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DISPLAY CONTROL DEVICE FOR A VEHICLE, DISPLAY SYSTEM FOR A VEHICLE, DISPLAY CONTROL METHOD FOR A VEHICLE, AND PROGRAM

Abstract

A display control device for a vehicle includes a processor configured to: acquire information relating to an obstacle in a vehicle's surroundings; perform superimposed display of information at a position of the obstacle as viewed by a vehicle occupant, at a display region provided in front of the vehicle occupant; and delete the display of the information in a case in which the vehicle occupant has perceived the obstacle in a state in which the information is displayed.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION [0001] This application is a continuation of U.S. patent application Ser. No. 18/327,926, filed Jun. 2, 2023, which is based on and claims priority under 35 USC 119 from Japanese Patent Application No. 2022-094581 filed on Jun. 10, 2022, the disclosure of which is incorporated by reference herein.

BACKGROUND
Technical Field
[0002] The present disclosure relates to a display control device for a vehicle, a display system for a vehicle, a display control method for a vehicle, and a non-transitory storage medium on which a program is stored.
Related Art
[0003] Japanese Patent Application Laid-Open (JP-A) No. 2016-24573 discloses a display device for a vehicle that detects an obstacle existing in front of a vehicle, and displays the obstacle on a display portion. In the display device for a vehicle of JP-A No. 2016-24573, the period of updating the display of images is made to be shorter for obstacles to which attention should be paid, as compared with that in a case in which there is no obstacle to which attention should be paid.
[0004] In a structure that displays information relating to an obstacle directly in front of a vehicle occupant as in the above-described display device for a vehicle, the vehicle occupant can recognize the obstacle at an early stage. On the other hand, if another obstacle to which attention should be paid appears, there is the possibility that the vehicle occupant may be slow to recognize that obstacle.
SUMMARY
[0005] The present disclosure provides a display control device for a vehicle, a display system for a vehicle, a display control method for a vehicle, and a non-transitory storage medium on which a program is stored, which enable recognition of a new obstacle at an early stage.
[0006] A first aspect of the present disclosure is a display control device for a vehicle including: an obstacle information acquisition unit configured to acquire information relating to an obstacle in a vehicle's surroundings; an information display unit configured to perform superimposed display of information at a position of the obstacle as viewed by a vehicle occupant, at a display region provided in front of the vehicle occupant; and an information deletion unit that, in a case in which the vehicle occupant has perceived the obstacle in a state in which the information is displayed, is configured to delete the display of the information.
[0007] In the display control device for a vehicle of the first aspect, information relating to an obstacle is displayed in a superposed manner in a display region provided in front of the vehicle occupant. Due thereto, the vehicle occupant can recognize an obstacle that is at the surroundings of the vehicle at an early stage.
[0008] Further, in a case in which the vehicle occupant has perceived the obstacle in a state in which information is displayed, the display of information is deleted. Due thereto, at a time when a new obstacle appears at the surroundings of the vehicle, information is displayed superposingly at only the new obstacle, and the vehicle occupant can recognize the new obstacle at an early stage. Note that what is called “displayed superposingly” here is not limited to a structure of carrying out superposed display for an obstacle that can be seen through the windshield glass, and is a concept

broadly encompassing structures of displaying information in a superposed manner in images of the obstacle that are displayed on a display in the vehicle cabin, or the like.

[0009] A display control device for a vehicle of a second aspect includes, in the first aspect, a sightline direction acquisition unit configured to acquire a sightline direction of the vehicle occupant, wherein the information deletion unit deletes the display of the information in a case in which a sightline direction of the vehicle occupant, which has been acquired by the sightline direction acquisition unit, has been directed toward the obstacle for a predetermined time.

[0010] In the display control device for a vehicle of the second aspect, in a case in which the vehicle occupant looks at the obstacle for a predetermined time, the display of the information is deleted. Due thereto, the vehicle occupant does not carry out a special operation in order to delete the display.

[0011] A display control device for a vehicle of a third aspect includes, in the first aspect, a steering direction acquisition unit configured to acquire a steering direction of the vehicle, wherein the information deletion unit deletes the display of the information in a case in which the steering direction of the vehicle, which has been acquired by the steering direction acquisition unit, is a direction of moving away from the obstacle.

[0012] In the display control device for a vehicle of the third aspect, in a case in which the vehicle is steered by the vehicle occupant in a direction of moving away from the obstacle, it is considered that the vehicle occupant has recognized the obstacle, and the display of the information is deleted. Due thereto, the display can be deleted merely by the vehicle occupant operating the steering wheel.

[0013] A display control device for a vehicle of a fourth aspect includes, in the first aspect, an acceleration acquisition unit configured to acquire an acceleration of the vehicle, wherein the information deletion unit deletes the display of the information in a case in which the acceleration of the vehicle, which has been acquired by the acceleration acquisition unit, has decreased by a predetermined amount or more.

[0014] In the display control device for a vehicle of the fourth aspect, in a case in which the vehicle is decelerated by the vehicle occupant, it is considered that the vehicle occupant has recognized the obstacle, and the display of the information is deleted. Due thereto, the display can be deleted merely by the vehicle occupant operating the brake pedal.

[0015] In a display control device for a vehicle of a fifth aspect, in the first aspect, the display region comprises a portion of a windshield glass onto which images are projected in front of a sightline of a driver by a head-up display device.

[0016] In the display control device for a vehicle of the fifth aspect, information relating to the obstacle is displayed on a portion of the windshield. Due thereto, information relating to the obstacle can be recognized even without the vehicle occupant greatly moving his/her sightline that is directed toward the region in front of the vehicle.

[0017] A sixth aspect of the present disclosure is a display system for a vehicle including: the display control device for a vehicle of any one of claims **1** through **5**; and a head-up display device configured to project images onto a windshield glass.

[0018] In the display system for a vehicle of the sixth aspect, information relating to an obstacle is displayed by the head-up display device projecting images onto the windshield. Further, due to the projecting of images from the head-up display device onto the windshield being stopped by the function of the information deleting unit, information relating to the obstacle can be set in a non-displayed state.

[0019] A seventh aspect of the present disclosure is a display control method for a vehicle including: acquiring information relating to an obstacle that is in a vehicle's surroundings; displaying information at a position of the obstacle as viewed by a vehicle occupant, at a display region within a vehicle cabin; and in a case in which the vehicle occupant has perceived the obstacle in a state in which the information is displayed, deleting display of the information.

[0020] A non-transitory storage medium that stores a program of an eighth aspect is a non-transitory storage medium on which is stored a program executable by a computer in order to execute processings including: acquiring information relating to an obstacle that is in a vehicle's surroundings; displaying information at a position of the obstacle as viewed by a vehicle occupant, at a display region within a vehicle cabin; and in a case in which the vehicle occupant has perceived the obstacle in a state in which the information is displayed, deleting display of the information.
[0021] In accordance with the display control device for a vehicle, the display system for a vehicle, the display control method for a vehicle, and the non-transitory storage medium on which a program is stored which relate to the present disclosure, a vehicle occupant can be made to recognize a new obstacle at an early stage.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0022] Exemplary embodiments of the present disclosure will be described in detail based on the following figures, wherein:
[0023] FIG. **1** is a schematic drawing in which the front portion of a cabin interior of a vehicle, to which a display system for a vehicle relating to an exemplary embodiment is applied, is seen from a vehicle rear side;
[0024] FIG. **2** is a block drawing illustrating hardware structures of a display control device for a vehicle relating to the exemplary embodiment;
[0025] FIG. **3** is a block drawing illustrating functional structures of the display control device for a vehicle relating to the exemplary embodiment;
[0026] FIG. **4** is a drawing illustrating an example of display of a display region in the exemplary embodiment, and illustrates an example in which information for a first obstacle is displayed;
[0027] FIG. **5** is a drawing illustrating an example of display of the display region in the exemplary embodiment, and illustrates an example in which the information for the first obstacle is deleted;
[0028] FIG. **6** is a drawing illustrating an example of display of the display region in the exemplary embodiment, and illustrates an example in which information for a second obstacle is displayed; and
[0029] FIG. **7** is a flowchart illustrating an example of the flow of display control processing in the exemplary embodiment.
DETAILED DESCRIPTION
[0030] A display system **10** for a vehicle relating to an exemplary embodiment is described with reference to the drawings. Note that arrow UP illustrated in FIG. **1** indicates the upper side in the vehicle vertical direction, and arrow RH indicates the right side in the vehicle transverse direction. The vertical direction and the left-right direction in the following explanation mean upward and downward in the vehicle vertical direction and leftward and rightward in the vehicle transverse direction, respectively.
[0031] As illustrated in FIG. **1**, an instrument panel **14** is provided at the front portion of the cabin interior of a vehicle **12**. The instrument panel **14** extends in the vehicle transverse direction, and a steering wheel **16** is provided at the vehicle right side of the instrument panel **14**. Namely, in the present exemplary embodiment, as an example, the vehicle **12** is a right-hand-drive vehicle in which the steering wheel **16** is provided at the right side, and the driver's seat is set at the vehicle right side.
[0032] A windshield glass **18** is provided at the front end portion of the instrument panel **14**. The windshield glass **18** extends in the vehicle vertical direction and the vehicle transverse direction, and divides the vehicle cabin interior and the vehicle cabin exterior from one another.

[0033] The vehicle right side end portion of the windshield glass **18** is fixed to a front pillar **20** that is at the vehicle right side. The front pillar **20** extends in the vehicle vertical direction, and the windshield glass **18** is fixed to the vehicle transverse direction inner side end portion of this front pillar **20**. The front end portion of a front side glass **22** is fixed to the vehicle transverse direction outer side end portion of the front pillar **20**. Note that the vehicle left side end portion of the windshield glass **18** is fixed to an unillustrated front pillar that is at the vehicle left side.

[0034] Here, a first display portion **24** having a display region VI for images is provided at the instrument panel **14**. The first display portion **24** is structured by the gauge display that is provided at the vehicle right side of the instrument panel **14**, at the vehicle front side of the driver's seat. The first display portion **24** is connected to various gauges installed in the vehicle **12**, and is provided at a position that is within the visual field of the driver in the state in which the sightline of the driver is directed toward the vehicle front side.

[0035] A second display portion **25** that is provided with a display region V**2** for images is provided at the instrument panel **14**. The second display portion **25** is structured by a center display disposed at the vehicle transverse direction central portion of the instrument panel **14**.

[0036] A third display portion **26** having a display region V**3** for images is provided at the windshield glass **18**. The third display portion **26** is set at the vehicle upper side of the first display portion **24**, and is structured by a projection surface that is projected by a head-up display device **52** (see FIG. **2**). Specifically, the head-up display device **52** that can project images is provided at the vehicle front side of the instrument panel **14**, and is structured such that images are projected from the head-up display device **52** onto the third display portion **26** of the windshield glass **18**. Namely, the third display portion **26** is a portion of the windshield glass **18** which portion is the projection surface of the head-up display device **52**.

[0037] Here, a display control device **28** for a vehicle that structures the display system **10** for a vehicle is provided at the vehicle **12**. The display control device **28** for a vehicle of the present exemplary embodiment is, for example, an ECU (Electronic Control Unit) that carries out various types of control.

Hardware Structures of Display Control Device **28** for a Vehicle

[0038] As illustrated in FIG. **2**, the display control device **28** for a vehicle is structured to include a CPU (Central Processing Unit: processor) **30**, a ROM (Read Only Memory) **32**, a RAM (Random Access Memory) **34**, a storage **36**, a communication interface (communication I/F) **38**, and an input/output interface (input/output I/F) **40**. These respective structures are connected so as to be able to communicate with one another via an internal bus **42**.

[0039] The CPU **30** is a central computing processing unit, and executes various programs and controls the respective sections. Namely, the CPU **30** reads-out programs from the ROM **32** or the storage **36**, and executes the programs by using the RAM **34** as a workspace. Further, the CPU **30** carries out control of the above-described respective structures, and various types of computing processings, in accordance with programs recorded in the ROM **32** or the storage **36**.

[0040] The ROM **32** stores various programs and various data. The RAM **34** temporarily stores programs and data as a workspace. The storage **36** is a non-transitory recording medium that is structured by an HDD (Hard Disk Drive) or an SSD (Solid State Drive), and that stores various programs, including the operating system, and various data. In the present exemplary embodiment, a display program for carrying out display processing, and the like, are stored in the ROM **32** or the storage **36**. Further, various input/output devices are connected to the input/output interface **40**.

[0041] A sightline detecting sensor **44**, a steering angle sensor **46**, an acceleration sensor **48**, periphery detecting sensors **50**, the first display portion **24**, the second display portion **25**, and the head-up display device **52** are connected to the input/output interface **40**. Further, images are projected onto the third display portion **26** by the head-up display device **52**.

[0042] The sightline detecting sensor **44** is provided at the instrument panel **14** for example, and is disposed so as to be directed toward the face of the vehicle occupant (the driver) seated in the

driver's seat. By recognizing an eye of the vehicle occupant, the sightline detecting sensor **44** detects the sightline direction of the vehicle occupant by using principles such as corneal reflection, scleral reflection, or the like.

[0043] The steering angle sensor **46** is a sensor that acquires the steering direction of the vehicle **12**. For example, the steering angle sensor **46** acquires the steering direction of the vehicle by detecting the steering angle of the steering wheel **16**. The acceleration sensor **48** detects the acceleration of the vehicle **12**.

[0044] The periphery detecting sensors **50** are sensors that detect the peripheral situation of the vehicle **12**. At least one sensor among various sensors such as, for example, cameras, radar, LIDAR (Light Detection and Ranging, or Laser Imaging Detection and Ranging) and the like is used as the periphery detecting sensors **50**.

[0045] The cameras are structured to include a front camera capturing images of the region ahead of the vehicle, a rear camera capturing images of the region at the rear of the vehicle, and the like. The radar detects the distance and the direction to an object at the periphery of the vehicle **12** by radio waves. LIDAR detects the distance and the direction to an object at the periphery of the vehicle **12** by laser light.

Functional Structures of Display Control Device **28** for a Vehicle

[0046] The display control device **28** for a vehicle realizes various functions by using the above-described hardware resources. Functional structures that are realized by the display control device **28** for a vehicle are described with reference to FIG. **3**.

[0047] As illustrated in FIG. **3**, the display control device **28** for a vehicle is structured to include, as the functional structures thereof, an obstacle information acquiring unit **54**, an information displaying unit **56**, a sightline direction acquiring unit **58**, a steering direction acquiring unit **60**, an acceleration acquiring unit **62** and an information deleting unit **64**. Note that these respective functional structures are realized by the CPU **30** reading-out a program stored in the ROM **32** or the storage **36**, and executing the program.

[0048] The obstacle information acquiring unit **54** acquires information relating to plural obstacles at the periphery of the vehicle. Specifically, the obstacle information acquiring unit **54** acquires information of obstacles at the periphery of the vehicle **12** that are detected by the periphery detecting sensors **50**. For example, the obstacle information acquiring unit **54** acquires captured image data of the region ahead of the vehicle that has been captured by a front camera. Further, the obstacle information acquiring unit **54** acquires data relating to the positions of obstacles that are detected by radar and LIDAR and the like.

[0049] The information displaying unit **56** displays information so as to be superposed on the position of an obstacle seen from the vehicle occupant, in the display region provided in front of the vehicle occupant. In the present exemplary embodiment, as an example, the information displaying unit **56** displays information relating to an obstacle in the display region V**3** of the third display portion **26**. Further, in order to display an image in front of the sightline of the vehicle occupant, the information displaying unit **56** may derive the position of the superposed display on the basis of the sightline direction of the vehicle occupant that is acquired from the sightline detecting sensor **44**.

[0050] FIG. **4** is a drawing illustrating a display example in which information relating to an obstacle is displayed in the display region V**3**. As illustrated in FIG. **4**, the view ahead of the vehicle can be seen through the windshield glass **18** at the display region V**3**. Note that, for convenience of explanation, only the view that can be seen in the display region V**3** is illustrated, but, in actuality, the view ahead of the vehicle is not partitioned by the border of the third display portion **26**.

[0051] Mark M**1** and mark M**2** are displayed in the display region V**3** by the head-up display device **52**. The mark M**1** is displayed so as to be superposed at the feet of pedestrian P**1** who is judged to be an obstacle from the information acquired by the obstacle information acquiring unit

54. The mark M**1** of the present exemplary embodiment is displayed in a substantially circular form as an example. Note that the mark M**1** is set such that the color thereof changes in accordance with the distance from the vehicle **12**. For example, if pedestrian P**1** is more than a predetermined distance away from the vehicle **12**, the mark M**1** is displayed green, and, if the pedestrian P**1** is positioned a predetermined distance or less from the vehicle **12**, the mark M**1** is displayed red. In this way, the driver can be urged to pay attention to an individual obstacle by the mark M**1**.

[0052] Information relating to the obstacle may be displayed in addition to the mark M**1**. For example, the information displaying unit **56** may display the distance to the obstacle in a vicinity of the mark M**1**. Further, the information displaying unit **56** may display the type of the obstacle or the like in a vicinity of the mark M**1**.

[0053] The current speed of the vehicle **12** that is sensed by an unillustrated vehicle speed sensor is displayed by the mark M**2**. Note that the mark M**2** does not have to be displayed.

[0054] The sightline direction acquiring unit **58** of FIG. **3** acquires the sightline direction of the vehicle occupant. Specifically, the sightline direction acquiring unit **58** acquires information relating to the sightline direction of the vehicle occupant that is detected by the sightline detecting sensor **44**.

[0055] The steering direction acquiring unit **60** acquires the steering direction of the vehicle **12**. Specifically, the steering direction acquiring unit **60** acquires information relating to the steering angle that is detected by the steering angle sensor **46**.

[0056] The acceleration acquiring unit **62** acquires the acceleration of the vehicle **12**. Specifically, the acceleration acquiring unit **62** acquires information relating to the acceleration of the vehicle **12** that is detected by the acceleration sensor **48**.

[0057] In a case in which a predetermined condition is met in a state in which information relating to an obstacle is displayed in a display region, the information deleting unit **64** judges that the vehicle occupant has recognized the obstacle, and deletes the display of information. Specifically, in the present exemplary embodiment, as an example, in a case in which the sightline direction of the vehicle occupant that is acquired by the sightline direction acquiring unit **58** is directed toward the obstacle for a predetermined time, the information deleting unit **64** deletes the display of information. At this time, during the time when the sightline direction of the vehicle occupant is directed toward the pedestrian P**1**, the color or the shape or the like of the mark M**1** may be changed.

[0058] Further, in a case in which the steering direction of the vehicle **12** that is acquired by the steering direction acquiring unit **60** is a direction of moving away from the obstacle, the information deleting unit **64** deletes the display of information. Note that, in a case in which the steering angle is not changed greatly before and after the pedestrian P**1** who is the obstacle is detected, display may be continued even if the advancing direction of the vehicle **12** is a direction of moving away from the obstacle. Namely, the display of information may be deleted only in a case in which, after the mark M**1** is displayed, the steering angle is changed by a predetermined threshold value or more, and the steering direction of the vehicle **12** becomes a direction of moving away from the obstacle.

[0059] Moreover, the information deleting unit **64** deletes the display of information in a case in which the acceleration of the vehicle **12** acquired by the acceleration acquiring unit **62** decelerates by a predetermined amount or more. Note the display of information may be deleted in a case in which the absolute value of the deceleration is greater than a predetermined value, or the display of information may be deleted in a case in which the deceleration per unit time becomes greater than or equal to a predetermined value such as at the time of sudden braking.

[0060] FIG. **5** is a drawing illustrating a display example in a case in which it is judged that the vehicle occupant has recognized the pedestrian P**1** who is an obstacle from the state of FIG. **4**. As illustrated in FIG. **5**, the mark M**1** that was displayed by the head-up display device **52** is deleted by the information deleting unit **64**. Note that, in a case in which the distance to the obstacle or the

type of the obstacle or the like is simultaneously displayed, the display of the distance or the type is also deleted together with the mark M**1** by the information deleting unit **64**.

[0061] FIG. **6** illustrates a display example in a case in which, from the state of FIG. **5**, a pedestrian P**2** who is a new obstacle appears. As illustrated in FIG. **6**, mark M**3** is displayed by the head-up display device **52** in the display region V**3**. The mark M**3** is displayed so as to be superposed at the feet of the pedestrian P**2** who is judged to be an obstacle from the information acquired by the obstacle information acquiring unit **54**. In the same way as the mark M**1**, the mark M**3** of the present exemplary embodiment is displayed in a substantially circular form as an example.

Operation

[0062] Operation of the present exemplary embodiment is described next.

Display Control Processing

[0063] An example of display control processing that displays and deletes the mark M**1** in and from the third display portion **26** that is the projection surface of the head-up display device **52** is described by using the flowchart illustrated in FIG. **7**. This display processing is executed due to the CPU **30** reading-out a display program from the ROM **32** or the storage **36**, and expanding and executing the display program in the RAM **34**. Further, the display processing is repeatedly executed each predetermined time.

[0064] In step S**102**, the CPU **30** acquires information relating to obstacles. Specifically, by the function of the obstacle information acquiring unit **54**, the CPU **30** acquires information such as the positions, types and the like of obstacles detected by the periphery detecting sensors **50**.

[0065] In step S**104**, the CPU **30** judges whether or not there is an obstacle. Here, in a case in which an obstacle that should be displayed in the display region V**3** is detected, the CPU **30** judges that there is an obstacle, and moves on to the processing of step S**106**. Because the pedestrian P**1**, who is walking at the front, right side of the vehicle **12**, is an obstacle that should be displayed in the display region V**3**, the CPU **30** judges that there is an obstacle, and moves on to the processing of step S**106**.

[0066] On the other hand, in step S**104**, in a case in which an obstacle that dose not to be displayed in the display region V**3** is not detected, the CPU **30** judges that there is no obstacle, and ends the display control processing. For example, even in a case in which the pedestrian P**1** does not exist but an obstacle is detected at the rear of the vehicle **12** by the rear camera, the CPU **30** ends the display control processing if that obstacle is not an obstacle that should be displayed in the display region V**3**.

[0067] In step S**106**, the CPU **30** displays the mark M**1** in a superposed manner on the pedestrian P**1** who is the obstacle. Specifically, by the function of the information displaying unit **56**, the CPU **30** displays information by projecting a predetermined image onto the display region V**3** of the third display portion **26** by the head-up display device **52**. The information displaying unit **56** displays the information so as to be superposed on a position of the obstacle that is seen from the vehicle occupant.

[0068] In step S**108**, the CPU **30** judges whether or not the vehicle occupant has recognized the obstacle. Specifically, the CPU **30** judges that the vehicle occupant has recognized the obstacle in a case in which the sightline direction of the vehicle occupant acquired by the function of the sightline direction acquiring unit **58** is directed toward the pedestrian P**1** for a predetermined time.

[0069] Further, in a case in which the steering direction of the vehicle **12** acquired by the function of the steering direction acquiring unit **60** is a direction of moving away from the pedestrian P**1**, the CPU **30** judges that the vehicle occupant has recognized the obstacle.

[0070] Moreover, in a case in which the acceleration of the vehicle **12** acquired by the function of the acceleration acquiring unit **62** has decelerated a predetermined amount or more, the CPU **30** judges that the vehicle occupant has recognized the obstacle.

[0071] If the CPU **30** judges in step S**108** that the vehicle occupant has recognized the obstacle, the CPU **30** moves on to the processing of step S**110**. Further, if the CPU **30** judges in step S**108** that

the vehicle occupant has not recognized the obstacle, the CPU **30** moves on to the processing of step S**106**, and continues displaying the mark M**1**. Note that, in a case in which an obstacle for which information is being displayed moves out of the display region, an object for which information is to be displayed no longer exists, and therefore, the mark M**1** is deleted.

[0072] In step S**110**, the CPU **30** deletes the mark M**1**. Specifically, by the function of the information deleting unit **64**, the CPU **30** stops the projecting of the image from the head-up display device **52** onto the display region V**3**. Then, the CPU **30** ends the display control processing. Note that, because the display control processing is repeatedly executed each predetermined time, in a case in which the another pedestrian P**2** appears after the mark M**1** is deleted in step S**110**, due to the display control processing being executed again and the processing proceeding from step S**102** through step S**106**, the mark M**3** is displayed so as to be superposed on the pedestrian P**2**.

[0073] As described above, in the display system **10** for a vehicle and the display control device **28** for a vehicle relating to the present exemplary embodiment, information relating to the obstacle is displayed in a superposed manner in the display region V**3** that is provided in front of the vehicle occupant. Due thereto, the vehicle occupant can recognize an obstacle at the periphery of the vehicle at an early stage.

[0074] Further, in the state in which information is displayed in the display region V**3**, in a case in which the vehicle occupant recognizes the obstacle, the display of information is deleted. Due thereto, at the time when a new obstacle appears at the periphery of the vehicle, information is superposingly displayed only on that new obstacle, and the vehicle occupant can recognize the new obstacle at an early stage.

[0075] Further, in the present exemplary embodiment, the display of information is deleted in a case in which the vehicle occupant views the obstacle for a predetermined time. Due thereto, the vehicle occupant does not carry out a special operation in order to delete the display. For example, there is no need for the vehicle occupant to move his/her hand in order to delete the display.

[0076] Moreover, in the present exemplary embodiment, in a case in which the vehicle **12** is steered by the vehicle occupant in a direction of moving away from the obstacle, it is considered that the vehicle occupant has recognized the obstacle, and the display of information is deleted. Due thereto, the display can be deleted merely due to the vehicle occupant operating the steering wheel **16**. Namely, the display can be deleted merely by the vehicle occupant carrying out general driving.

[0077] Still further, in the present exemplary embodiment, in a case in which the vehicle **12** is decelerated by the vehicle occupant, it is considered that the vehicle occupant has recognized the obstacle, and the display of information is deleted. Due thereto, the display can be deleted merely by the vehicle occupant operating the brake pedal.

[0078] Further, in the present exemplary embodiment, information relating to the obstacle is displayed on the display region V**3** that is a portion of the windshield glass **18**. Due thereto, information relating to the obstacle can be recognized even without the vehicle occupant greatly moving his/her sightline that is directed toward the region in front of the vehicle. In particular, in the present exemplary embodiment, information relating to the obstacle is displayed due to the head-up display device **52** projecting images onto the windshield glass **18** by the function of the information displaying unit **56**. Further, information relating to the obstacle can be set in a non-displayed state due to the projection of images from the head-up display device **52** onto the windshield glass **18** being stopped by the function of the information deleting unit **64**.

[0079] Although the display system **10** for a vehicle and the display control device **28** for a vehicle relating to an exemplary embodiment have been described above, the technique of the present disclosure can, of course, be implemented in various forms within a scope that does not depart from the gist thereof. For example, in the above-described exemplary embodiment, the information deleting unit **64** deletes the mark M**1** when at least one condition among the sightline direction of

the vehicle occupant is directed toward the obstacle for a predetermined time, the steering direction of the vehicle **12** is a direction of moving away from the obstacle, and the acceleration of the vehicle **12** decelerates by a predetermined amount or more, is satisfied. However, the present disclosure is not limited to this, and may be structured such that the mark MI is deleted when two of the above-described three conditions are satisfied. Or, there may be a structure in which the mark M**1** is deleted only in a case in which all of the above-described three conditions are satisfied.
[0080] Further, in the above-described exemplary embodiment, the mark M**1** is displayed in a substantially circular form as illustrated in FIG. **4**, but the present disclosure is not limited to this. For example, an arrow-like mark may be displayed above the head of the pedestrian P. Or, separate marks that are different for pedestrians and for two-wheeled vehicles may be displayed.
[0081] Moreover, although the above exemplary embodiment describes a structure in which information is displayed in a superposed manner in the display region V**3** of the third display portion **26**, the present disclosure is not limited to this. For example, a structure may be employed in which information is superposingly displayed in the display region V**1** of the first display portion **24** or the display region V**2** of the second display portion **25**. In this case, information is superposingly displayed on images of the periphery of the vehicle **12** that are captured by the front camera or the like.

Claims

1. A display control device for a vehicle, comprising a processor configured to: acquire a position of an obstacle in a vehicle's surroundings; determine a distance from the vehicle to the obstacle; perform superimposed display of information at the position of the obstacle as viewed by a vehicle occupant, at a display region provided in front of the vehicle occupant, wherein the display of information is performed in a first manner if the determined distance is greater than a predetermined threshold and in a second manner if the determined distance is less than or equal to the predetermined threshold; determine whether the vehicle occupant has perceived the obstacle; and delete the display of the information when it is determined that the vehicle occupant has perceived the obstacle while the information is displayed so the vehicle occupant can identify a new obstacle at an early stage.
2. The display control device for a vehicle of claim 1, wherein the processor acquires a sightline direction of the vehicle occupant, and deletes the display of the information in a case in which a sightline direction of the vehicle occupant, which has been acquired, has been directed toward the obstacle for a predetermined time.
3. The display control device for a vehicle of claim 1, wherein the processor acquires a steering direction of the vehicle, and deletes the display of the information in a case in which the steering direction of the vehicle, which has been acquired, is a direction of moving away from the obstacle.
4. The display control device for a vehicle of claim 1, wherein the processor acquires an acceleration of the vehicle, and deletes the display of the information in a case in which the acceleration of the vehicle, which has been acquired, has decreased by a predetermined amount or more.
5. The display control device for a vehicle of claim 1, wherein the display region comprises a portion of a windshield glass onto which images are projected in front of a sightline of a driver by a head-up display device.
6. A display system for a vehicle, the system comprising: the display control device for a vehicle of claim 1; and a head-up display device configured to project images onto a windshield glass.
7. A display control method for a vehicle, the method comprising: acquiring a position of an obstacle that is in a vehicle's surroundings; determining a distance from the vehicle to the obstacle; displaying information at the position of the obstacle as viewed by a vehicle occupant, at a display region within a vehicle cabin, wherein the information is displayed in a first manner if the

determined distance is greater than a predetermined threshold and in a second manner if the determined distance is less than or equal to the predetermined threshold; determining whether the vehicle occupant has perceived the obstacle; and when it is determined that the vehicle occupant has perceived the obstacle while the information is displayed, deleting display of the information.

8. A non-transitory storage medium storing a program that is executable by a computer to execute processing comprising: acquiring a position of an obstacle that is in a vehicle's surroundings; determining a distance from the vehicle to the obstacle; displaying information on a windshield of the vehicle with a heads-up-displayed device at the position of the obstacle as viewed by a vehicle occupant, at a display region within a vehicle cabin, wherein the information is displayed in a first manner if the determined distance is greater than a predetermined threshold and in a second manner if the determined distance is less than or equal to the predetermined threshold; determining whether the vehicle occupant has perceived the obstacle; and when it is determined that the vehicle occupant has perceived the obstacle while the information is displayed, deleting display of the information.

9. The display control device of claim 1, wherein the first manner comprises displaying the information in a first color, and the second manner comprises displaying the information in a second color.