[0018] The exercise diagnosis device according to the application example may generate advice information for improving the exercise of the player based on the diagnosis. The diagnosis information may include the advice information.

[0019] The exercise diagnosis device according to this application example can supply appropriate advice according to a diagnosis result of the exercise of the player.

Application Example 7

[0020] The exercise diagnosis device according to the application example may generate the advice information separately in the plurality of states.

[0021] The exercise diagnosis device according to this application example can supply advice appropriate for each state of the player.

Application Example 8

[0022] The exercise diagnosis device according to the application example may output the diagnosis information.

[0023] In the exercise diagnosis device according to this application example, a user of the exercise diagnosis device can recognize the diagnosis result.

Application Example 9

[0024] The exercise diagnosis device according to the application example may transmit the diagnosis information to an information device including a display unit.

[0025] In the exercise diagnosis device according to this application example, a user of the information device can recognize the diagnosis result.

Application Example 10

[0026] An exercise diagnosis system according to this application example is a diagnosis system that includes an electronic device worn on a player, an exercise diagnosis device, and an information device. The electronic device determines a plurality of states including a first exercise state in which the player is executing a first exercise event and a second exercise state in which the player is executing a second exercise event based on a satellite signal transmitted from a positional information satellite, generates exercise information regarding the player including the determined states, and transmits the generated exercise information to the exercise diagnosis device. The exercise diagnosis device receives the exercise information transmitted from the electronic device, diagnoses an exercise of the player based on the received exercise information, generates diagnosis information related to the diagnosis, and transmits the generated diagnosis information to the information device.

[0027] In the exercise diagnosis system according to this application example, the exercise diagnosis device diagnoses the exercise of the player based on the exercise information regarding the player transmitted and received from the electronic device in consideration of the first exercise state in which the player is executing the first exercise event and the second exercise state in which the player is executing the second exercise event, generates the diagnosis information related to the diagnosis, and transmits the diagnosis information to the information device. Accordingly, in the exercise diagnosis system according to this application example, it is possible to diagnose the exercise of the player in a game in which the exercise events continuously switch.

[0028] In the exercise diagnosis system according to this application example, the electronic device worn on the player can determine the first and second exercise states of the player. Therefore, manual work of the player is not necessary when the exercise event executed by the player switches from the first exercise event to the second exercise event. Accordingly, the player can focus on the game.

Application Example 11

[0029] A program according to this application example causes a computer to perform receiving exercise information transmitted from an electronic device that is worn on a player, determines a plurality of states including a first exercise state in which the player is executing a first exercise event and a second exercise state in which the player is executing a second exercise event based on a satellite signal transmitted from a positional information satellite, and generates the exercise information regarding the player including the determined states, diagnosing an exercise of the player based on the received exercise information, and generating diagnosis information related to the diagnosis.

Application Example 12

[0030] A recording medium according to this application example is a computer-readable recording medium that stores a program causing a computer to perform receiving exercise information transmitted from an electronic device that is worn on a player, determines a plurality of states including a first exercise state in which the player is executing a first exercise event and a second exercise state in which the player is executing a second exercise event based on a satellite signal transmitted from a positional information satellite, and generates the exercise information regarding the player including the determined states, diagnosing an exercise of the player based on the received exercise information, and generating diagnosis information related to the diagnosis.

Application Example 13

[0031] An exercise diagnosis method according to this application example includes receiving exercise information transmitted from an electronic device that is worn on a player, determines a plurality of states including a first exercise state in which the player is executing a first exercise event and a second exercise state in which the player is executing a second exercise event based on a satellite signal transmitted from a positional information satellite, and generates the exercise information regarding the player including the determined states, diagnosing an exercise of the

player based on the received exercise information, and generating diagnosis information related to the diagnosis.

[0032] In the computer executing the program according to the application example, the computer executing the program recorded on the recording medium according to the application example, or the exercise diagnosis method according to the application example, the exercise of the player is diagnosed based on the exercise information regarding the player transmitted and received from the electronic device in consideration of the first exercise state in which the player is executing the first exercise event and the second exercise state in which the player is executing the second exercise event and generates the diagnosis information related to the diagnosis. Accordingly, according to the application example, it is possible to diagnose the exercise of the player in a game in which the exercise events continuously switch.

[0033] According to the application example, the electronic device worn on the player can determine the first and second exercise states of the player. Therefore, manual work of the player is not necessary when the exercise event executed by the player switches from the first exercise event to the second exercise event. Accordingly, the player can focus the game.

Application Example 14

[0034] In the exercise diagnosis method according to the application example, the plurality of exercise states may include a third exercise state in which the player is executing a third exercise event.

[0035] In the exercise diagnosis method according to this application example, the exercise of the player can be diagnosed based on the exercise information regarding the player transmitted and received from the electronic device in consideration of the first exercise state in which the player is executing the first exercise event, the second exercise state in which the player is executing the second exercise event, and the third exercise state in which the player is executing the third exercise event.

Application Example 15

[0036] In the exercise diagnosis method according to the application example, the plurality of states may include a first transition state in which the first exercise state is transitioning to the second exercise state and a second transition state in which the second exercise state is transitioning to the third exercise state.

[0037] In the exercise diagnosis method according to this application example, it is possible to diagnose the exercise of the player based on the exercise information regarding the player transmitted and received from the electronic device in consideration of the first exercise state of the player, the first transition state in which the first exercise state is transitioning to the second exercise state, the second exercise state, the second transition state in which the second exercise state is transitioning to the third exercise state, and the third exercise state.

Application Example 16

[0038] In the exercise diagnosis method according to the application example, the first exercise event may be a swim, the second exercise event may be a bicycle, and the third exercise event may be a running.

[0039] In the exercise diagnosis method according to this application example, it is possible to diagnose the exercise of the player in a triathlon.

Application Example 17

[0040] In the exercise diagnosis method according to the application example, in the diagnosing of the exercise, the exercise of the player may be diagnosed separately in the plurality of exercise states. In the generating of the diagnosis information, the plurality of pieces of diagnosis information corresponding to the plurality of exercise states may be generated.

[0041] In the exercise diagnosis method according to this application example, it is possible to appropriately diagnose the exercise of the player in each state.

Application Example 18

[0042] The exercise diagnosis method according to the application example may include generating advice information for improving the exercise of the player based on the diagnosis.

[0043] In the exercise diagnosis method according to this application example, it is possible to supply appropriate advice according to a diagnosis result of the exercise of the player.

Application Example 19

[0044] In the exercise diagnosis method according to the application example, in the generating of the advice information, the advice information may be generated separately in the plurality of states.

[0045] In the exercise diagnosis method according to this application example, it is possible to supply advice appropriate for each state of the player.

Application Example 20

[0046] The exercise diagnosis method according to the application example may include outputting the diagnosis information.

[0047] In the exercise diagnosis method according to this application example, a user of the exercise diagnosis device can recognize the diagnosis result.

Application Example 21

[0048] The exercise diagnosis method according to the application example may include transmitting the diagnosis information to an information device including a display unit.

[0049] In the exercise diagnosis method according to this application example, a user of the information device can recognize the diagnosis result.

Application Example 22

[0050] The exercise diagnosis device according to this application example includes a communication unit that receives from an electronic device worn by an exerciser exercise information including data representing a plurality of exercise states of the exerciser determined based on a satellite signal transmitted from a positional information satellite and including a first exercise state in which the exerciser is performing a first exercise event and a second exercise state in which the exerciser is performing a second

exercise event. The device also includes a processing unit that diagnoses the performance of the exerciser based on the exercise information acquired by the communication unit and generates diagnosis information related to at least one of the plurality of exercise states. In addition, the plurality of exercise states include a third exercise state in which the exerciser is performing a third exercise event. Also, the plurality of exercise states include a first transition state in which the exerciser transitions from the first exercise state to the second exercise state and a second transition state in which the exerciser transitions from the second exercise state to the third exercise state. In this application example, the first exercise event is swimming, the second exercise event is cycling, and the third exercise event is running. The processing unit diagnoses the exercise of the exerciser separately in the plurality of exercise states, and the processing unit generates a plurality of pieces of diagnosis information corresponding to the plurality of exercise states. In addition, the diagnosis information generated by the processing unit includes advice information for improving the performance of the exerciser, and the communication unit transmits the diagnosis information to an information device including a display unit.

Application Example 23

[0051] An exercise diagnosis system according to this application example includes an electronic device configured to be worn on an exerciser, an exercise diagnosis device, and an information device. The electronic device includes a first processing unit and a transmission unit. The first processing unit generates exercise information including data representing a plurality of exercise states of the exerciser determined based on a satellite signal transmitted from a positional information satellite and including a first exercise state in which the exerciser performs a first exercise event and a second exercise state in which the exerciser performs a second exercise event. The transmission unit transmits the exercise information to the information device. The information device includes a first communication unit and a display unit. The first communication unit transmits the exercise information to the exercise diagnosis device and requests the exercise diagnosis device to transmit diagnosis information generated by the exercise diagnosis device based on the exercise information. The display unit displays the diagnosis information. The exercise diagnosis device includes a second communication unit and a second processing unit. The second communication unit acquires the exercise information from the information device. The second processing unit diagnoses the performance of the exerciser based on the exercise information acquired by the second communication unit and generates the diagnosis information related to at least one of the plurality of exercise states. The second communication unit transmits the diagnosis information to the information device in response to the request from the information device.

Application Example 24

[0052] A computer-readable recording medium according to this application example stores a program causing a computer of an electronic device configured to be worn on an exerciser to: acquire exercise information including data representing a plurality of exercise states determined based on a satellite signal transmitted from a positional information satellite and including a first exercise state in which the exerciser performs a first exercise event and a second exercise state in which the exerciser performs a second exercise event; and diagnose the performance of the exerciser based on the exercise information and generating diagnosis information.

Application Example 25

[0053] An exercise diagnosis method according to this application example is performed by a processing unit configured to perform data communication with an electronic device worn on a player. The method includes receiving and diagnosing steps. The receiving step receives from the electronic device exercise information including data representing a plurality of exercise states determined based on a satellite signal transmitted from a positional information satellite and including a first exercise state in which an exerciser performs a first exercise event and a second exercise state in which the exerciser performs a second exercise event. The diagnosing step diagnoses the performance of the exerciser based on the exercise information and generating diagnosis information related to at least one of the plurality of exercise states. The plurality of exercise states also include a third exercise state in which the exerciser performs a third exercise event. The plurality of exercise states also includes a first transition state in which the exerciser transitions from the first exercise state to the second exercise state and a second transition state in which the exerciser transitions from the second exercise state to the third exercise state. The first exercise event is swimming, the second exercise event is cycling, and the third exercise event is running. The generating of the diagnosis information includes diagnosing the exercise of the exerciser separately in the plurality of exercise states, and generating a plurality of pieces of diagnosis information corresponding to the plurality of exercise states. The diagnosis information includes advice information corresponding to the plurality of exercise states. The method may also include outputting the diagnosis information and transmitting the diagnosis information to an information device including a display unit.

Application Example 26

[0054] A wrist-type electronic device according to this application example is to be worn on the wrist of an exerciser and is for determining the exercise state of the exerciser. The device includes a sensor, a processing unit, and a transmission unit. The sensor is configured to sense a characteristic of the exerciser or the environment in which the exerciser exercises. The processing unit determines the types of exercise performed by the exerciser based on data received from a satellite signal transmitted from a positional information satellite and a signal received from the sensor, and generates exercise information including data representing the type of exercises performed by the exerciser. The transmission unit transmits the exercise information to an information device configured to perform a notification operation about the exercise information.

Application Example 27

[0055] An exercise evaluation device according to this application example is for evaluating the performance by an exerciser of each of multiple types of exercise, including a communication unit and a processing unit. The communi-

cation unit receives signals from an electronic device worn by an exerciser representing exercise information, the electronic device including sensors configured to sense plural characteristics of the exerciser that change during exercise and a receiver that receives a satellite signal transmitted from a positional information satellite. The exercise information includes data representing a plurality of exercise states of the exerciser determined based on the satellite signal and including a first exercise state in which the exerciser is performing a first type of exercise and a second exercise state in which the exerciser is performing a second type of exercise, and data representing the sensed plural characteristics of the exerciser. The processing unit evaluates the performance of the exerciser based on the exercise information acquired by the communication unit and generates evaluation information evaluating at least one of the plurality of exercise states.

BRIEF DESCRIPTION OF THE DRAWING

[0056] The invention will be described with reference to the accompanying drawings, wherein like numbers reference like elements.

[0057] FIG. **1** is a diagram illustrating an example of a configuration of an exercise diagnosis system according to an embodiment.

[0058] FIG. **2** is an explanatory diagram illustrating an overview of the exercise diagnosis system according to the embodiment.

[0059] FIG. **3** is a diagram illustrating an example of a course used in a triathlon.

[0060] FIG. **4** is a diagram illustrating an example of a functional block of a player terminal.

[0061] FIG. **5** is a flowchart illustrating an example of a procedure of some processes performed by a processing unit of the player terminal.

[0062] FIG. **6** is a flowchart illustrating an example of details of a state determination process according to a first embodiment.

[0063] FIG. **7** is a diagram illustrating an example of a functional block of an exercise diagnosis device.

[0064] FIG. **8** is a flowchart illustrating an example of a procedure of some processes performed by a processing unit of the exercise diagnosis device.

[0065] FIG. **9** is a diagram illustrating an example of an image displayed on an information device.

[0066] FIG. **10** is an enlarged diagram illustrating a part of the image illustrated in FIG. **9**.

[0067] FIG. **11** is an enlarged diagram illustrating a part of the image illustrated in FIG. **9**.

[0068] FIG. **12** is an enlarged diagram illustrating a part of the image illustrated in FIG. **9**.

[0069] FIG. **13** is an enlarged diagram illustrating a part of the image illustrated in FIG. **9**.

[0070] FIG. **14** is an enlarged diagram illustrating a part of the image illustrated in FIG. **9**.

[0071] FIG. **15** is a diagram illustrating an example of an image displayed on the information device.

[0072] FIG. **16** is a diagram illustrating an example of an image displayed on the information device.

[0073] FIG. **17** is a diagram illustrating an example of an image displayed on the information device.

[0074] FIG. **18** is a diagram illustrating an example of an image displayed on the information device.

[0075] FIG. **19** is a flowchart illustrating an example of a swim determination process according to a first modification example of the state determination process.

[0076] FIG. **20** is a flowchart illustrating an example of a transition **1** determination process according to the first modification example of the state determination process.

[0077] FIG. **21** is a flowchart illustrating an example of a bike determination process according to the first modification example of the state determination process.

[0078] FIG. **22** is a flowchart illustrating an example of a transition **2** determination process according to the first modification example of the state determination process.

[0079] FIG. **23** is a flowchart illustrating an example of a run determination process according to the first modification example of the state determination process.

[0080] FIG. **24** is a flowchart illustrating an example of a swim determination process according to a second modification example of the state determination process.

[0081] FIG. **25** is a flowchart illustrating an example of a transition **1** determination process according to the second modification example of the state determination process.

[0082] FIG. **26** is a flowchart illustrating an example of a bike determination process according to the second modification example of the state determination process.

[0083] FIG. **27** is a flowchart illustrating an example of a transition **2** determination process according to the second modification example of the state determination process.

[0084] FIG. **28** is a flowchart illustrating an example of a run determination process according to the second modification example of the state determination process.

[0085] FIG. **29** is a diagram illustrating an example of registration of a position for a third modification example of the state determination process.

[0086] FIG. **30** is a flowchart illustrating the third modification example of the state determination process.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0087] Hereinafter, preferred embodiments of the invention will be described in detail with reference to the drawings. The embodiments to be described below do not inappropriately limit content of the invention described in the appended claims. All of the configurations to be described below are not prerequisite configurations of the invention.

[0088] Hereinafter, an exercise diagnosis system that diagnoses exercises of players executing a triathlon as a game including a plurality of game events (exercise events) will be exemplified.

1. Embodiment

1-1. Configuration of Exercise Diagnosis System

[0089] FIG. **1** is a diagram illustrating an example of a configuration of an exercise diagnosis system **1** according to an embodiment. As illustrated in FIG. **1**, the exercise diagnosis system **1** is configured to include a player terminal **3**, an exercise diagnosis device **4**, and an information device **8**. The exercise diagnosis device **4** and the information device **8** is connected to a network **6** configured to include, for example, the Internet and a Local Area Network (LAN).

[0090] In the embodiment, each of a plurality of players **2** performs a triathlon carrying the player terminal **3** (which is an example of an "electronic device"). The players **2** may

execute a triathlon in a competition or may execute a triathlon in a training. The triathlon is configured to include three game events (exercise events), a swim (swimming), a bike (bicycle), and a run (running). The players **2** execute the events in a procedure of the swim, the bike, and the run.

[0091] As illustrated in FIG. **2**, in the embodiment, the player terminal **3** is a wrist type (watch type) electronic device and is worn on a wrist or the like of the player **2**. FIG. **2** is a diagram when the player **2** is running.

[0092] FIG. **3** is a diagram illustrating an example of a course used in the triathlon. A solid line C**1** indicates a course of the swim, a dotted line C**2** indicates a course of the bike, and a one-dot chain line C**3** indicates a course of the run. S**1** indicates a start point of the swim (a start point of the triathlon), S**2** indicates a start point of the bike, and S**3** indicates a start point of the run. G**1** indicates a goal point of the swim, G**2** indicates a goal point of the bike, and G**3** indicates a goal point of the run (a goal point of the triathlon). TA indicates a transition area.

[0093] In the triathlon, for example, an elapsed time in which the player **2** starts from the start point S**1** of the swim and then passes the start point S**2** of the bike is considered to be a time necessary for the swim (a swim time), an elapsed time in which the player **2** passes the start point S**2** of the bike and then passes the start point S**3** of the run is considered to be a time necessary for the bike (a bike time), and an elapsed time in which the player **2** passes the start point S**3** of the run and then passes the goal point G**3** of the run is considered to be a time necessary for the run (a run time). In this case, an elapsed time (transition **1** time) in which the player **2** passes the goal point G**1** of the swim and then passes the start point S**2** of the bike, that is, a sum of a time in which the player **2** moves from the goal point G**1** of the swim to the transition area TA, a time necessary for the player **2** to change clothes or the like (for example, the player wears bike shoes, a helmet, and sunglasses, and the like) in the transition area TA, and a time in which the player **2** moves up to the start point S**2** of the bike, is included in the swim time. Similarly, an elapsed time (transition **2** time) in which the player **2** passes the goal point G**2** of the bike and then passes the start point S**3** of the run, that is, a sum of a time in which the player **2** moves from the goal point G**2** of the bike to a cloth change place in the transition area TA, a time necessary for changing clothes or the like (for example, the player takes off the helmet, the sunglasses, and the bike shoes, and the like and wears running shoes or the like), and a time in which the player **2** moves up to the start point S**3** of the run, is included in the bike time. A sum of the swim time, the bike time, and the run time is a total time.

[0094] In the embodiment, the player **2** performs a measurement start operation on the player terminal **3** when the triathlon starts (the player **2** starts the swim at the start point S**1**).

[0095] The player terminal **3** contains a clocking unit **130** (see FIG. **4** to be described below). An elapsed time from the measurement start operation, that is, a total elapsed time Ttotal from start of the triathlon by the player **2**, is measured. Information regarding the measured total elapsed time Ttotal is displayed on a display unit **150** (see FIG. **4**) or the like in sequence (in real time).

[0096] The player terminal **3** determines a plurality of states including a state "swim" (an example of a "first exercise event") in which the player **2** is swimming (an example of a "first exercise state"), a state "bike" (an example of a "second exercise event") in which the player **2** is biking (an example of a "second exercise state"), a state "run" (an example of a "third exercise event") in which the player **2** is running (an example of a "third exercise state") based on a satellite signal transmitted from a Global Positioning System (GPS) satellite **7** (an example of"positional information satellite"). In particular, in the embodiment, the player terminal **3** determines the plurality of states of the player **2** based on positional information obtained based on a satellite signal transmitted from the GPS satellite **7** and at least one of an output signal of an acceleration sensor **113** (see FIG. **4**) and an output signal of a pressure sensor **112** (see FIG. **4**). In the embodiment, the plurality of states determined by the player terminal **3** include a state "transition **1**" in which "swim" is transitioning to "bike" (an example of a "first transition state") and a state "transition **2**" in which "bike" is transitioning to "run" (an example of a "second transition state"). That is, in the embodiment, the player terminal **3** determines five states, "swim", "transition **1**", "bike", "transition **2**", and "run".

[0097] The player terminal **3** measures an elapsed time Tswim from start to end of "swim", an elapsed time Ttran**1** from start to end of "transition **1**", an elapsed time Thbike from start to end of"bike", an elapsed time Ttran**2** from start to end of "transition **2**", and an elapsed time Trun from start to end of "run", and then displays information regarding each of the determined states or the measured elapsed time of each of the states on the display unit **150** or the like in sequence (in real time).

[0098] The player terminal **3** generates information regarding a speed, a pace, a distance, a trajectory, a pulse rate, a heart rate, a pitch (running pitch), a stride (running stride), a swim stroke, trajectories of the wrists of strokes, right and left balance, and the like of the player **2** based on output signals of various sensors.

[0099] A cadence sensor may be mounted on a bicycle and the player terminal **3** may communicate with the cadence sensor and acquire information regarding bike cadence (the number of crank rotations per minute).

[0100] For example, the player **2** may mount a sensor device including a motion sensor (an acceleration sensor or an angular velocity sensor) near the center of a ventral side of his or her waist or the center of an occipital side (for example, near the center of a belt strap installed in a goggle) and the player terminal **3** may communicate the sensor device to acquire detected data of the motion sensor. Then, the player terminal **3** may determine whether the waist or the head of the player **2** faces to the right or left with respect to a traveling direction based on the acquired detected data and may generate information regarding a time ratio (right and left balance) when the head faces to the right and left.

[0101] For example, sensor devices including atmospheric pressure sensors may be mounted on a plurality of buoys installed in a swim course. Then, the player terminal **3** may communicate with the plurality of sensor devices to acquire detected data of the plurality of atmospheric pressure sensors and may generate information of wave movements (for example, a direction in which waves come and a direction in which the waves go) based on a temporal change of the heights of the waves at the positions of the buoys obtained from the plurality of pieces of detected data.

[0102] The player terminal **3** stores exercise information (the total elapsed time Ttotal, the elapsed times Tswim, Ttran**1**, Tbike, Ttran**2**, and Trun, the determined states, the

speed, the pace, the distance, the trajectory, the pulse rate, the heart rate, the pitch, the stride, the swim stroke, trajectories of the wrists of strokes, bike cadence, right and left balance, wave movements, and the like) regarding the player **2** in a contained storage unit **140** (see FIG. **4**) in sequence while the player **2** is executing the triathlon.

[0103] In the embodiment, the player **2** performs a measurement end operation on the player terminal **3** when the player **2** ends the triathlon (when the player **2** passes the goal point G**3**).

[0104] When the measurement end operation is operated, the player terminal **3** ends the determination process for the five states, the measurement process for the total elapsed time Ttotal, the measurement processes for "swim", "transition **1**", "bike", "transition **2**", and "run" of the states, and the measurement processes for the elapsed times Tswim, Ttran**1**, Tbike, Ttran**2**, and Trun and stores the total elapsed time Ttotal and the elapsed times Tswim, Ttran**1**, Tbike, Ttran**2**, and Trun in the contained storage unit **140** (see FIG. **4**). The total elapsed time Ttotal stored in the storage unit **140** is equivalent to the above-described "total time". A sum of the elapsed times Tswim and Ttran**1** stored in the storage unit **140** is equivalent to the above-described "swim time". A sum of the elapsed times Tbike and Ttran**2** stored in the storage unit **140** is equivalent to the above-described "bike time". The elapsed time Trun stored in the storage unit **140** is equivalent to the above-described "run time". The elapsed time Ttran**1** stored in the storage unit **140** is equivalent to the above-described "transition **1** time". The elapsed time Ttran**2** stored in the storage unit **140** is equivalent to the above-described "transition **2** time".

[0105] In the embodiment, the player terminal **3** can be connected to the network **6** via the information terminal **5**. Then, after the player **2** starts the triathlon or the player **2** ends the triathlon, the player terminal **3** transmits the exercise information regarding the player **2** stored in the storage unit **140** of the player terminal **3** to the exercise diagnosis device **4** via the information terminal **5** and the network **6**. The information terminal **5** may be, for example, a smartphone or a personal computer.

[0106] The exercise diagnosis device **4** receives the exercise information regarding the player **2** transmitted from the player terminal **3** via the network **6** and stores (reserves) the received exercise information in the storage unit **220** or a recording medium **230** (see FIG. **7**). The exercise diagnosis device **4** stores various kinds of information regarding the triathlon (map information regarding the course of the triathlon, a determination table for diagnosing the exercise of the player **2**, object information indicating each of the states of "swim", "transition **1**", "bike", "transition **2**", and "run", and the like) in the storage unit **220** or the recording medium **230**. Then, the exercise diagnosis device **4** diagnoses the exercise of the player **2** (any of the plurality of players **2**) based on the exercise information received and stored in the storage unit **220** or the recording medium **230** or various kinds of information in response to a request from the information device **8** and generates diagnosis information related to the diagnosis. The exercise diagnosis device **4** may diagnose the exercise of the player **2** separately in the plurality of states ("swim", "transition **1**", "bike", "transition **2**", and "run") and generate diagnosis information related to diagnosis of each of the plurality of states. The exercise diagnosis device **4** may generate advice information for improving the exercises of the player **2** based on the diagnosis and the diagnosis information may include the advice information. For example, the exercise diagnosis device **4** may separately generate the advice information regarding the plurality of states ("swim", "transition **1**", "bike", "transition **2**", and "run"). The exercise diagnosis device **4** transmits the generated diagnosis information to the information device **8** via the network **6**. The exercise diagnosis device **4** may be, for example, a server that is owned by a game organizer of the triathlon or a maker, of the player terminal **3**, or the like.

[0107] The information device **8** receives the diagnosis information regarding the player **2** from the exercise diagnosis device **4** via the network **6** and outputs the diagnosis information as an image or a sound. The information device **8** may generate various signals (for example, a transmission request for the diagnosis information and selection information for selecting the player **2** who is a diagnosis information display target) based on an input signal from an operation unit (not illustrated), may transmit the various signals to the exercise diagnosis device **4**, and may receive the diagnosis information according to the various signals from the exercise diagnosis device **4**. The information device **8** is, for example, a smartphone or a personal computer. A user (the player **2** or a person concerned such as a coach of the player **2**) of the information device **8** can examine strategies or effective training methods necessary for the player **2** to improve a result of the triathlon based on the diagnosis information regarding the player **2** displayed on the display unit of the information device **8**.

1-2. Configuration and Process of Player Terminal

[0108] FIG. **4** is a diagram illustrating an example of a functional block of the player terminal **3**. As illustrated in FIG. **4**, the player terminal **3** is configured to include a processing unit **100**, a GPS sensor **110**, a geomagnetic sensor **111**, a pressure sensor **112**, an acceleration sensor **113**, an angular velocity sensor **114**, a pulse rate sensor **115**, a temperature sensor **116**, an operation unit **120**, a clocking unit **130**, a storage unit **140**, a display unit **150**, a sound output unit **160**, a communication unit **170**, and a battery **180**. Here, in the configuration of the player terminal **3**, some of the constituent elements may be deleted or changed, or other constituent elements may be added.

[0109] The GPS sensor **110** generates positional information based on a satellite signal transmitted from the GPS satellite **7**. For example, the GPS sensor **110** may be a GPS receiver that receives the satellite signal transmitted from the GPS satellite **7** with an antenna (not illustrated), demodulates a navigation message from the satellite signal, and generates and outputs positioning data (data of a latitude, a longitude, an altitude, a velocity vector, and the like) which is positional information indicating the position or the like of the player terminal **3** based on the navigation message.

[0110] The geomagnetic sensor **111** is a sensor that detects and outputs a magnetic field (geomagnetic field) of the earth and, for example, generates and outputs a geomagnetic signal indicating a magnetic flux density in three axial directions perpendicular to each other. As the geomagnetic sensor **111**, for example, a magnet resistive (MR) element, a magnet impedance (MI) element, or a Hall element is used.

[0111] The pressure sensor **112** is a sensor that detects and outputs a surrounding pressure (an atmospheric pressure, a hydraulic pressure, a wind pressure, or the like) and includes, for example, a pressure-sensitive element of a

scheme (vibration scheme) of using a change in a resonance frequency of a resonator element. The pressure-sensitive element is, for example, a piezoelectric vibrator formed of a piezoelectric material such as quartz crystal, lithium niobate, or lithium tantalate. For example, a tuning fork type vibrator, a dual tuning fork type vibrator, or an AT vibrator (thickness shear vibrator), or a SAW resonator is applied. Alternatively, the pressure sensor **112** may be a MEMS type pressure sensor manufactured using a semiconductor manufacturing technology. For example, the pressure sensor **112** includes a diaphragm unit that is flexural-deformed by received pressure and a strain detection element that detects flexural deformation of the diaphragm unit. The diaphragm unit is formed of, for example, silicon. The strain detection element is, for example, a piezoresistive element.

[0112] The acceleration sensor **113** detects acceleration in each of triaxial directions intersecting each other (ideally, perpendicular to each other) and outputs a signal (acceleration signal) according to the magnitude and direction of the detected triaxial acceleration.

[0113] The angular velocity sensor **114** detects an angular velocity in each of triaxial directions intersecting each other (ideally, perpendicular to each other) and outputs a signal (angular velocity signal) according to the magnitude and direction of the detected triaxial angular velocity.

[0114] At least one of the signal (the pressure signal) output by the pressure sensor **112**, the signal (the acceleration signal) output by the acceleration sensor **113**, and the signal (the angular velocity signal) output by the angular velocity sensor **114** may be used to correct information regarding a position included in positioning data by the GPS sensor **110**.

[0115] The pulse rate sensor **115** is a sensor that generates and outputs a signal indicating a pulse rate of the player **2** and includes, for example, a light source such as a light-emitting diode (LED) light source that emits measurement light with an appropriate wavelength to a hypodermic blood vessel and a light-receiving element that detects a change in the intensity of light generated from the blood vessel according to the measurement light. For example, by performing an intensity change waveform (pulse wave) of the light through a known scheme such as frequency analysis, it is possible to measure a pulse rate (the number of pulsations per minute). Since a heart rate (the number of beats per minute) is substantially the same as the pulse rate as long as there is no arrhythmia, pulse deficit, or the like, the pulse rate sensor **115** can measure a heart rate. As the pulse rate sensor **115**, an ultrasonic sensor that detects contraction of blood vessels by ultrasonic waves and measures a pulse rate (heart rate) may be adopted or a sensor that flows a weak current in a body from an electrode and measures a pulse rate (heart rate) may be adopted instead of a photoelectric sensor including a light source and a light-receiving element.

[0116] The temperature sensor **116** is a sensor that outputs a signal according to a surrounding temperature (temperature signal).

[0117] The operation unit **120** is configured to have, for example, a button, a key, a microphone, a touch panel, a sound recognition function (using a microphone (not illustrated)), and an action detection function (using the acceleration sensor **113** or the like) and performs processes of converting an instruction from the player **2** into an appropriate signal and transmitting the signal to the processing unit **100**.

[0118] The clocking unit **130** is configured with, for example, a real time clock (RTC) IC, generates time data such as year, month, day, hour, minute, and second, and transmits the time data to the processing unit **100**. The time data may be appropriately corrected based on time information included in positioning data by the GPS sensor **110**.

[0119] The storage unit **140** is configured with a plurality of integrated circuit (IC) memories and includes, for example, a read-only memory (ROM) that stores data such as a program, a random access memory (RAM) that serves as a work area of the processing unit **100**, and a recording medium (a recording medium from which data can be read by the player terminal **3** (an example of a computer) such as a memory card that stores a program, data, and the like. The ROM or the recording medium stores various programs used for the processing unit **100** to perform various calculation processes or control processes, various program used to realize application functions, various kinds of data, and the like.

[0120] The player terminal **3** may receive various programs and various kinds of data stored in a recording medium (an optical disc (a CD or a DVD), a magneto-optical disc (MO), a magnetic disk, a hard disk, a magnetic tape, or the like) or a storage unit included in the exercise diagnosis device **4** via the information terminal **5** and the network **6** and may store the received various programs and various kinds of data in the storage unit **140** (RAM).

[0121] The display unit **150** is configured with, for example, a liquid crystal display (LCD), an organic electroluminescence (EL) display, an electrophoretic display (EPD), or a touch panel display and displays various images in response to an instruction from the processing unit **100**. As the display unit **150**, a head-mounted display (HMD) installed to be separate from the player terminal **3** can also be used.

[0122] The sound output unit **160** is configured with, for example, a speaker, a buzzer, or a vibrator and generates various sounds (including vibration) in response to an instruction from the processing unit **100**. As the sound output unit **160**, a bone conduction device installed to be separate from the player terminal **3** can also be used.

[0123] The communication unit **170** performs various kinds of control to establish communication between the player terminal **3** and the information terminal **5**. The communication unit **170** is configured with, for example, a transceiver corresponding to a short-range wireless communication standard such as Bluetooth (registered trademark) (including Bluetooth Low Energy (BTLE)), wireless fidelity (Wi-Fi) (registered trademark), Zigbee (registered trademark), near field communication (NFC), or ANT+ (registered trademark). The communication unit **170** is configured to include a connector corresponding to a communication bus standard such as Universal Serial Bus (USB).

[0124] The battery **180** supplies power to each unit included in the player terminal **3** and is, for example, a charging battery. For example, a non-contact charging scheme or a contact charging scheme (charging in which a cradle or the like is used) can be applied as the charging scheme of the battery **180**. The battery **180** may be an interchangeable battery or may be a solar power generation battery.

[0125] The processing unit **100** (processor) is configured with, for example, a microprocessing unit (MPU), or a digital signal processor (DSP), an application specific inte-

grated circuit (ASIC). The processing unit **100** performs various processes based on programs stored in the storage unit **140** and signals input from the operation unit **120**. The processes performed by the processing unit **100** include data processing on signals output by the GPS sensor **110**, the geomagnetic sensor **111**, the pressure sensor **112**, the acceleration sensor **113**, the angular velocity sensor **114**, the pulse rate sensor **115**, the temperature sensor **116**, and the clocking unit **130**, a display process of causing the display unit **150** to display an image, sound output processes of causing the sound output unit **160** to output a sound, communication processes of communicating with the information terminal **5** via the communication unit **170**, and a power control process of supplying power from the battery **180** to each unit.

[0126] In particular, in the embodiment, as one of the data processing, the processing unit **100** performs a process of measuring an elapsed time (the total elapsed time Ttotal) elapsed from reception of a signal indicating a measurement start operation from the operation unit **120** based on a signal output by the clocking unit **130**.

[0127] As one of the data processing, the processing unit **100** performs a process of determining the plurality of states of the player **2**, "swim", "transition **1**", "bike", "transition **2**", and "run" based on positioning data (positional information obtained based on a satellite signal transmitted from the GPS satellite **7**) generated and output by the GPS sensor **110** and at least one of a signal output by the pressure sensor **112** and a signal output by the acceleration sensor **113**.

[0128] Generally, in the swim, since strokes of the arms of the player **2** are regular (have periodicity), waveforms of signals output by the acceleration sensor **113** are regular (have periodicity). A speed (movement speed) at which the player **2** is swimming is within a predetermined speed range (for example, about 3 km/h). Further, since a state in which the arms of the player **2** are in the air and a state in which the arms of the player **2** are in the water are alternately repeated, the pressure sensor **112** detects the atmospheric pressure and the hydraulic pressure. In the transition **1**, since the player **2** changes clothes or the like, the position of the player **2** is not substantially changed and the player **2** nearly stops (a movement speed is zero). In the bike, a speed (movement speed) at which the player **2** is biking is equal to or greater than a predetermined speed (for example, 20 km/h). Since the player **2** moves against wind, the pressure sensor **112** detects a wind pressure. In the transition **2**, since the player **2** is changing clothes or the like, the position of the player **2** is not substantially changed and the player **2** nearly stops (a movement speed is zero). In the run, since arm swinging of the player **2** is regular (have periodicity), waveforms of signals output by the acceleration sensor **113** are regular (have periodicity). A speed (movement speed) at which the player **2** is running is within a predetermined speed range (for example, 8 km/h to 20 km/h).

[0129] Accordingly, the processing unit **100** may calculate a movement speed of the player **2** based on the positioning data (positional information) generated and output by the GPS sensor **110**, determine whether the waveforms of the signals output by the acceleration sensor **113** have the periodicity, detect a change in the pressure based on the signal output by the pressure sensor **112**, determine whether the movement speed of the player **2** and the waveforms of the signals output by the acceleration sensor **113** have the periodicity, and determine the plurality of states of the player **2**, "swim", "transition **1**", "bike", "transition **2**", and "run" based on the change in the pressure.

[0130] As one of the data processing, the processing unit **100** performs a process of calculating a time necessary for each of the plurality of states of the player **2**, "swim", "transition **1**", "bike", "transition **2**", and "run". That is, the processing unit **100** performs a process of measuring the elapsed time Tswim of the state "swim", the elapsed time Ttran**1** of the state "transition **1**", the elapsed time Tbike of the state "bike", the elapsed time Ttran**2** of the state "transition **2**", and the elapsed time Trun of the state "run" based on the signals output by the clocking unit **130**.

[0131] As one of the data processing, the processing unit **100** performs a process of generating information regarding the speed, the pace, the distance, the trajectory, the pulse rate, the heart rate, the pitch (running pitch), the stride (running stride), the swim stroke, the trajectories of the wrists of stroke, and the like of the player **2** after reception of signals indicating measurement start operations from the operation unit **120** based on the signals output by the GPS sensor **110**, the geomagnetic sensor **111**, the pressure sensor **112**, the acceleration sensor **113**, the angular velocity sensor **114**, the pulse rate sensor **115**, the temperature sensor **116**, and the clocking unit **130**.

[0132] For example, the processing unit **100** generates information regarding the movement speed (speed), the pace, the distance, and the trajectory of the player **2** based on the positioning data (positional information) output by the GPS sensor **110**. The processing unit **100** generates information regarding a pulse rate and a heart rate based on signals output by the pulse rate sensor **115**. The processing unit **100** generates information regarding the pitch (running pitch) based on a signal output by the acceleration sensor **113** or a signal output by the angular velocity sensor **114**. The processing unit **100** generates information regarding the stride (running stride) from the information regarding the distance and the pitch. The processing unit **100** generates information regarding the swim stroke (stroke speed) or the trajectories of the wrists of stroke based on a temporal change of a water depth obtained from a signal output by the pressure sensor **112**.

[0133] When the cadence sensor is mounted on the bicycle, the processing unit **100** communicates with the cadence sensor to acquire information regarding the bike cadence.

[0134] For example, when the player **2** may mount a sensor device including a motion sensor near the center of a ventral side of his or her waist or the center of an occipital side, the processing unit **100** may communicate with the sensor device to acquire detected data of the motion sensor, may determine whether the waist or the head of the player **2** faces to the right or left with respect to a traveling direction based on the acquired detected data, and may generate information regarding right and left balance.

[0135] For example, sensor devices including atmospheric pressure sensors may be mounted on the plurality of buoys installed in a swim course. Then, the processing unit **100** may communicate with the plurality of sensor devices to acquire detected data of the plurality of atmospheric pressure sensors and may generate information of wave movements based on a temporal change of the heights of the waves at the positions of the buoys obtained from the plurality of pieces of detected data.

[0136] As one of the data processing, the processing unit **100** performs a process of storing exercise information regarding the player **2** (the total elapsed time Ttotal, the elapsed times Tswim, Ttran**1**, Tbike, Ttran**2**, and Trun, the determined states, the speed, the pace, the distance, the trajectory, the pulse rate, the heart rate, the pitch, the stride, the swim stroke, the trajectories of the wrists of stroke, the bike cadence, the right and left balance, wave movements, and the like) from reception of a signal indicating a measurement start operation from the operation unit **120** to reception of a signal indicating a measurement end operation in the storage unit **140**.

[0137] As one of the data processing, when a signal indicating a measurement end operation is received from the operation unit **120**, the processing unit **100** ends the measurement process of the total elapsed time Ttotal, the determination process for the plurality of states, "swim", "transition **1**", "bike", "transition **2**", and "run", and the measurement process for the elapsed times Tswim, Ttran**1**, Tbike, Ttran**2**, and Trun of the states and performs a process of storing the total elapsed time Ttotal and the elapsed times Tswim, Ttran**1**, Tbike, Ttran**2**, and Trun (final times) in the storage unit **140** in a temporal order.

[0138] As one of the communication processes, the processing unit **100** performs a process of transmitting the exercise information regarding the player **2** stored in the storage unit **140** to the exercise diagnosis device **4** via the communication unit **170** and the information terminal **5** in a temporal order from reception of a signal indicating the measurement start operation from the operation unit **120** to reception of a signal indicating the measurement end operation.

[0139] As one of the display processes, the processing unit **100** may perform a process of causing the display unit **150** to display at least one of the plurality of states "swim", "transition **1**", "bike", "transition **2**", and "run" of the player **2**. In this case, the display unit **150** functions as a notification unit that notifies of the state determined by the processing unit **100**.

[0140] As one of the display processes, the processing unit **100** may perform a process of causing the display unit **150** to display at least some of the exercise information regarding the player **2**.

[0141] As one of the sound output processes, the processing unit **100** may perform a process of outputting at least one of the plurality of states "swim", "transition **1**", "bike", "transition **2**", and "run" of the player **2** as a sound to the sound output unit **160**. In this case, the sound output unit **160** functions as a notification unit that notifies of the state determined by the processing unit **100**.

[0142] As one of the sound output processes, the processing unit **100** may perform a process of outputting at least some of the exercise information regarding the player **2** as sounds to the sound output unit **160**.

[0143] As one of the communication processes, the processing unit **100** may perform a process of transmitting at least one of the plurality of states "swim", "transition **1**", "bike", "transition **2**", and "run" of the player **2** to the information terminal **5** via the communication unit **170**. In this case, the communication unit **170** functions as a notification unit that notifies of the state determined by the processing unit **100**.

[0144] FIG. **5** is a flowchart illustrating an example of a procedure of some of the processes performed by the processing unit **100** of the player terminal **3**. The processing unit **100** of the player terminal **3** performs a process in the procedure of the flowchart of FIG. **5** by executing a program stored in the storage unit **140** (the recording medium, the ROM, or the RAM).

[0145] As illustrated in FIG. **5**, the processing unit **100** first stands by until receiving a signal indicating a measurement start operation from the operation unit **120** (N in step S**10**). When the signal indicating the measurement start operation is received (Y in S**10**), the processing unit **100** starts a process of generating the exercise information regarding the player **2** and a process of transmitting the exercise information to the exercise diagnosis device **4** (step S**12**).

[0146] Subsequently, the processing unit **100** performs a state determination process of determining the player **2** state (step S**14**). In the embodiment, the processing unit **100** performs the process of determining the plurality of states of the player **2**, "swim", "transition **1**", "bike", "transition **2**", and "run" based on the positioning data (positional information) generated and output by the GPS sensor **110**, the signal output by the acceleration sensor **113**, and the signal output by the pressure sensor **112**. The details of the state determination process will be described below.

[0147] Subsequently, the processing unit **100** stands by until receiving a signal indicating the measurement end operation from the operation unit **120** (N in step S**16**). When the processing unit **100** receives the signal indicating the measurement end operation (Y in step S**16**), the processing unit **100** ends the process of generating the exercise information regarding the player **2** and the process of transmitting the exercise information regarding the player **2** to the exercise diagnosis device **4** (step S**18**).

[0148] FIG. **6** is a flowchart illustrating a detailed example of the state determination process (the process of step S**14** in FIG. **5**).

[0149] As illustrated in FIG. **6**, in the embodiment, the processing unit **100** performs a swim determination process (S**100**), a transition **1** determination process (step S**200**), a bike determination process (step S**300**), a transition **2** determination process (step S**400**), and a run determination process (step S**500**).

[0150] As described above, in the swim, the strokes of the arms of the player **2** are regular (have periodicity), the speed at which the player **2** is swimming is within the predetermined speed range (for example, about 3 km/h), and the state in which the arms of the player **2** are in the air and the state in which the arms of the player **2** are in the water are alternately repeated. Accordingly, when the acceleration waveforms (the waveforms output by the acceleration sensor **113**) are regular (have periodicity) (Y in step S**101**), a movement speed obtained by differentiating the position of the player terminal **3** included in the positioning data of the GPS sensor **110** is about 3 km/h (Y in step S**102**), and the hydraulic pressure and the atmospheric pressure are detected based on signals output by the pressure sensor **112** (Y in step S**103**) in the swim determination process (step S**100**), the processing unit **100** determines that the player **2** is swimming and changes the player **2** state from a negative state to "swim" (step S**104**).

[0151] When a period at which a voltage of a signal output by the acceleration sensor **113** matches a threshold Vt**1** is substantially constant (within a predetermined range) for a predetermined time, the processing unit **100** may determine

that the acceleration waveforms are regular. The threshold Vt**1** may be appropriately determined. When the movement speed of the player terminal **3** is equal to or greater than 3 km/h−α**1** and equal to or less than 3 km/h+α**2**, the processing unit **100** may determine that speed is about 3 km/h. Here, α**1** and α**2** may be appropriately determined. The hydraulic pressure is greater than the atmospheric pressure by a predetermined amount. Therefore, when a pressure applied to the player terminal **3** and calculated using a signal output by the pressure sensor **112** is periodically changed and a difference between the maximum value and the minimum value is equal to or greater than a threshold Pt**1**, the processing unit **100** may determine that the hydraulic pressure and the atmospheric pressure are detected. The threshold Pt**1** may be appropriately set.

[0152] As described above, in the transition **1**, the position of the player **2** is not substantially changed since the player **2** is changing clothes or the like. Accordingly, when the movement speed of the player terminal **3** is nearly zero (the player **2** nearly stops) (Y in step S**201**) in the transition **1** determination process (step S**200**), the processing unit **100** determines that the player **2** is in the transition **1** state and changes the player **2** state from "swim" to "transition **1**" (step S**202**).

[0153] When the movement speed of the player terminal **3** is equal to or less than β**1**, the processing unit **100** may determines that the player **2** nearly stops. β**1** may be appropriately determined.

[0154] As described above, in the bike, the speed at which the player **2** is biking is equal to or greater than the predetermined speed (for example, 20 km/h) and the player **2** moves against wind. Accordingly, when the movement speed of the player terminal **3** is equal to or greater than 20 km/h (Y in step S**301**) and the wind pressure is detected based on the signal output by the pressure sensor **112** (Y in step S**302**) in the bike determination process (step S**300**), the processing unit **100** determines that the player **2** is biking and changes the player **2** state from "transition **1**" to "bike" (step S**303**).

[0155] As described above, in the transition **2**, the position of the player **2** is not substantially changed since the player **2** is changing clothes or the like. Accordingly, when the movement speed of the player terminal **3** is nearly zero (the player **2** nearly stops) (Y in step S**401**) in the transition **2** determination process (step S**400**), the processing unit **100** determines that the player **2** is in the transition **2** state and changes the player **2** state from "bike" to "transition **2**" (step S**402**).

[0156] As described above, in the run, arm swinging of the player **2** is regular (has periodicity) and the speed at which the player **2** is running is within the predetermined speed range (for example, 8 km/h to 20 km/h). Accordingly, when the acceleration waveforms (the waveforms output by the acceleration sensor **113**) are regular (have periodicity) (Y in step S**501**) and the movement speed of the player terminal **3** is 8 km/h to 20 km/h (Y in step S**502**) in the run determination process (step S**500**), the processing unit **100** determines that the player **2** is running and changes the player **2** state from "transition **2**" to "run" (step S**503**).

1-3. Configuration and Process of Exercise Diagnosis Device (Exercise Diagnosis Method)

[0157] FIG. **7** is a diagram illustrating an example of a functional block of the exercise diagnosis device **4**. As illustrated in FIG. **7**, the exercise diagnosis device **4** is configured to include a processing unit **200**, a communication unit **210**, a storage unit **220**, and a recording medium **230**. Here, in the configuration of the exercise diagnosis device **4**, some of the constituent elements may be deleted or changed, or other constituent elements may be added.

[0158] The storage unit **220** is configured with, for example, a plurality of IC memories and includes a ROM that stores data or a program used for the processing unit **200** to perform various calculation processes or control processes and a RAM that serves as a work area of the processing unit **200**.

[0159] The recording medium **230** is a recording medium which can be read by the exercise diagnosis device **4** (an example of a computer) and is, for example, an optical disc (a CD or a DVD), a magneto-optical disc (MO), a magnetic disk, a hard disk, a magnetic tape, or a memory card. The recording medium **230** stores data or a program used for the processing unit **200** to realize an application function. In particular, in the embodiment, the recording medium **230** stores a diagnosis information generation program **231** used for the processing unit **200** to generate diagnosis information. The storage unit **220** or the recording medium **230** stores various kinds of information regarding the triathlon (map information regarding the course of the triathlon, a determination table for diagnosing an exercise of the player **2**, object information indicating each of the states of "swim", "transition **1**", "bike", "transition **2**", and "run", and the like).

[0160] The exercise diagnosis device **4** may receive various kinds of data or various programs including the diagnosis information generation program **231** stored in a recording medium of a server (not illustrated) via the network **6** or the like and may store the received various kinds of data or various programs in the storage unit **220** (the RAM).

[0161] The communication unit **210** communicates with the plurality of player terminals **3** or the information device **8** via the network **6**. Specifically, the communication unit **210** receives identification information regarding the player terminals **3** and the exercise information regarding the players **2** from the plurality of player terminals **3** in a temporal order. The communication unit **210** receives a request for transmitting diagnosis information or selection information for selecting the player **2** who is a target for which the diagnosis information is generated, from the information device **8**. The communication unit **210** transmits the diagnosis information in response to the transmission request to the information device **8**.

[0162] The processing unit **200** (the processor) is configured with, for example, an MPU, a DSP, or an ASIC. The processing unit **200** performs various processes based on programs stored in the storage unit **220** or programs stored in the recording medium **230**. In particular, in the embodiment, the processing unit **200** functions as an exercise information acquisition unit **201** and a diagnosis information generation unit **202** by executing the diagnosis information generation program **231** stored in the recording medium **230**.

[0163] The exercise information acquisition unit **201** performs a process of acquiring the exercise information received by the communication unit **210** in sequence and storing the exercise information in association with the identification information (or the identification information

regarding the player **2** carrying the player terminal **3**) regarding the player terminal **3** in the storage unit **220** or the recording medium **230**.

[0164] The diagnosis information generation unit **202** performs a process of diagnosing the exercise of the player **2** based on the exercise information regarding the plurality of players **2** stored in the storage unit **220** or the recording medium **230**, generating the diagnosis information related to the diagnosis, and transmitting the generated diagnosis information to the information device **8** via the communication unit **210**. For example, the diagnosis information generation unit **202** may compare the exercise information regarding the player **2** to the determination table stored in the storage unit **220** or the recording medium **230** and may generate the diagnosis information based on a comparison result. The determination table is, for example, a table in which a plurality of numerical ranges divided step by step and scores, diagnosis text information, or the like are associated for each item of the exercise information. With reference to the determination table, the diagnosis information generation unit **202** may specify a numerical range including actually measured numerical values (an average value, a maximum value, a minimum value, and the like of a predetermined period) in each item included in the exercise information regarding the player **2**, select (further process) the diagnosis text information associated with the numerical value range, and generate the diagnosis information including the text information. Based on the exercise information regarding the plurality of players **2**, the diagnosis information generation unit **202** may change boundary values or the like of the plurality of numerical ranges in each item in the determination table.

[0165] The diagnosis information generation unit **202** may acquire the selection information received by the communication unit **210**, select the player **2** who is a target for which the diagnosis information is generated based on the acquired selection information, and generate the diagnosis information based on the exercise information regarding the selected player **2**. For example, the diagnosis information generation unit **202** may diagnose the exercise of the selected player **2** separately in the plurality of states ("swim", "transition **1**", "bike", "transition **2**", and "run") and generate diagnosis information related to the diagnosis of each of the plurality of states. For example, the diagnosis information generation unit **202** may generate the diagnosis information including the objects indicating the plurality of states of the player **2** based on the object information (the object information indicating the states, "swim", "transition **1**", "bike", "transition **2**", and "run") stored in the storage unit **220** or the recording medium **230**.

[0166] The diagnosis information generation unit **202** may generate advice information for improving the exercise of the player **2** based on a diagnosis result and generate the diagnosis information including the advice information. For example, the diagnosis information generation unit **202** may compare the exercise information regarding the player **2** to the determination table stored in the storage unit **220** or the recording medium **230** and generate the advice information based on a comparison result. For example, the above-described determination table includes advice text information as a part of the diagnosis text information. Thus, the diagnosis information generation unit **202** may specify a numerical range including an actually measured numerical value in each item included in the exercise information regarding the player **2** in the determination table, select the advice text information associated with the numerical range (process the text information as necessary), and generate advice information including the text information. For example, the diagnosis information generation unit **202** may generate the advice information separately in the plurality of states ("swim", "transition **1**", "bike", "transition **2**", and "run").

[0167] The diagnosis information generation unit **202** may generate a trend graph of at least a part of the exercise information regarding the player **2**, a course map, and attachment information such as the comparison result between the selected player **2** and the other players **2** and may generate diagnosis information including the attachment information along with the diagnosis result or the advice information. For example, the diagnosis information generation unit **202** can generate the trend graph by reading and plotting at least a part of the exercise information regarding the player **2** in a temporal order from the storage unit **220** or the recording medium **230** and can generate diagnosis information including the trend graph. For example, the diagnosis information generation unit **202** can read map information regarding a course from the storage unit **220** or the recording medium **230** and can generate diagnosis information including the map information. For example, the diagnosis information generation unit **202** can select another player **2** to be compared to the selected player **2** in response to a request from the information device **8**, can compare the selected player **2** to the other player **2** in at least a part of the exercise information, and can generate the diagnosis information including a comparison result.

[0168] FIG. **8** is a flowchart illustrating an example of a procedure of some processes (diagnosis information generation process) performed by the processing unit **200** of the exercise diagnosis device **4**. The processing unit **200** of the exercise diagnosis device **4** performs the diagnosis information generation process (exercise diagnosis method) in the procedure of the flowchart in FIG. **8** by executing the diagnosis information generation program **231** stored in the recording medium **230** or the storage unit **220**.

[0169] As illustrated in FIG. **8**, when the communication unit **210** receives the exercise information regarding the player **2** from any player terminal **3** (Y in step S**20**), the processing unit **200** first acquires the exercise information received by the communication unit **210** and stores the acquired exercise information in association with the identification information regarding the player terminal **3** (or the identification information regarding the player **2** carrying the player terminal **3**) in the storage unit **220** or the recording medium **230** (step S**22**). Conversely, when the communication unit **210** does not receive the exercise information regarding the player **2** from any player terminal **3** (N in step S**20**), the processing unit **200** does not perform the process of step S**22**.

[0170] Subsequently, when the communication unit **210** receives the selection information from the information device **8** (Y in step S**24**), the processing unit **200** acquires the selection information received by the communication unit **210** and selects the player **2** who is a target for which the diagnosis information is generated based on the acquired selection information (step S**26**). Conversely, when the communication unit **210** does not receive the selection

information from the information device **8** (N in step S**24**), the processing unit **200** does not perform the process of step S**26**.

[0171] Subsequently, when the communication unit **210** receives a request for transmitting the diagnosis information (a signal requesting transmission of the diagnosis information) from the information device **8** (Y in step S**28**), the processing unit **200** acquires the transmission request received by the communication unit **210**, generates the diagnosis information related to the player **2** selected in step S**26** based on the acquired transmission request, and transmits the generated diagnosis information to the information device **8** (step S**30**).

[0172] Conversely, when the communication unit **210** does not receive the request for transmitting the diagnosis information from the information device **8** (N in step S**28**), the processing unit **200** does not perform the process of step S**30**. Then, the processing unit **200** repeatedly performs the processes after steps S**20** to S**30**.

[0173] Then, for example, the diagnosis information transmitted to the information device **8** in step S**30** is displayed on the display unit of the information device **8**.

[0174] The transmission of the selection information from the information device **8** to the exercise diagnosis device **4** and the request for transmitting the diagnosis information may be performed while the player **2** is executing the triathlon or may be performed after the player **2** ends the triathlon.

[0175] When the exercise diagnosis device **4** includes a connection unit to a display unit, a sound output unit, or a printer, the flowchart of FIG. **8** may include a step of causing the processing unit **200** to output (display, print, or the like) the diagnosis information as an image or output the diagnosis information as a sound.

1-4. Display Example of Diagnosis Information

[0176] FIG. **9** is a diagram illustrating an example of an image including the diagnosis information displayed on the display unit of the information device **8**. An image **400** illustrated in FIG. **9** includes, as the diagnosis information, a diagnosis table **401** in which a plurality of data items related to the selected player **2** are arranged in the row direction, a plurality of states of the player **2** are arranged in the horizontal direction, and a diagnosis result is written in each field corresponding to a combination of each data item and each state. In the diagnosis table **401**, the plurality of data items related to the player **2** are, for example, "total evaluation", "time", "pace and speed", "trajectory", "distance", "pulse rate and heart rate", "pitch", "stride" "bike cadence", "swim stroke", "trajectory of wrist of stroke", "right and left balance", and "wave movement". In the diagnosis table **401**, the plurality of states of the player **2** are "swim", "transition **1**", "bike", "transition **2**", and "run".

[0177] In the diagnosis table **401**, objects OB**1**, OB**2**, OB**3**, OB**4**, and OB**5** are provided below the display fields of the states "swim", "transition **1**", "bike", "transition **2**", and "run" in display fields. The object OB**1** is a figure recalling that the player **2** is swimming. The object OB**2** is a figure recalling that the player **2** is transitioning from the swim to the bike. The object OB**3** is a figure recalling that the player **2** is biking. The object OB**4** is a figure recalling that the player **2** is transitioning from the bike to the run. The object OB**5** is a figure recalling that the player **2** is running.

[0178] When the user of the information device **8** performs an operation of selecting each field in which a diagnosis result is written, information related to the diagnosis result is displayed.

[0179] FIG. **10** is an extended diagram illustrating a column corresponding to the state "swim" of the diagnosis table **401** illustrated in FIG. **9** and illustrates a diagnosis result of each data item in the state "swim" of the player **2**. As illustrated in FIG. **10**, an evaluation "B" which is the second highest among five step evaluations A, B, C, D, and E is written as a diagnosis result of "total evaluation". As a diagnosis result of "time", information "Reason why time is improved is that player can smoothly swim near buoys herein." is written. As a diagnosis result of "pace and speed", information "Since swim pace slows down in last half, be careful about physical strength distribution. Reflect pace making use of wave and tidal directions. Since pace is not stable, repeat reciprocation training in pool to enhance physical fitness." is written. As a diagnosis result of"trajectory", information "You swim efficiently in shortest distance near buoys without circulation. Here, take course of professional player and take line." is written. As a diagnosis result of "distance", information "Swimming distance is shorter than in previous time and thus you swim efficiently in shortest distance near buoys without circulation." is written. As a diagnosis result of "pulse rate and heart rate", information "Manage pace so that pulse rate is constant during swim." is written. As a diagnosis result of "swim stroke", information "Stroke hands more slowly." is written. As a diagnosis result of "trajectory of wrist of stroke", information "Stroke wrists more deeply." is written. As a diagnosis result of "right and left balance", information "Swim straight by stroking right and left arms with same strength." is written. As a diagnosis result of "wave movement", information "Be careful about wave movement from offing in sea course." is written. Since "pitch", "stride", and "bike cadence" are the data items irrelevant to "swim", no diagnosis results are written. The information indicating the diagnosis results of "time", "pace and speed", "pulse rate and heart rate", "swim stroke", "trajectory of wrist of stroke", "right and left balance", and "wave movement" includes advice information for the player **2**.

[0180] FIG. **11** is an enlarged diagram illustrating a column corresponding to the state "transition **1**" of the diagnosis table **401** illustrated in FIG. **9** and illustrates a diagnosis result of each data item in the state "transition **1**" of the player **2**. As illustrated in FIG. **11**, an evaluation "C" which is the third highest among five step evaluations A, B, C, D, and E is written as a diagnosis result of "total evaluation". As a diagnosis result of "time", information "Cloth changing time: be careful that changing time of transition **2** is shorter." is written. As a diagnosis result of "pulse rate and heart rate", information "During transition after swim, take deep breath to make heart rate stable." is written. Since "pace and speed", "trajectory", "distance", "pitch", "stride", "bike cadence", "swim stroke", "trajectory of wrist of stroke", "right and left balance", and "wave movement" are the data items irrelevant to "transition **1**", no diagnosis results are written. The information indicating the diagnosis results of "time" and "pulse rate and heart rate" includes advice information for the player **2**.

[0181] FIG. **12** is an enlarged diagram illustrating a column corresponding to the state "bike" of the diagnosis table **401** illustrated in FIG. **9** and illustrates a diagnosis result of

each data item in the state "bike" of the player **2**. As illustrated in FIG. **12**, an evaluation "A" which is the highest among five step evaluations A, B, C, D, and E is written as a diagnosis result of "total evaluation". As a diagnosis result of "time", information "Reason why time is improved is that player can bike in this region more smoothly than in previous time." is written. As a diagnosis result of "pace and speed", information "Make use of wind direction to reflect in speed. Since wind is strong in this region, hold group driving (drafting). Since professional player is absolutely faster in this region, refer to this." is written. As a diagnosis result of "trajectory", information "In this sharp curve, minor collision easily occurs, and thus keep group driving strictly. This sharp curve is a main point which makes professional player feel fatigue. Take course of professional player and take line here." is written. As a diagnosis result of "distance", information "Compared to professional player, difference in distance is small and driving is stable." is written. As a diagnosis result of "pulse rate and heart rate", information "Distribute physical strength for next run so that pulse rate is 150 or less during bike." is written. As a diagnosis result of "bike cadence", information "Manage cadence so that pulse rate is 150 or less." is written. As a diagnosis result of "right and left balance", information "Make cadences of right and left legs with same strength so that loads are evenly applied to pedals." is written. Since "pitch", "stride", "swim stroke", "trajectory of wrist of stroke" and "wave movement" are the data items irrelevant to "bike", no diagnosis results are written. The information indicating the diagnosis results of "pace and speed", "trajectory". "pulse rate and heart rate", "bike cadence", and "right and left balance" includes advice information for the player **2**.

[0182] FIG. **13** is an enlarged diagram illustrating a column corresponding to the state "transition **2**" of the diagnosis table **401** illustrated in FIG. **9** and illustrates a diagnosis result of each data item in the state "transition **2**" of the player **2**. As illustrated in FIG. **13**, an evaluation "A" which is the highest among five step evaluations A, B, C, D, and E is written as a diagnosis result of "total evaluation". As a diagnosis result of "time", information "Cloth changing time: feed back later since time is shorter than in transition **1**. Make reference since transition time of professional player is about ½." is written. As a diagnosis result of"pulse rate and heart rate", information "Heart rate is stable even during transition, and thus maintain this state." is written. Since "pace and speed", "trajectory", "distance", "pitch", "stride", "bike cadence", "swim stroke". "trajectory of wrist of stroke", "right and left balance", and "wave movement" are the data items irrelevant to "transition **2**", no diagnosis results are written. The information indicating the diagnosis results of "time" and "pulse rate and heart rate" includes advice information for the player **2**.

[0183] FIG. **14** is an enlarged diagram illustrating a column corresponding to the state "run" of the diagnosis table **401** illustrated in FIG. **9** and illustrates a diagnosis result of each data item in the state "run" of the player **2**. As illustrated in FIG. **14**, an evaluation "C" which is the intermediate highest among five step evaluations A, B, C, D, and E is written as a diagnosis result of "total evaluation". As a diagnosis result of "time", information "Reason why time is not improved is that transition in heart rate value is unstable in this region than in previous time." is written. As a diagnosis result of "pace and speed", information "Since physical strength for run is stored after bike, pace is stable. Make use of wind direction to reflect in pace. Since you have good match with professional player, maintain this pace." is written. As a diagnosis result of "trajectory", information "In this curve, do not take unnecessary course. Professional player puts on last spurt in this position." is written. As a diagnosis result of "distance", information "It seems that there is difference in distance, compared to professional player. Thus, be careful so that waste does not occur in curve." is written. As a diagnosis result of "pulse rate and heart rate", information "Suppress heart rate to about 160 to prepare uphill ground in last half and preserve physical strength." is written. As a diagnosis result of "pitch", information "Near summit in last half, physical strength is lost and pitch is down." is written. As a diagnosis result of "stride", information "Since stride is stable even last half of race, maintain this state." is written. As a diagnosis result of"right and left balance", information "H-lave kicks of right and left legs with same strength so that loads are evenly applied." is written. Since "bike cadence", "swim stroke", "trajectory of wrist of stroke" and "wave movement" are the data items irrelevant to "run", no diagnosis results are written. The information indicating the diagnosis results of "pace and speed", "trajectory", "distance", "pulse rate and heart rate", "stride", and "right and left balance" includes advice information for the player **2**.

[0184] FIGS. **15** to **18** are diagrams illustrating other examples of images displayed on the display unit of the information device **8**. An image **500** illustrated in FIG. **15** includes a trend graph that shows an average pace, an altitude, and a heart rate over time presented by the horizontal axis and information regarding diagnosis results of an elapsed time Ttran**1** (62 seconds) of transition **1**, an elapsed time Ttran**2** (44 seconds) of transition **2**, and "time" of "transition **1**" or "transition **2**". The image **500** illustrated in FIG. **15** is displayed, for example, when the user performs an operation of selecting any of the display fields indicating the diagnosis results of "pace and speed" and "pulse rate and heart rate" in the states "swim", "bike", and "run" in the image **400** illustrated in FIG. **9** or an operation of selecting any of the display fields indicating the diagnosis result of "time" in the states "transition **1**" and "transition **2**".

[0185] An image **600** illustrated in FIG. **16** includes a trend graph that shows an average pace, an altitude, and a pitch over time represented by the horizontal axis and information regarding a diagnosis result of "pace and speed" of "swim" or "run". The image **600** illustrated in FIG. **16** is displayed, for example, when the user performs an operation of selecting any of the display fields indicating the diagnosis results of "pace and speed" and "pitch" in the states "swim", "bike", and "run" in the image **400** illustrated in FIG. **9**.

[0186] An image **700** illustrated in FIG. **17** includes information of a movement trajectory of a player A (for example, the selected player **2**) and a movement trajectory of a player B (for example, a professional player). The image **700** illustrated in FIG. **17** is displayed, for example, when the user performs an operation of selecting any of the display fields indicating the diagnosis results of "trajectory" in the states "swim", "bike", and "run" in the image **400** illustrated in FIG. **9**.

[0187] An image **800** illustrated in FIG. **18** includes a course used in the triathlon and information regarding the diagnosis results of"trajectory" or "pace and speed" of"bike". The image **800** illustrated in FIG. **18** is displayed,

for example, when the user performs an operation of selecting any of the display fields indicating the diagnosis results of "pace and speed" and "trajectory" in the state "bike" in the image **400** illustrated in FIG. **9**.

[0188] The user of the information device **8** can recognize the diagnosis results and the advice of the exercise of the player **2** and comparison results or the like of the exercise information to the professional player from the images illustrated in FIGS. **9** to **18** and can examine strategies and effective training methods necessary for the player **2** to improve results of the triathlon.

1-5. Operational Effects

[0189] As described above, in the exercise diagnosis system **1** according to the embodiment, each player terminal **3** automatically determines the plurality of states, "swim", "transition **1**", "bike", "transition **2**", and "run" of each player **2**, generates the exercise information including the determined states, and transmits the exercise information to the exercise diagnosis device **4**. The exercise diagnosis device **4** receives and stores the exercise information regarding each player **2** transmitted from each player terminal **3**, diagnoses the exercise of the selected player **2** based on the selection information from the information device **8** in response to the transmission request from the information device **8**, generates the diagnosis information related to the diagnosis, and transmits the diagnosis information to the information device **8**. The information device **8** displays an image including the diagnosis information transmitted from the exercise diagnosis device **4** on the display unit. Accordingly, in the exercise diagnosis system **1** according to the embodiment, the exercise of the player **2** can be diagnosed in consideration of the states of the player **2**, "swim", "transition **1**", "bike", "transition **2**", and "run" in the triathlon and the diagnosis results can be displayed on the display unit of the information device **8**.

[0190] In the exercise diagnosis system **1** according to the embodiment, the exercise diagnosis device **4** generates the advice information for improving the exercise of the player **2** based on the diagnosis of the exercise of the selected player **2**, generates the diagnosis information including the advice information, and transmits the diagnosis information to the information device **8**. Accordingly, in the exercise diagnosis system **1** according to the embodiment, the appropriate advice can be supplied according to the diagnosis result of the exercise of the player **2** in consideration of the states of the player **2**, "swim", "transition **1**", "bike", "transition **2**", and "run" in the triathlon.

[0191] In the exercise diagnosis system **1** according to the embodiment, the exercise diagnosis device **4** diagnoses the exercise of the selected player **2** and generates the advice information in each of the determined states of the player **2**. Accordingly, in the exercise diagnosis system **1** according to the embodiment, the appropriate diagnosis result and advice can be supplied in each of the states of the player **2** "swim", "transition **1**", "bike", "transition **2**", and "run".

[0192] Further, in the exercise diagnosis system **1** according to the embodiment, each of the plurality of player terminals **3** automatically determines the states of each player **2**. Therefore, when the game event switches from the swim to the bike or switches from the bike to the run, manual work is not necessary, and thus each player **2** can focus on the triathlon.

2. Modification Examples

[0193] The invention is not limited to the embodiment, but various modifications can be made within a range of the gist of the invention. Hereinafter, modification examples will be described. The same reference numerals are given to the same configurations as those of the foregoing embodiment and the description thereof will be omitted.

[0194] For example, in the foregoing embodiment, the processing unit **200** of the exercise diagnosis device **4** diagnoses the exercise of the player **2**, generates the diagnosis information, and transmits the generated diagnosis information to the information device **8**, but the information device **8** may generate the diagnosis information. For example, the exercise diagnosis device **4** may be replaced with a data collection device receiving the exercise information regarding the player **2** from the player terminal **3** and stores the exercise information in the storage unit **140**, and the processing unit **300** of the information device **8** may acquire the exercise information regarding the player **2** via the data collection device from the player terminal **3** and generate the diagnosis information based on the exercise information. That is, the information device **8** may function as the exercise diagnosis device. The information device **8** may output the generated diagnosis information. For example, the information device **8** may output (display, print, or the like) the generated diagnosis information as an image and outputs the diagnosis information as a sound.

[0195] For example, the processing unit **100** of the player terminal **3** may perform a player **2** state determination process in a different procedure from the procedure of the state determination process (the swim determination process (step S**100**), the transition **1** determination process (step S**200**), the bike determination process (S**300**), the transition **2** determination process (step S**400**), and the run determination process (step S**500**)) illustrated in FIG. **6**.

[0196] In a first modification example of the player **2** state determination process, the processing unit **100** of the player terminal **3** performs a process of determining the plurality of states of the player **2**, "swim", "transition **1**", "bike", "transition **2**", and "run" based on positioning data (positional information) generated and output by the GPS sensor **110**, a signal output by the acceleration sensor **113** and a signal output by the pressure sensor **112**.

[0197] As illustrated in FIG. **19**, when the acceleration waveforms (the waveforms output by the acceleration sensor **113**) are regular (have periodicity) (Y in step S**111**), the movement speed obtained by differentiating the position of the player terminal **3** included in the positioning data of the GPS sensor **110** is about 3 km/h (Y in step S**112**), and the hydraulic pressure and the atmospheric pressure are detected based on the signals output by the pressure sensor **112** (Y in step S**113**) in the swim determination process (step S**100**) as in the embodiment, the processing unit **100** determines that the player **2** is swimming and changes the player **2** state from the negative state to "swim" (step S**114**).

[0198] In the transition **1**, since the player **2** changes clothes or the like, the motions of the arms of the player **2** are irregular (have no periodicity) and signals output by the acceleration sensor **113** are irregular (have no periodicity). The position of the player **2** is not substantially changed and the player nearly stops (the movement speed is zero). Further, since the arms of the player **2** are normally in the air, the pressure sensor **112** detects only the atmospheric pressure. Accordingly, as illustrated in FIG. **20**, when the accel-

eration waveforms (the waveforms output by the acceleration sensor **113**) are irregular (have no periodicity) (Y in step S**211**), the movement speed of the player terminal **3** is nearly zero (the player nearly stops) (Y in step S**212**), and only the atmospheric pressure is detected based on the signal output by the pressure sensor **112** (no hydraulic pressure is detected) (Y in step S**213**) in the transition **1** determination process (step S**200**), the processing unit **100** determines that the player **2** is in the transition **1** state and changes the player **2** state from "swim" to "transition **1**" (step S**214**). The processing unit **100** may determine that the acceleration waveforms are irregular when a period at which a voltage of a signal output by the acceleration sensor **113** matches the threshold Vt**2** is not substantially constant (within a predetermined range) for a predetermined time or a state in which the voltage is less than the threshold Vt**2** continues for the predetermined time. The threshold Vt**2** may be appropriately determined. The processing unit **100** may determine that only the atmospheric pressure is detected when a state in which a pressure applied to the player terminal **3** and calculated using a signal output by the pressure sensor **112** is less than the threshold Pt**2** continues for the predetermined time. The threshold Pt**2** may be appropriately determined.

[0199] In the bike, since the motions of the arms of the player **2** are irregular (have no periodicity), the waveforms of the signals output by the acceleration sensor **113** are irregular (have no periodicity). A speed (movement speed) at which the player **2** is biking is equal to or greater than a predetermined speed (for example, 20 km/h). Since the player **2** moves against wind, the pressure sensor **112** detects a wind pressure. Accordingly, as illustrated in FIG. **21**, when the acceleration waveforms (the waveforms output by the acceleration sensor **113**) are irregular (have no periodicity) (Y in step S**311**), the movement speed of the player terminal **3** is equal to or greater than 20 km/h (Y in step S**312**), and a wind pressure is detected based on a signal output by the pressure sensor **112** (Y in step S**313**) in the bike determination process (step S**300**), the processing unit **100** determines that the player **2** is biking and changes the player **2** state from "transition **1**" to "bike" (step S**314**).

[0200] In the transition **2**, since the player **2** is changing clothes or the like, the motions of the arms of the player **2** are irregular (have no periodicity) and the waveforms of the signals output by the acceleration sensor **113** are irregular (have no periodicity). The position of the player **2** is not substantially changed and the player **2** nearly stops (a movement speed is zero). Further, since the arms of the player **2** are in the air, the pressure sensor **112** detects only the atmospheric pressure. Accordingly, as illustrated in FIG. **22**, when the acceleration waveforms (the waveforms output by the acceleration sensor **113**) are irregular (have no periodicity) (Y in step S**411**), the movement speed of the player terminal **3** is nearly zero (the player nearly stops) (Y in step S**412**), and only the atmospheric pressure is detected based on the signal output by the pressure sensor **112** (no hydraulic pressure is detected) (Y in step S**413**) in the transition **2** determination process (step S**400**), the processing unit **100** determines that the player **2** is in the transition **2** state and changes the player **2** state from "bike" to "transition **2**" (step S**414**).

[0201] In the run, since the arm swinging of the player **2** is regular (has periodicity), the waveforms of the signals output by the acceleration sensor **113** are regular (have periodicity). A speed (movement speed) at which the player **2** is running is within a predetermined speed range (for example, 8 km/h to 20 km/h). Further, since the arms of the player **2** are normally in the air, the pressure sensor **112** detects only the atmospheric pressure. Accordingly, as illustrated in FIG. **23**, when the acceleration waves (the waveforms output by the acceleration sensor **113**) are regular (have periodicity) (Y in step S**511**), the movement speed of the player terminal **3** is within the range of 8 km/h to 20 km/h (Y in step S**512**), and only the atmospheric pressure is detected based on the signal output by the pressure sensor **112** (no hydraulic pressure is detected) (Y in step S**513**) in the run determination process (step S**500**), the processing unit **100** determines that the player **2** is running and changes the player **2** state from "transition **2**" to "run" (step S**514**).

[0202] In a second modification example of the player **2** state determination process, the processing unit **100** of the player terminal **3** performs a process of determining the plurality of states of the player **2**, "swim", "transition **1**", "bike", "transition **2**", and "run" based on the positioning data (positional information) generated and output by the GPS sensor **110**, at least one of the signal output by the acceleration sensor **113** and the signal output by the pressure sensor **112**, and at least one of the signal output by the angular velocity sensor **114** and the signal output by the temperature sensor **116**.

[0203] In the swim, the strokes of the arms of the player **2** are regular (have periodicity), a speed at which the player **2** is swimming is within a predetermined speed range (for example, about 3 km/h), and a state in which the arms of the player **2** are in the air and a state in which the arms are in the water are alternately repeated. Accordingly, as illustrated in FIG. **24**, the processing unit **100** first resets a count value of a counter (not illustrated) to 0 in the swim determination process (step S**100**) (step S**121**). Subsequently, when the acceleration waveforms (the waveforms output by the acceleration sensor **113**) are regular (have periodicity) (Y in S**122**), the processing unit **100** increases the count value by 1 (step S**123**). Then, when the movement speed obtained by differentiating the position of the player terminal **3** included in positioning data measured by the GPS sensor **110** is about 3 km/h (Y in step S**124**), the processing unit **100** increases the count value by 1 (step S**125**). When the hydraulic pressure and the atmospheric pressure are detected based on a signal output by the pressure sensor **112** (Y in step S**126**), the processing unit **100** increases the count value by 1 (step S**127**). When angular velocity waveforms (waveforms output by the angular velocity sensor **114**) are regular (have periodicity) (Y in step S**128**), the processing unit **100** increases the count value by 1 (step S**129**). When a period at which a voltage of a signal output by the angular velocity sensor **114** matches a threshold Vt**3** is substantially constant (within a predetermined range) for a predetermined time, the processing unit **100** may determine that the angular velocity waveforms are regular. The threshold Vt**3** may be appropriately determined. When a water temperature is detected based on a signal output by the temperature sensor **116** (Y in step S**130**), the processing unit **100** increases the count value by 1 (step S**131**). Then, when the count value is less than 3 (N in step S**132**), the processing unit **100** performs the process subsequent to step S**121** again. When the count value is equal to or greater than 3 (Y in step S**132**), the processing unit **100** determines that the player **2** is swimming and changes the player **2** state from a negative state to "swim" (step S**133**). In the flowchart of FIG. **24**, the

determination sequence of steps S122, S124, S126, S128, and S130 may be appropriately changed.

[0204] In the transition 1, since the player 2 is changing clothes or the like, the motions of the arms of the player 2 are irregular (have no periodicity), the position of the player 2 is not substantially changed, and the arms of the player 2 are normally in the air. Accordingly, as illustrated in FIG. 25, the processing unit 100 first resets the count value of the counter (not illustrated) to 0 in the transition 1 determination process (step S200) (step S221). Subsequently, when the acceleration waveforms (the waveforms output by the acceleration sensor 113) are irregular (have no periodicity) (Y in S222), the processing unit 100 increases the count value by 1 (step S223). Then, when the movement speed of the player terminal 3 is nearly zero (the player nearly stops) (Y in step S224), the processing unit 100 increases the count value by 1 (step S225). When only the atmospheric pressure is detected based on a signal output by the pressure sensor 112 (no hydraulic pressure is detected) (Y in step S226), the processing unit 100 increases the count value by 1 (step S227). When angular velocity waveforms (waveforms output by the angular velocity sensor 114) are irregular (have no periodicity) (Y in step S228), the processing unit 100 increases the count value by 1 (step S229). When a period at which a voltage of a signal output by the angular velocity sensor 114 matches a threshold Vt4 is not substantially constant (within a predetermined range) for a predetermined time or a state in which the voltage is less than the threshold Vt4 continuous for a predetermined time, the processing unit 100 may determine that the angular velocity waveforms are irregular. The threshold Vt4 may be appropriately determined. When a temperature and a body temperature of the player 2 are detected based on signals output by the temperature sensor 116 (Y in step S230), the processing unit 100 increases the count value by 1 (step S231). Then, when the count value is less than 3 (N in step S232), the processing unit 100 performs the processes subsequent to step S221 again. When the count value is equal to or greater than 3 (Y in step S232), the processing unit 100 determines that the player 2 is in the transition 1 state and changes the player 2 state from "swim" to "transition 1" (step S233). In the flowchart of FIG. 25, the determination sequence of steps S222, S224, S226, S228, and S230 may be appropriately changed.

[0205] In the bike, the motions of the arms of the player 2 are irregular (have no periodicity), a speed at which the player 2 is biking is equal to or greater than a predetermined speed (for example, 20 km/h), the player 2 moves against wind, and the arms of the player 2 are normally in the air. Accordingly, as illustrated in FIG. 26, the processing unit 100 first resets the count value of the counter (not illustrated) to 0 in the bike determination process (step S300) (step S321). Subsequently, when the acceleration waveforms (the waveforms output by the acceleration sensor 113) are irregular (have no periodicity) (Y in S322), the processing unit 100 increases the count value by 1 (step S323). Then, when the movement speed of the player terminal 3 is equal to or greater than 20 km/h (Y in step S324), the processing unit 100 increases the count value by 1 (step S325). When the wind pressure is detected based on a signal output by the pressure sensor 112 (Y in step S326), the processing unit 100 increases the count value by 1 (step S327). When angular velocity waveforms (waveforms output by the angular velocity sensor 114) are irregular (have no periodicity) (Y in step S328), the processing unit 100 increases the count value by 1 (step S329). When a temperature and a body temperature of the player 2 are detected based on signals output by the temperature sensor 116 (Y in step S330), the processing unit 100 increases the count value by 1 (step S331). Then, when the count value is less than 3 (N in step S332), the processing unit 100 performs the process subsequent to step S321 again. When the count value is equal to or greater than 3 (Y in step S332), the processing unit 100 determines that the player 2 is biking and changes the player 2 state from "transition 1" to "bike" (step S333). In the flowchart of FIG. 26, the determination sequence of steps S322, S324, S326, S328, and S330 may be appropriately changed.

[0206] In the transition 2, since the player 2 is changing clothes or the like, the motions of the arms of the player 2 are irregular (have no periodicity), the position of the player 2 is not substantially changed, and the arms of the player 2 are normally in the air. Accordingly, as illustrated in FIG. 27, the processing unit 100 first resets the count value of the counter (not illustrated) to 0 in the transition 2 determination process (step S400) (step S421). Subsequently, when the acceleration waveforms (the waveforms output by the acceleration sensor 113) are irregular (have no periodicity) (Y in S422), the processing unit 100 increases the count value by 1 (step S423). Then, when the movement speed of the player terminal 3 is nearly zero (the player nearly stops) (Y in step S424), the processing unit 100 increases the count value by 1 (step S425). When only the atmospheric pressure is detected based on a signal output by the pressure sensor 112 (no hydraulic pressure is detected) (Y in step S426), the processing unit 100 increases the count value by 1 (step S427). When angular velocity waveforms (waveforms output by the angular velocity sensor 114) are irregular (have no periodicity) (Y in step S428), the processing unit 100 increases the count value by 1 (step S429). When a temperature and a body temperature of the player 2 are detected based on signals output by the temperature sensor 116 (Y in step S430), the processing unit 100 increases the count value by 1 (step S431). Then, when the count value is less than 3 (N in step S432), the processing unit 100 performs the process subsequent to step S421 again. When the count value is equal to or greater than 3 (Y in step S432), the processing unit 100 determines that the player 2 is in the transition 2 state and changes the player 2 state from "bike" to "transition 2" (step S433). In the flowchart of FIG. 27, the determination sequence of steps S422, S424, S426, S428, and S430 may be appropriately changed.

[0207] In the run, the arm swinging of the player 2 is regular (has periodicity), a speed at which the player 2 is running is within a predetermined speed range (for example, about 8 km/h to 20 km/h), and the arms of the player 2 are normally in the air. Accordingly, as illustrated in FIG. 28, the processing unit 100 first resets a count value of the counter (not illustrated) to 0 in the run determination process (step S500) (step S521). Subsequently, when the acceleration waveforms (the waveforms output by the acceleration sensor 113) are regular (have periodicity) (Y in S522), the processing unit 100 increases the count value by 1 (step S523). Then, when the movement speed of the player terminal 3 is within the range of 8 km/h to 20 km/h (Y in step S524), the processing unit 100 increases the count value by 1 (step S525). When only the atmospheric pressure is detected based on a signal output by the pressure sensor 112 (no hydraulic pressure is detected) (Y in step S526), the pro-

cessing unit **100** increases the count value by 1 (step S**527**). When angular velocity waveforms (waveforms output by the angular velocity sensor **114**) are regular (have periodicity) (Y in step S**528**), the processing unit **100** increases the count value by 1 (step S**529**). When a temperature and a body temperature of the player **2** are detected based on signals output by the temperature sensor **116** (Y in step S**530**), the processing unit **100** increases the count value by 1 (step S**531**). Then, when the count value is less than 3 (N in step S**532**), the processing unit **100** performs the process subsequent to step S**521** again. When the count value is equal to or greater than 3 (Y in step S**532**), the processing unit **100** determines that the player **2** is running and changes the player **2** state from "transition **2**" to "run" (step S**533**). In the flowchart of FIG. **28**, the determination sequence of steps S**522**, S**524**, S**526**, S**528**, and S**530** may be appropriately changed.

[0208] In a third modification example of the player **2** state determination process, as illustrated in FIG. **29**, before the player **2** starts the triathlon, the player **2** registers the goal point G**1** of the swim or a position P**1** (first position) near the goal point G**1**, the start point S**2** of the bike or a position P**2** (second position) near the start point S**2**, the goal point G**2** of the bike or a position P**3** (third position) near the goal point G**2**, and the start point S**3** of the run or a position P**4** (fourth position) near the start point S**3** in the storage unit **140** of the player terminal **3** in advance. The player **2** may actually go to the goal point G**1** of the swim, the start point S**2** of the bike, the goal point G**2** of the bike, and the start point S**3** of the run and operates the operation unit **120** of the player terminal **3** to register the positions (latitude and longitude) of the current locations as the positions P**1**, P**2**, P**3**, and P**4** in the storage unit **140**. Alternatively, the player **2** may select positions corresponding to the goal point G**1** of the swim, the start point S**2** of the bike, the goal point G**2** of the bike, and the start point S**3** of the run on map data of an area of the triathlon with the information terminal **5** and the player terminal **3** may receive information regarding the selected positions (latitude and longitude) via the communication unit **170** to register the selected positions as the positions P**1**, P**2**, P**3**, and P**4** in the storage unit **140**. Then, the processing unit **100** of the player terminal **3** determines five states of the player **2**, "swim", "transition **1**", "bike", "transition **2**", and "run" based on the positional information obtained based on satellite signals transmitted from the GPS satellite **7** and the positions P**1**, P**2**, P**3**, and P**4** registered in advance.

[0209] FIG. **30** is a flowchart illustrating a detailed example of a state determination process according to the third modification example. As illustrated in FIG. **30**, the processing unit **100** first sets the player **2** state to "swim" (step S**600**). Subsequently, the processing unit **100** acquires positioning data (positional information) from the GPS sensor **110** (step S**602**) and determines whether a distance between the position of the player **2** and the position P**1** is equal to or less than a threshold based on the acquired positional information and the registered position P**1** (step S**604**). The threshold may be appropriately determined. When the distance between the position of the player **2** and the position P**1** is not equal to or less than the threshold (N in step S**604**), the processing unit **100** performs the processes of steps S**602** and S**604** again. Conversely, when the distance between the position of the player **2** and the position **1** is equal to or less than the threshold (Y in step S**604**), the processing unit **100** changes the player **2** state from "swim" to "transition **1**" (step S**606**). Subsequently, the processing unit **100** acquires positioning data (positional information) from the GPS sensor **110** (step S**608**) and determines whether a distance between the position of the player **2** and the position P**2** is equal to or less than the threshold based on the acquired positional information and the registered position P**2** (step S**610**). When the distance between the position of the player **2** and the position P**2** is not equal to or less than the threshold (N in step S**610**), the processing unit **100** performs the processes of steps S**608** and S**610** again. Conversely, when the distance between the position of the player **2** and the position P**2** is equal to or less than the threshold (Y in step S**610**), the processing unit **100** changes the player **2** state from "transition **1**" to "bike" (step S**612**). Subsequently, the processing unit **100** acquires positioning data (positional information) from the GPS sensor **110** (step S**614**) and determines whether a distance between the position of the player **2** and the position P**3** is equal to or less than the threshold based on the acquired positional information and the registered position P**3** (step S**616**). When the distance between the position of the player **2** and the position P**3** is not equal to or less than the threshold (N in step S**616**), the processing unit **100** performs the processes of steps S**614** and S**616** again. Conversely, when the distance between the position of the player **2** and the position P**3** is equal to or less than the threshold (Y in step S**616**), the processing unit **100** changes the player **2** state from "bike" to "transition **2**" (step S**618**). Subsequently, the processing unit **100** acquires positioning data (positional information) from the GPS sensor **110** (step S**620**) and determines whether a distance between the position of the player **2** and the position P**4** is equal to or less than the threshold based on the acquired positional information and the registered position P**4** (step S**622**). When the distance between the position of the player **2** and the position P**4** is not equal to or less than the threshold (N in step S**622**), the processing unit **100** performs the processes of steps S**620** and S**622** again. Conversely, when the distance between the position of the player **2** and the position P**4** is equal to or less than the threshold (Y in step S**622**), the processing unit **100** changes the player **2** state from "transition **2**" to "run" (step S**624**).

[0210] For example, the exercise diagnosis system **1** according to the foregoing embodiment diagnoses the exercise of the player **2** of the triathlon. However, the exercise diagnosis system **1** may also diagnose an exercise of the player **2** in any game including a plurality of game events such as winter triathlon (snow run=>snow bike=>cross country ski), duathlon (first run=>bike=>second run), or aquathlon (run=>swim or first run=>swim=>second run), biathlon (cross country ski=>rifle shooting). For example, in a winter triathlon, the processing unit **100** of the player terminal **3** can apply the above-described run determination process to determination of whether the player **2** is executing a snow run. The above-described bike determination process can be applied to determination of whether the player **2** is executing a snow bike. The above-described transition **1** determination process can be applied to transition of the player **2** from the snow run to the snow bike and the above-described transition **2** determination process can be applied to transition of the player **2** from the snow bike to a cross country. In general, in cross country ski, the player **2** pokes the ground with a stock in an uphill ground or a flat ground. Therefore, a waveform of a signal output by the

acceleration sensor **113** or a signal output by the angular velocity sensor **114** has a steep peak. Since a traveling speed (movement speed) of the player **2** is within a predetermined speed range (for example, 20 km/h or less) and the arms of the player **2** are normally in the air, the temperature sensor **116** detects temperature. In a downhill ground, a traveling speed (movement speed) of the player **2** is high (for example, 20 km/h or more) and an altitude continuously decreases. Therefore, coordinates indicating an altitude of positioning data (positional information) generated and output by the GPS sensor **110** or atmospheric pressure detected by the pressure sensor **112** continuously decreases and the arms of the player **2** are normally in the air, the temperature sensor **116** detects temperature. Accordingly, the processing unit **100** of the player terminal **3** can determine that the player **2** is executing cross country ski based on at least one of signals output by the GPS sensor **110**, the pressure sensor **112**, the acceleration sensor **113**, the angular velocity sensor **114**, and the temperature sensor **116**.

[0211] For example, in the foregoing embodiment, at least some of the various sensors (the GPS sensor **110**, the geomagnetic sensor **111**, the pressure sensor **112**, the acceleration sensor **113**, the angular velocity sensor **114**, the pulse rate sensor **115**, and the temperature sensor **116**) may not be integrated with the player terminal **3**.

[0212] For example, in the foregoing embodiment, some of the functions of the exercise diagnosis device **4** or the information terminal **5** may be mounted on the player terminal **3** and some of the functions of the player terminal **3** may be mounted on the exercise diagnosis device **4** or the information terminal **5**. For example, some of the functions of the exercise diagnosis device **4** may be mounted on the information device **8** or some of the functions of the information device **8** may be mounted on the exercise diagnosis device **4**.

[0213] For example, in the foregoing embodiment, functions of a known smartphone, for example, a camera function, a calling function, and a communication function may be mounted on the player terminal **3** or another sensing function (a humidity sensor or the like) may be mounted on the player terminal **3**. For example, the player terminal **3** can be configured not only with a wrist type electronic device but also with any of various types of electronic devices such as an earphone type electronic device, a ring type electronic device, a pendant type electronic device, an electronic device worn on a sports instrument, a smartphone, and a head-mounted display (HMD). The player terminal **3** may be mounted at a position at which an exercise situation of the player **2** can be analyzed or may be mounted not only on a wrist but also, for example, an arm, a waist, a breast, or a leg.

[0214] For example, in the foregoing embodiment, the player terminal **3** performs various processes using a satellite signal from a GPS satellite. However, a positioning satellite of Global Navigation Satellite System (GNSS) other than GPS or a satellite signal from a positioning satellite other than GNSS may be used. For example, satellite signals from one or two or more of satellite positioning systems such as Wide Area Augmentation System (WAAS), European Geostationary-Satellite Navigation Overlay Service (EGNOS), Quasi Zenith Satellite System (QZSS), GLObal NAvigation Satellite System (GLONASS), GALILEO, and BeiDou Navigation Satellite System (BeiDou) may be used.

[0215] The foregoing embodiments and modification examples are merely examples, but the invention is not limited thereto. For example, the embodiments and the modification examples can also be appropriately combined.

[0216] The invention includes substantially the same configurations (for example, configurations in which functions, methods, and results are the same or configurations in which objectives and effects are the same) as the configurations described in the embodiments. The invention includes configurations in which unsubstantial portions of the configurations described in the embodiment are replaced. The invention includes configurations in which the same operational effects as the configurations described above or configurations in which the same objectives can be achieved. The invention includes configurations in which known technologies are added to the configuration described in the embodiments.

What is claimed is:

1. An exercise diagnosis device comprising:

a communication unit that receives from an electronic device worn by an exerciser exercise information including data representing a plurality of exercise states of the exerciser determined based on a satellite signal transmitted from a positional information satellite and including a first exercise state in which the exerciser is performing a first exercise event and a second exercise state in which the exerciser is performing a second exercise event; and

a processing unit that diagnoses the performance of the exerciser based on the exercise information acquired by the communication unit and generates diagnosis information related to at least one of the plurality of exercise states.

2. The exercise diagnosis device according to claim **1**,

wherein the plurality of exercise states include a third exercise state in which the exerciser is performing a third exercise event.

3. The exercise diagnosis device according to claim **2**,

wherein the plurality of exercise states include a first transition state in which the exerciser transitions from the first exercise state to the second exercise state and a second transition state in which the exerciser transitions from the second exercise state to the third exercise state.

4. The exercise diagnosis device according to claim **2**,

wherein the first exercise event is swimming, the second exercise event is cycling, and the third exercise event is running.

5. The exercise diagnosis device according to claim **1**,

wherein the processing unit diagnoses the exercise of the exerciser separately in the plurality of exercise states, and

wherein the processing unit generates a plurality of pieces of diagnosis information corresponding to the plurality of exercise states.

6. The exercise diagnosis device according to claim **1**,

wherein the diagnosis information generated by the processing unit includes advice information for improving the performance of the exerciser.

7. The exercise diagnosis device according to claim **1**,

wherein the communication unit transmits the diagnosis information to an information device including a display unit.

8. An exercise diagnosis system comprising:
an electronic device configured to be worn on an exerciser;
an exercise diagnosis device; and
an information device,
wherein the electronic device includes
a first processing unit that generates exercise information including data representing a plurality of exercise states of the exerciser determined based on a satellite signal transmitted from a positional information satellite and including a first exercise state in which the exerciser performs a first exercise event and a second exercise state in which the exerciser performs a second exercise event, and
a transmission unit that transmits the exercise information to the information device,
wherein the information device includes
a first communication unit that transmits the exercise information to the exercise diagnosis device and requests the exercise diagnosis device to transmit diagnosis information generated by the exercise diagnosis device based on the exercise information, and
a display unit that displays the diagnosis information,
wherein the exercise diagnosis device includes
a second communication unit that acquires the exercise information from the information device, and
a second processing unit that diagnoses the performance of the exerciser based on the exercise information acquired by the second communication unit and generates the diagnosis information related to at least one of the plurality of exercise states, and
wherein the second communication unit transmits the diagnosis information to the information device in response to the request from the information device.

9. A computer-readable recording medium that stores a program causing a computer of an electronic device configured to be worn on an exerciser to:
acquire exercise information including data representing a plurality of exercise states determined based on a satellite signal transmitted from a positional information satellite and including a first exercise state in which the exerciser performs a first exercise event and a second exercise state in which the exerciser performs a second exercise event; and
diagnose the performance of the exerciser based on the exercise information and generating diagnosis information.

10. An exercise diagnosis method performed by a processing unit configured to perform data communication with an electronic device worn on a player, the method comprising:
receiving from the electronic device exercise information including data representing a plurality of exercise states determined based on a satellite signal transmitted from a positional information satellite and including a first exercise state in which an exerciser performs a first exercise event and a second exercise state in which the exerciser performs a second exercise event; and
diagnosing the performance of the exerciser based on the exercise information and generating diagnosis information related to at least one of the plurality of exercise states.

11. The exercise diagnosis method according to claim 10, wherein the plurality of exercise states include a third exercise state in which the exerciser performs a third exercise event.

12. The exercise diagnosis method according to claim 10, wherein the plurality of exercise states includes a first transition state in which the exerciser transitions from the first exercise state to the second exercise state and a second transition state in which the exerciser transitions from the second exercise state to the third exercise state.

13. The exercise diagnosis method according to claim 10, wherein the first exercise event is swimming, the second exercise event is cycling, and the third exercise event is running.

14. The exercise diagnosis method according to claim 10, wherein the generating of the diagnosis information includes
diagnosing the exercise of the exerciser separately in the plurality of exercise states, and
generating a plurality of pieces of diagnosis information corresponding to the plurality of exercise states.

15. The exercise diagnosis method according to claim 10, wherein the diagnosis information includes advice information corresponding to the plurality of exercise states.

16. The exercise diagnosis method according to claim 10, further comprising:
outputting the diagnosis information.

17. The exercise diagnosis method according to claim 10, further comprising:
transmitting the diagnosis information to an information device including a display unit.

18. A wrist-type electronic device to be worn on the wrist of an exerciser for determining the exercise state of the exerciser, comprising:
a sensor configured to sense a characteristic of the exerciser or the environment in which the exerciser exercises;
a processing unit that
determines the types of exercise performed by the exerciser based on data received from a satellite signal transmitted from a positional information satellite and a signal received from the sensor, and
generates exercise information including data representing the type of exercises performed by the exerciser; and
a transmission unit that transmits the exercise information to an information device configured to perform a notification operation about the exercise information.

19. An exercise evaluation device for evaluating the performance by an exerciser of each of multiple types of exercise, comprising:
a communication unit that receives signals from an electronic device worn by an exerciser representing exercise information, the electronic device including sensors configured to sense plural characteristics of the exerciser that change during exercise and a receiver that receives a satellite signal transmitted from a positional information satellite, the exercise information including
data representing a plurality of exercise states of the exerciser determined based on the satellite signal and including a first exercise state in which the exerciser is performing a first type of exercise and a second

exercise state in which the exerciser is performing a second type of exercise; and

data representing the sensed plural characteristics of the exerciser; and

a processing unit that evaluates the performance of the exerciser based on the exercise information acquired by the communication unit and generates evaluation information evaluating at least one of the plurality of exercise states.

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