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INFORMATION PROCESSING APPARATUS AND METHOD

Abstract

A controller includes at least one processor of an information processing apparatus acquires a number of standing passengers in a vehicle. The controller of the information processing apparatus determines whether to execute the detection process of passengers moving inside the vehicle based on analysis of a moving image capturing the inside of the vehicle according to the number of standing passengers. Then, the controller outputs announcement information for making an in-vehicle announcement regarding movement inside the vehicle when the detection process detects a standing passenger moving inside the vehicle.

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Background/Summary

CROSS REFERENCE TO THE RELATED APPLICATION

[0001] This application claims the benefit of Japanese Patent Application No. 2024-024396, filed on Feb. 21, 2024, which is hereby incorporated by reference herein in its entirety.

BACKGROUND

Technical Field

[0002] The present disclosure relates to an information processing apparatus and a method.

Description of the Related Art

[0003] Japanese Patent Application Laid-open No. 2022-94724 discloses a monitoring system. In the monitoring system, images taken of each compartment of multiple moving bodies are obtained. In the monitoring system, based on the obtained images, the amount of movement of passengers present in each compartment of the multiple moving bodies is acquired. In the monitoring system, based on the obtained movement amount, the priority indicating the necessity of monitoring the passengers is calculated. Then, in the monitoring system, the target for display to a display device that sequentially switches the images of each compartment of multiple moving bodies during the display switching period is determined based on the priority.

SUMMARY

[0004] This disclosure aims to suppress in-vehicle announcements for alerting passengers about movements inside the vehicle in unnecessary situations.

[0005] An information processing apparatus, according to the present disclosure, includes a controller comprising at least one processor configured to perform; [0006] acquiring a number of standing passengers in a vehicle, [0007] determining whether to execute the detection process of passengers moving inside the vehicle based on analysis of a moving image capturing the inside of the vehicle according to the number of standing passengers, and [0008] outputting announcement information for making an in-vehicle announcement regarding movement inside the vehicle when the detection process detects a standing passenger moving inside the vehicle.

[0009] This disclosure allows for the suppression of onboard announcements that alert passengers about moving within the vehicle in unnecessary situations.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. **1** is a diagram illustrating the outline structure of the monitoring system,

[0011] FIG. **2** demonstrates an example of a moving image taken by an in-vehicle camera, [0012] FIG. **3** is a block diagram schematically illustrating an example of the functional configuration of an in-vehicle device,

[0013] FIG. **4** is a flowchart of the first process, and [0014] FIG. **5** is a flowchart of the second process.

DESCRIPTION OF THE EMBODIMENTS

[0015] There are cases where a passenger inside the vehicle may fall while moving inside the vehicle. Therefore, when the movement of passengers inside the vehicle is detected, an in-vehicle announcement alerting the passengers about the movement may be made. Here, it is envisioned that the movement of passengers in the vehicle is detected through analysis of the moving images taken by the cameras installed in the vehicle.

[0016] When there are many standing passengers (hereinafter occasionally referred to as “standing passengers”) inside the vehicle, the distance between the standing passengers becomes shorter compared to when there are fewer standees. Therefore, when there are many standing passengers compared to when there are few standing passengers, it is more likely that the recorded moving images of overlapping standing passengers will be captured by cameras installed inside the vehicle. At this time, due to overlapping standing passengers within the moving images, it becomes difficult to distinguish the contours of different standing passengers during the moving image analysis.

[0017] Thus, during the video moving image analysis, it may sometimes recognize two different standing passengers as the same individual. In this case, within the captured moving image, one standing passenger's position might be recognized as the position of two standing passengers treated as the same individual. At this time, in the next frame, if the position of the another standing passenger is recognized as the position of two standing passengers of the same person, it is recognized that the position of the two standing passengers of the same person has moved from the one standing passenger's position to the another standing passenger's position. As a result, there may be cases where it is mistakenly recognized that the standing passenger is moving. Thus, compared to when there are fewer standing passengers, there is a higher likelihood of incorrect detection of a standing passenger moving within the vehicle when there are many standing passengers.

[0018] Additionally, when there are many standing passengers compared to fewer, the space to move inside the vehicle is smaller, thus restricting movement within the vehicle. Therefore, if the movement of a standing passenger is detected when there are many standing passengers, it is assumed that the probability of such detection being incorrect is higher than when there are fewer.

[0019] A controller comprising at least one processor of an information processing apparatus, according to the present disclosure, acquires a number of standing passengers in a vehicle. The controller of the information processing apparatus determines whether to execute the detection process of passengers moving inside the vehicle based on analysis of a moving image capturing the inside of the vehicle according to the number of standing passengers. Then, the controller outputs announcement information for making an in-vehicle announcement regarding movement inside the vehicle when the detection process detects a standing passenger moving inside the vehicle.

[0020] As explained above, the information processing apparatus determines the feasibility of performing detection process according to the number of standing passengers. This suppresses the execution of detection process in situations where standing passengers might be mistakenly detected as moving. Additionally, the execution of the detection process is restricted in situation where in-vehicle movement is already limited. As a result, it is possible to suppress the output of announcement information in these circumstances. Thus, it is possible to suppress in-vehicle announcements encouraging awareness of movement within the vehicle by passengers unnecessary situations.

[0021] The detailed embodiments of this disclosure will be explained below with reference to the drawings. Unless stated otherwise, the hardware configuration, module configuration, and functional configuration described in the various embodiments are not intended to limit the technical scope of the disclosure.

Embodiment

[0022] A monitoring system **1** of this embodiment will be explained based on FIGS. **1** and **2**. FIG. **1** is a diagram illustrating the schematic structure of the monitoring system **1**. The monitoring system **1** constitutes an in-vehicle device **100**, an in-vehicle camera **200**, and an acceleration sensor **300**. In monitoring system **1**, in-vehicle device **100**, in-vehicle camera **200**, and acceleration sensor **300** are interconnected through the in-vehicle network.

In-Vehicle Camera

[0023] The in-vehicle camera **200** is a camera provided within the vehicle **10**. Here, vehicle **10** is a vehicle that can accommodate multiple passengers. Also, within the vehicle **10**, passengers can stand. In this embodiment, the vehicle **10** is a bus. Note that the vehicle **10** may be other vehicles than a bus, as long as it is capable of carrying multiple passengers and allowing passengers to stand. For instance, the vehicle **10** may also be a train car.

[0024] The in-vehicle camera **200** images the inside of the vehicle **10**. The in-vehicle camera **200** is installed at the top of the vehicle **10**. The in-vehicle camera **200** then overlooks the passengers of the vehicle **10**. Thus, the in-vehicle camera **200** can image the entirety of the inside of the vehicle **10**. In-vehicle camera **200** transmits the captured moving images to the in-vehicle device **100** real-time through the in-vehicle network.

[0025] The acceleration sensor **300** is a sensor that detects acceleration. The acceleration sensor **300** transmits the detected acceleration to the in-vehicle device **100** real-time through the in-vehicle network. Thus, in-vehicle device **100** can comprehend the acceleration of vehicle **10**.

In-Vehicle Device

[0026] The in-vehicle device **100** is installed within vehicle **10**. The in-vehicle device **100** provides output (such as display or audio output on a screen) corresponding to various pieces of information to the passengers of vehicle **10**. Here, there are instances where passengers of the vehicle **10** may fall down while moving within the vehicle **10**. Therefore, when the passengers of vehicle **10** are moving within the vehicle, in-vehicle device **100** announces an alert about in-vehicle movement to the passengers of vehicle **10**.

[0027] The in-vehicle device **100** performs a process to detect the movement of passengers in the vehicle **10** by analyzing the moving image captured by the in-vehicle camera **200** (hereinafter sometimes referred to as “detection process”). Specifically, in the detection process, the in-vehicle device **100** identifies the contours of the passengers imaged in the moving images and specifies their positions. Then, the in-vehicle device **100** detects the movement of the passenger within the vehicle **10** by determining whether the position of the identified passenger has moved during the detection process.

[0028] At this time, when there are many standing passengers in vehicle **10** (hereinafter sometimes referred to as “standing passengers”), the distance between the standing passengers becomes shorter compared to when there are fewer standing passengers. Therefore, when there are many standing passengers compared to when there are few standing passengers, it is more likely that the recorded moving images of overlapping standing passengers will be captured by cameras installed inside the vehicle.

[0029] FIG. **2** is a diagram illustrating an example of a moving image within the vehicle **10** captured by the in-vehicle camera **200**. In the moving image shown in FIG. **2**, standing passenger **30**A is positioned in front of standing passenger **30**B, capturing the situation where standing passenger **30**A and standing passenger **30**B are overlapping. In this case, because standing passenger **30**A and standing passenger **30**B are overlapping in the moving image, it becomes difficult for the in-vehicle device **100** to distinguish the contours of standing passenger **30**A and standing passenger **30**B during moving image analysis.

[0030] Hence, it is possible that the in-vehicle device **100** may recognize standing passengers **30**A and **30**B as the same person during the moving image analysis. In the example shown in FIG. **2**, the in-vehicle device **100** first recognizes standing passenger **30**A as standing passengers **30**A and **30**B as the same person. Next, in the following frame, the in-vehicle device **100** recognizes standing passenger **30**B as standing passengers **30**A and **30**B as the same person.

[0031] In other words, the positions of standing passenger **30**A and standing passenger **30**B of the same person are first recognized at the position of standing passenger **30**A (hatched area on the left side of FIG. **2**). Then, in the next frame, they are recognized at the position of standing passenger **30**B (hatched area on the right side of FIG. **2**). As a result, the in-vehicle device **100** recognizes that standing passengers **30**A and **30**B as the same person have moved from the position of standing passenger **30**A to the position of standing passenger **30**B between frames. Thus, compared to when there are fewer standing passengers, there is a higher likelihood of incorrect detection of a standing passenger moving when there are many standing passengers.

[0032] Additionally, when there are many standing passengers compared to fewer, the space inside vehicle **10** available for moving is smaller, restricting movement within the vehicle. Therefore, even if the movement of a standing passenger is detected when there are many standing passengers, compared to when there are fewer, it is assumed that the probability of such detection being incorrect is higher.

[0033] Thus, the in-vehicle device **100** obtains the number of standing passengers in vehicle **10** (hereinafter possibly referred to as “number of standing passengers”). The in-vehicle device **100** determines whether to execute the detection process based on the number of standing passengers. When in-vehicle device **100** detects standing passengers moving inside the vehicle during the detection process, it makes an in-vehicle announcement to alert passengers about the movement. The details of how the in-vehicle device **100** determines whether to execute the detection process and how the in-vehicle announcement is conducted will be described later.

[0034] The in-vehicle device **100** consists of a computer having a processor **110**, main memory **120**, auxiliary memory **130**, and a communication interface (communication I/F) **140**. The processor **110** is, for example, a CPU (Central Processing Unit) or a DSP (Digital Signal Processor). The main memory **120** is, for example, RAM (Random Access Memory). The auxiliary memory **130** is, for example, ROM (Read Only Memory). Also, the auxiliary memory **130** is, for example, a disk recording medium such as an HDD (Hard Disk Drive), or a CD-ROM, DVD disk, or Blu-ray disc. In addition, the auxiliary memory **130** may also be a removable medium (portable storage medium). Here, for example, a USB memory or an SD card is illustrated as a removable medium. The communication I/F **140** is, for example, a LAN (Local Area Network) interface board. The speaker **150** is a speaker provided in the vehicle **10**.

[0035] In the in-vehicle device **100**, the auxiliary memory **130** stores the operating system (OS), various programs, and various information tables, etc. Furthermore, the in-vehicle device **100** realizes various functions described later by having the processor **110** load the programs stored in the auxiliary memory **130** into the main memory **120** and execute them. However, part or all of the functions in the in-vehicle device **100** may be implemented by hardware circuits such as ASICs or FPGAS. Moreover, the in-vehicle device **100** does not necessarily have to be realized by a single physical structure and may be composed of multiple computers that work together.

Functional Configuration

[0036] Next, the functional configuration of the in-vehicle device **100** that constitutes the monitoring system **1** according to this embodiment will be explained based on FIG. **3**. FIG. **3** is a block diagram schematically illustrating an example of the functional configuration of the in-vehicle device **100**.

[0037] The in-vehicle device **100** includes a controller **101**, a communication unit **102**, and an output unit **103**. The controller **101** has the function of performing computational processing to control the in-vehicle device **100**. The controller **101** can be realized by a processor **110** in the in-vehicle device **100**. The communication unit **102** has the function of connecting the in-vehicle device **100** to an in-vehicle network. The communication unit **102** can be realized by the communication I/F **140** in the in-vehicle device **100**. The output unit **103** has the function of outputting audio within the vehicle **10**. The output unit **103** can be realized by the speaker **150** in the in-vehicle device **100**. The output unit **103** may also have a function to display images, etc. by a display provided in the vehicle **10**.

[0038] The controller **101** receives moving images inside vehicle **10** from the in-vehicle camera **200** via the communication unit **102**. The controller **101** obtains the number of standing passengers in vehicle **10** by analyzing the moving images inside vehicle **10**. Specifically, the controller **101** identifies the position of the standing passengers in the vehicle **10** by specifying the position of characteristic points (for example, the head) of the passengers as their location based on the moving image analysis. Then, the controller **101** identifies the passengers located within the area where standing riding is performed as standees and counts the number of standing passengers.

[0039] Furthermore, the controller **101** will monitor the positions of the identified standing passengers. By referring to this position, controller **101** executes the detection process. Specifically, in the detection process, the controller **101** determines that the standing passenger is moving within the vehicle **10** if the position of the standing passenger has moved a predetermined distance within a predetermined time. In other words, the controller **101** determines that a standing passenger is moving within the vehicle **10** when the passenger's head moves a certain distance within a predetermined time during detection process processing.

[0040] On the other hand, as previously mentioned, the probability of incorrect movement detection is higher with many standing passengers compared to fewer. Additionally, when there are many standees, there is a higher possibility that the detection of standee movement is a false positive compared to when there are fewer standees. Therefore, the controller **101** determines whether the number of standees is equal to or greater than a first threshold value. Here, the first threshold value is a value determined according to the density of passengers in the vehicle **10**. The first threshold value is determined by multiplying the area of the boarding part of the vehicle **10** by a predetermined density. The predetermined density is a density assumed to be dependent on the in-vehicle camera **200** capturing a moving image of standing passengers overlapped with each other, and is defined by the density at which the movement of standing passengers inside the vehicle is assumed to be restrained.

[0041] The controller **101** obtains the acceleration of the vehicle **10** from the acceleration sensor **300** via the communication unit **102**. The controller **101** acquires the horizontal acceleration of the vehicle **10** (hereinafter also referred to as “horizontal acceleration”) as the acceleration of the vehicle **10**. Here, when the horizontal acceleration of the vehicle **10** is large, the standing passengers stagger or their upper bodies shake compared to when the horizontal acceleration of the vehicle **10** is small. Therefore, even when standing passengers are not moving, there are times when their heads move the predetermined distance within the predetermined time due to the sway. Therefore, if the horizontal acceleration is such that the standing passengers stagger or their upper bodies shake, the possibility of misdetecting the standing passengers as moving within the vehicle increases compared to when that is not the case.

[0042] Thus, the controller **101** decides to prohibit the execution of the detection process when the number of standing passengers is equal to or above the first threshold, and the horizontal acceleration is equal to or above a predetermined value. The predetermined value is set as the acceleration assumed for the stagger or upper body shake of the standing passengers in the vehicle **10**. Even if the number of standing passengers is above the first threshold, there may be passengers moving within the vehicle. Thus, controller **101** decides to execute the detection process when the number of standing passengers is equal to or above the first threshold, and the horizontal acceleration is less than a predetermined value. Additionally, controller **101** decides to execute the detection process when the number of standing passengers is less than the first threshold.

[0043] Also, the controller **101** may decide to prohibit the execution of the detection process when the number of standing passengers exceeds the first threshold and the horizontal acceleration exceeds the predetermined value. At this time, the controller **101** decides to execute the detection process when the number of standing passengers exceeds the first threshold, and the horizontal acceleration is less than the predetermined value. Furthermore, controller **101** decides to execute the detection process when the number of standing passengers is below the first threshold. In this scenario, controller **101** can make any decision about the execution of the detection process when the number of standing passengers equals the first threshold or there is a horizontal acceleration equal to the predetermined value.

[0044] Once the controller **101** decides to execute the detection process, the detection process begins. The controller **101** conducts an in-vehicle announcement (hereafter possibly simply referred to as “in-vehicle announcement”) via the output unit **103** for raising awareness about moving within the vehicle when it detects standing passengers moving during the detection process.

[0045] Here, the more the number of standing passengers, the higher the possibility of false detection during the detection process. Therefore, the controller **101**, when detecting movement of standing passengers in the vehicle during the detection process, makes different in-vehicle announcements depending on whether the potential for false detection is high or low according to the number of standing passengers.

[0046] Specifically, if the number of standing passengers exceeds the second threshold, the controller **101** outputs cautionary behavior information to make announcements to alert the behavior of the vehicle. An announcement to draw attention to the behavior of the vehicle is, for example, an announcement about the shaking of the vehicle **10** while in motion.

[0047] Furthermore, if the number of standing passengers is below the second threshold, the controller **101** outputs safety action information to announce a predetermined action for safety. The predetermined action is, for example, sitting on a seat. Also, the predetermined action is, for example, grasping a strap handle. Additionally, the predetermined action could also be standing at the current position without moving inside the vehicle. Note that the second threshold value may be the same as or smaller than the first threshold value.

[0048] In this way, the controller **101** outputs either cautionary behavior information or safety action information according to the number of standing passengers. Here, the content of in-car announcements due to the output of safety action information is more direct in alerting standing passengers of their movement within the vehicle than the content of announcements due to cautionary behavior information. In this way, indirect caution is provided when there is a high possibility of false detection in the detection process, and direct caution is given when there is a low possibility of false detection in the detection process. This suppresses the in-vehicle announcement of direct caution when a detection in the detection process is a false detection, thereby preventing passengers from feeling uncomfortable.

First Processing

[0049] The first process executed by the controller **101** in the in-vehicle device **100** of the monitoring system **1** will be explained based on FIG. **4**. FIG. **4** is a flowchart illustrating the first processing. The first process is to decide whether to execute the detection process. The first process is repeatedly executed at a predetermined interval. The first processing is executed when the vehicle **10** is running.

[0050] In the first process, in S**101**, the number of standing passengers in the vehicle **10** is acquired. Next, in S**102**, it is determined whether or not the number of standing passengers is above the first threshold. If a negative judgment is made in S**102**, it is presumed that the possibility of false detection of movement inside the vehicle during the detection process is lower than what occurs during a positive judgment. Therefore, the execution of the detection process is determined in S**106**. Then, the first process is temporarily terminated.

[0051] When a negative judgment is made in S**102**, the horizontal acceleration is acquired from the acceleration sensor **300** in S**103**. Next, in S**104**, it is determined whether the acquired horizontal acceleration is equal to or greater than the predetermined value. In S**104**, if the decision is negative, the number of standing passengers is above the first threshold, and the horizontal acceleration is below a predetermined value. Therefore, although the likelihood of misdetection of movement inside the vehicle during the detection process is higher than when a negative judgment is made in S**102**, it is lower than when an affirmative judgment is made in S**104**. Consequently, the execution of the detection process is determined in S**106**. Then, the first process is temporarily terminated.

[0052] In S**104**, if the decision is affirmative, the number of standing passengers is above the first threshold, and the horizontal acceleration is above a predetermined value. Therefore, the possibility of false detection in the detection process is presumed to be higher compared to when a negative judgment was made. Therefore, in S**105**, it is decided to prohibit the execution of the detection process. Then, the first process is temporarily terminated.

Second Process

[0053] Next, the second process executed by the controller **101** in the in-vehicle device **100** of the monitoring system **1** will be explained based on FIG. **5**. FIG. **5** is a flowchart of the second process. The second process executes a detection process and outputs cautionary behavior information or safety action information when there are standing passengers moving inside the vehicle **10**. The second process begins execution if it is determined in S**106** of the first process that the detection process should be executed.

[0054] In the second process, in S**201**, the detection process using moving image analysis is executed. Then, in S**202**, it is determined whether in-vehicle movement has been detected in the detection process. Specifically, in the detection process, it is determined whether the standing passenger has moved more than a predetermined distance within a certain period. Then, in S**203**, it is determined whether or not the number of standing passengers is above the second threshold. If a positive determination is made in S**203**, cautionary behavior information is output in S**204**. In other words, in S**204**, cautionary behavior information is output instead of safety action information. Then, the second process is terminated. Also, if the negative judgment is made in S**203**, safety action information is output in S**205**. In other words, in S**205**, safety action information is output rather than behavior caution information. Then, the second process is terminated.

[0055] As explained above, it is determined whether or not to execute the detection process according to the number of standing passengers using the monitoring system **1**. This suppresses the execution of the detection process in situations where there is a high likelihood of a standee being falsely detected as moving. Additionally, the execution of the detection process is suppressed in situations where movement within the vehicle **10** has been suppressed. Therefore, in these situations, it is possible to suppress in-vehicle announcement. In this way, it is possible to suppress in-car announcements that alert passengers about movement within the vehicle **10** in unnecessary situations.

Modified Example 1

[0056] In this embodiment, the in-vehicle device **100** decides to execute the detection process if the number of standees is above the first threshold and the horizontal acceleration is below the predetermined value. On the other hand, in this modified example, the in-vehicle device **100** decides to prohibit the execution of the detection process if the number of standees is above the first threshold. In other words, the in-vehicle device **100** decides to prohibit the execution of the detection process if the number of standees is above the first threshold, and to execute the detection process if the number of standees is below the first threshold.

[0057] As a result, regardless of the horizontal acceleration, the detection process will not be executed in situations where there is a high possibility of being falsely detected as moving, and the standing passengers' movement inside the vehicle **10** is suppressed. By doing so, it is possible to suppress in-vehicle announcements that alert passengers about movement within the vehicle **10** in unnecessary situations. Note that, in this modified example, the second threshold is set to a value smaller than the first threshold because the detection process is not executed when the number of standing passengers is above the first threshold.

Modified Example 2

[0058] As described above, the more standing passengers there are, the higher the possibility of false detection in the detection process. Therefore, the more standing passengers there are, the higher the possibility of unnecessary in-vehicle announcements. Moreover, if the cautionary behavior information or safety action information is output every time in-vehicle movement is detected in the detection process, an in-car announcement will be made every time even if in-vehicle movement is misdetected. Therefore, it is conceivable that passengers of vehicle **10** would sense discomfort due to repeated in-vehicle announcements despite no movement inside the vehicle. Additionally, even if cautionary behavior information or safety action information is not output every time in-vehicle movement is detected in the detection process, passengers of the vehicle **10** can recognize that alerts related to in-vehicle movement are being issued if these pieces of information are announced a certain number of times.

[0059] Therefore, the in-vehicle device **100** limits the number of times cautionary behavior information or safety action information is output within a predetermined period when the number of standing passengers exceeds the third threshold, which is below the first threshold. Here, the third threshold may be the same value as the second threshold, or it may be a different value.

[0060] At this time, during the period when vehicle **10** is moving between bus stops, the passengers of vehicle **10** do not change. As a result, it is assumed that sufficient in-vehicle announcements can be made while the vehicle **10** is moving between bus stops by performing the predetermined number of in-vehicle announcements. Therefore, the predetermined period is set as the period during which the vehicle **10** moves between bus stops. Moreover, the predetermined period may be, for instance, a period determined by a predetermined length of time. By doing so, unnecessary in-vehicle announcements alerting attention under situations with a high possibility of false detection in the detection process can be suppressed.

Modified Example 3

[0061] The monitoring system **1** can be used in various situations. Monitoring system **1** may be used to provide Mobility as a Service (MaaS), a service that utilizes mobility.

Other Embodiments

[0062] The above-described embodiments are merely examples, and the present disclosure may be appropriately modified and embodied without departing from its spirit. Furthermore, the processes and elements described in this disclosure can be freely combined and implemented as long as no technical contradictions arise.

[0063] In addition, the processing described as being performed by a single device may be shared and executed by multiple devices. Alternatively, the processing described as being performed by different devices may be executed by a single device. In a computer system, the hardware configuration (server configuration) realizing each function can be flexibly changed.

[0064] The present disclosure can also be implemented by supplying a computer program that implements the functions described in the above embodiments to a computer, and one or more processors of the computer reading and executing the program. Such a computer program may be provided to the computer via a non-transitory computer-readable storage medium connectable to the system bus of the computer, or may be provided to the computer via a network. A non-transitory computer-readable storage medium includes any type of medium suitable for storing electronic instructions, such as, for example, any type of disk, such as a magnetic disk (such as a floppy disk or a hard disk drive (HDD)), an optical disk (such as a CD-ROM, a DVD disk, or a Blu-ray disk), a read-only memory (ROM), a random-access memory (RAM), an EPROM, an EEPROM, a magnetic card, a flash memory, or an optical card.

Claims

1. An information processing apparatus including a controller comprising at least one processor configured to perform; acquiring a number of standing passengers in a vehicle, determining whether to execute a detection process of passengers moving inside the vehicle based on analysis of a moving image capturing the inside of the vehicle according to the number of standing passengers, and outputting announcement information for making an in-vehicle announcement regarding movement inside the vehicle when the detection process detects a standing passenger moving inside the vehicle.

2. The information processing apparatus according to claim 1, wherein determining whether to execute the detection process includes; deciding to prohibit the execution of the detection process when the number of standing passengers exceeds a first threshold, and deciding to execute the detection process when the number of standing passengers is less than the first threshold.

3. The information processing apparatus according to claim 1, wherein the controller further configured to perform; acquiring horizontal acceleration of the vehicle, and determining whether to execute the detection process includes; deciding to prohibit the execution of the detection process when the number of standing passengers exceeds a first threshold and the acceleration exceeds a predetermined value, deciding to execute the detection process when the number of standing passengers exceeds the first threshold and the acceleration is less than the predetermined value, and deciding to execute the detection process when the number of standing passengers is less than the first threshold.

4. The information processing apparatus according to claim 2, wherein the outputted announcement information includes; a first announcement to draw attention to behavior of the vehicle when the number of standing passengers exceeds a second threshold, which is the first threshold or less, and a second announcement to encourage predetermined actions for safety when the number of standing passengers is less than the second threshold.

5. The information processing apparatus according to claim 2, wherein outputting the announcement information includes limiting the number of times the announcement information is output within a predetermined period when the number of standing passengers exceeds a third threshold, which is the first threshold or less.

6. A method, by the at least one processor of the information processing apparatus according to claim 1, for improving travel mobility as a service (MaaS).