VEHICLE INPUT DEVICE, VEHICLE INPUT METHOD, AND NON-TRANSITORY STORAGE MEDIUM STORED WITH VEHICLE INPUT PROGRAM

BACKGROUND

Technical Field

[0001] The present disclosure relates to a vehicle input device.

[0002] For example, Japanese Patent Application Laid-Open (JP-A) No. 2006-315562 discloses an in-vehicle input device in which plural switches are provided at a steering wheel. In this in-vehicle input device, the placement of options on a virtual screen displayed on a front windshield by a head-up display corresponds with the placement of the switches.

[0003] When there is a correspondence relationship between positions on a virtual screen and the positions of switches (operation sections) as in the in-vehicle input device disclosed in JP-A No. 2006-315562, an occupant can more easily operate a desired switch while keeping their gaze directed toward the front. However, the likelihood of erroneous input increases if the plural switches are disposed close together.

SUMMARY

[0004] The present disclosure obtains a vehicle input device capable of suppressing erroneous input during operation without the need to greatly shift one's gaze when driving in a case in which plural operation sections are disposed close together.

[0005] A vehicle input device of a first aspect includes an operation detection section configured to detect input to an onboard unit allocated to one operation section of plural of operation sections provided in a vicinity of a driving seat due to the one operation section being operated, a preliminary action detection section configured to detect a preliminary action directly prior to the one operation section being operated, a display section provided at a vehicle front side of the driving seat and configured to display images that represent each of the plurality of operation sections, and a notification section configured to notify an occupant by displaying, on the display section, information relating to the onboard unit allocated to the one operation section~~images that represent each of the plurality of operation sections~~ in a case in which the preliminary action has been detected by the preliminary action detection section, prior to the one operation section being operated. The operation detection section is configured to detect input to the onboard unit allocated to the one operation section, due to the one operation section being pressed, and the preliminary action detection section is configured to detect touching of the one operation section by the occupant as the preliminary action directly prior to the one operation section being pressed.

The notification section is configured to display on the display section, with every image layer, at least one of an icon or text indicating the onboard unit allocated to the one operation section being touched by the occupant. A different function is allocated to at least one operation section of the plurality of operation sections, depending on the image layer displayed on the display section, when the at least one of an icon or text displayed on the display section is switched.

[0006] In the vehicle input device as disclosed, the plural operation sections are provided in the vicinity of the driving seat. Input to the onboard unit allocated to the one operation section is detected by the operation detection section when the one operation section is operated by the occupant.

[0007] The preliminary action directly prior to the one operation section being operated is detected by the preliminary action detection section. The occupant is then notified of the

information relating to the onboard unit allocated to the one operation section by the notification section. The occupant is therefore able to ascertain the information relating to the onboard unit allocated to the one operation section directly prior to the one operation section being operated without diverting their eyes toward the operation section. Note that the "operation" referred to here is, for example, a concept encompassing pressing the operation section or touching the operation section. Moreover, the "onboard unit" referred to here is, for example, a concept encompassing travel assist equipment such as active cruise control (ACC) and lane tracing assist (LTA) in addition to other equipment such as an air conditioner, an audio system, a car navigation system, or an audio input device.

[0008]

[0009] In the vehicle input device as disclosed, the information relating to the onboard unit allocated to the one operation section is displayed on the display section at the vehicle front of the driving seat in a case in which the preliminary action directly prior to the one operation section being operated has been detected by the preliminary action detection section. This enables the occupant to ascertain the information relating to the onboard unit allocated to the operation section they are about to operate by looking at the display section.

[0010] ~~The operation detection section may be configured to detect input to the onboard unit allocated to the one operation section due to the one operation section being pressed, and the preliminary action detection section is configured to detect touching of the one operation section by the occupant as the preliminary action directly prior to the one operation section being pressed.~~

[0011] In the vehicle input device as disclosed, the information relating to the onboard unit allocated to the operation section that is being touched is displayed on the display section when the occupant touches the one operation section. This enables the occupant to ascertain the information relating to the onboard unit they are about to operate by touching the one operation section. From the touched state, input to the onboard unit is then performed by pressing the operation section.

[0012] The notification section may be configured to emphatically display the image corresponding to the one operation section that the occupant is touching.

[0013] In the vehicle input device as disclosed, an image is displayed on the display

section to represent each of the plural operation sections. The notification section emphatically displays the image corresponding to the one operation section that the occupant is touching. This enables the occupant to ascertain which of the operation sections they are touching by looking at the display section.

[0014] ~~The notification section may be configured to display on the display section at least one of an icon or text indicating the onboard unit allocated to the one operation section being touched by the occupant.~~

[0015] In the vehicle input device as disclosed, the notification section displays on the display section the at least one of an icon or text for the information relating to the onboard unit allocated to the one operation section being touched by the occupant. This enables the occupant to see the at least one of an icon or text displayed on the display section.

[0016] ~~A different function may be allocated to at least one operation section of the plural operation sections when the at least one of an icon or text displayed on the display section is switched.~~

[0017] In the vehicle input device as disclosed, a different function is allocated to the operation section when the at least one of the icon or text displayed on the display section is switched. Namely, plural functions can be allocated to a single operation section.

[0018] At least one operation section of the plural operation sections may be switched to an inoperable state when the at least one of an icon or text displayed on the display section is categorized as not-for-display.

[0019] In the vehicle input device as disclosed, the at least one operation section of the operation sections is switched to the inoperable state when the at least one of the icon or text displayed on the display section is categorized as not-for-display. This enables the occupant to ascertain the operation section that is inoperable by looking at the display section. Note that "inoperable" here is a concept encompassing cases in which although pressing is physically possible, such pressing does not result in input to the allocated onboard unit.

[0020] The display section may be a display screen projected from a head-up display onto a partial region of a windshield.

[0021] In the vehicle input device as disclosed, information relating to the onboard unit allocated to the operation section that is about to be operated is displayed on the windshield. This enables the occupant to ascertain the information while keeping their gaze directed toward the scene ahead of the vehicle.

[0022] The plural operation sections may be provided at a steering wheel provided at a vehicle front of the driving seat.

[0023] In the vehicle input device as disclosed, the plural operation sections are provided at the steering wheel, and input to the onboard unit allocated to the operation section is detected by the operation detection section when the operation section is operated.

[0024] As described above, the vehicle input device as disclosed is capable of suppressing erroneous input during operation without the need to greatly shift one's gaze when driving in a case in which plural operation sections are disposed close together.

[0025] The vehicle input device as disclosed is also capable of suppressing erroneous input since the occupant looks at the information displayed on the display section while driving.

[0026] The vehicle input device as disclosed enables the occupant to ascertain the information relating to the onboard unit allocated to the one operation section without performing a deliberate action directly prior to operating the one operation section.

[0027] The vehicle input device as disclosed also enables the operation section that is being touched to be easily ascertained.

[0028] The vehicle input device as disclosed also enables the occupant to reliably ascertain the information relating to the onboard unit that they are about to operate while keeping their gaze directed ahead of the vehicle.

[0029] The vehicle input device as disclosed further enables the number of operation sections to be decreased in comparison to cases in which only a single function is allocated to a single operation section.

[0030] The vehicle input device as disclosed further enables the occupant to easily check operable operation sections and input-disabled operation sections while looking ahead of the vehicle.

[0031] The vehicle input device as disclosed further enables the occupant to look at the information displayed on the display section while keeping their gaze directed toward the scene ahead of the vehicle.

[0032] The vehicle input device as disclosed further enables the occupant to perform input to the onboard unit in a while gripping the steering wheel.

[0032a] Another aspect provides a vehicle input method comprising detecting input to an onboard unit allocated to one operation section of a plurality of operation sections provided in a vicinity of a driving seat, due to the one operation section being operated; detecting a preliminary action directly prior to the one operation section being operated; and notifying an occupant by displaying, on a display section at a vehicle front side of the driving

seat, information relating to the onboard unit allocated to the one operation section~~images that represent each of the plurality of operation sections~~ in a case in which the preliminary action has been detected, prior to the one operation section being operated. The method also includes detecting the input to the onboard unit allocated to the one operation section when the one operation section is pressed, detecting touching of the one operation section by the occupant as the preliminary action directly prior to the one operation section being pressed, displaying on the display section, with every image layer, at least one of an icon or text indicating the onboard unit allocated to the one operation section being touched by the occupant, and allocating a different function to at least one operation section of the plurality of operation sections, depending on the image layer displayed on the display section, when the at least one of an icon or text displayed on the display section is switched.

[0032b] Another aspect provides a non-transitory storage medium storing a program executable by a processor to perform vehicle input processing, the vehicle input processing comprising detecting input to an onboard unit allocated to one operation section of a plurality of operation sections provided in a vicinity of a driving seat, due to the one operation section being operated; detecting a preliminary action directly prior to the one operation section being operated; and notifying an occupant by displaying, on a display section at a vehicle front side of the driving seat, information relating to the onboard unit allocated to the one operation section~~images that represent each of the plurality of operation sections~~ in a case in which the preliminary action has been detected, prior to the one operation section being operated. The vehicle input processing further comprises detecting the input to the onboard unit allocated to the one operation section when the one operation section is pressed, detecting touching of the one operation section by the occupant as the preliminary action directly prior to the one operation section being pressed, displaying on the display section, with every image layer, at least one of an icon or text indicating the onboard unit allocated to the one operation section being touched by the occupant, and allocating a different function to at least one operation section of the plurality of operation sections, depending on the image layer displayed on the display section, when the at least one of an icon or text displayed on the display section is switched.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] Exemplary embodiments of the present invention will be described in detail based on the following figures, wherein:

CLAIMS

1. A vehicle input device comprising:

an operation detection section configured to detect input to an onboard unit allocated to one operation section of a plurality of operation sections provided in a vicinity of a driving seat, due to the one operation section being operated;

a preliminary action detection section configured to detect a preliminary action directly prior to the one operation section being operated;

a display section provided at a vehicle front side of the driving seat and configured to display images that represent each of the plurality of operation sections; and

a notification section configured to notify an occupant by displaying, on the display section, ~~images that represent each of the plurality of operation sections~~ information relating to the onboard unit allocated to the one operation section~~,~~ in a case in which the preliminary action has been detected by the preliminary action detection section, prior to the one operation section being operated,

wherein the operation detection section is configured to detect input to the onboard unit allocated to the one operation section, due to the one operation section being pressed, and the preliminary action detection section is configured to detect touching of the one operation section by the occupant as the preliminary action directly prior to the one operation section being pressed,

wherein the notification section is configured to display on the display section, with every image layer, at least one of an icon or text indicating the onboard unit allocated to the one operation section being touched by the occupant, and

wherein a different function is allocated to at least one operation section of the plurality of operation sections, depending on the image layer displayed on the display section, when the at least one of an icon or text displayed on the display section is switched.

~~2. The vehicle input device of claim 1, wherein:~~

~~the operation detection section is configured to detect input to the onboard unit allocated to the one operation section, due to the one operation section being pressed; and~~

~~the preliminary action detection section is configured to detect touching of the one operation section by the occupant as the preliminary action directly prior to the one operation section being pressed.~~

~~3~~2. The vehicle input device of claim ~~2~~1, wherein:

the notification section is configured to emphatically display, from the images representing each of the plurality of operation sections, an image corresponding to the one operation section that the occupant is touching.

~~4. The vehicle input device of claim 2 or claim 3, wherein:~~

~~the notification section is configured to display on the display section at least one of an icon or text indicating the onboard unit allocated to the one operation section being touched by the occupant.~~

~~5. The vehicle input device of claim 4, wherein:~~

~~a different function is allocated to at least one operation section of the plurality of operation sections when the at least one of an icon or text displayed on the display section is switched.~~

~~6~~3. The vehicle input device of claim ~~4~~ 1 or claim ~~5~~2, wherein:

at least one operation section of the plurality of operation sections is switched to an inoperable state when the at least one of an icon or text displayed on the display section is categorized as not-for-display.

~~7~~4. The vehicle input device of any one of claim 1 to claim ~~6~~3, wherein the display section is a display screen projected from a head-up display onto a partial region of a windshield.

~~8~~5. The vehicle input device of any one of claim 1 to claim ~~7~~4, wherein the plurality of operation sections are provided at a steering wheel provided at a vehicle front of the driving seat.

~~9~~6. A vehicle input method comprising:

detecting input to an onboard unit allocated to one operation section of a plurality of operation sections provided in a vicinity of a driving seat, due to the one operation section being operated;

detecting a preliminary action directly prior to the one operation section being operated; and

notifying an occupant by displaying, on a display section at a vehicle front side of the driving seat, information relating to the onboard unit allocated to the one operation section ~~images that represent each of the plurality of operation sections~~ in a case in which the

preliminary action has been detected, prior to the one operation section being operated,

wherein the method further comprises:

detecting the input to the onboard unit allocated to the one operation section when the one operation section is pressed;

detecting touching of the one operation section by the occupant as the preliminary action directly prior to the one operation section being pressed;

displaying on the display section, with every image layer, at least one of an icon or text indicating the onboard unit allocated to the one operation section being touched by the occupant; and

allocating a different function to at least one operation section of the plurality of operation sections, depending on the image layer displayed on the display section, when the at least one of an icon or text displayed on the display section is switched.

~~10. The vehicle input method of claim 9, further comprising:~~

~~detecting the input to the onboard unit allocated to the one operation section when the one operation section is pressed; and~~

~~detecting touching of the one operation section by the occupant as the preliminary action directly prior to the one operation section being pressed.~~

~~11~~7. The vehicle input method of claim ~~10~~6, further comprising emphatically displaying an image, from ~~the~~ images representing each of the plurality of operation sections, which is an image corresponding to the one operation section that the occupant is touching.

~~12. The vehicle input method of claim 10 or claim 11, further comprising displaying on the display section at least one of an icon or text indicating the onboard unit allocated to the one operation section being touched by the occupant.~~

~~13~~8. A non-transitory storage medium storing a program executable by a processor to perform vehicle input processing, the vehicle input processing comprising:

detecting input to an onboard unit allocated to one operation section of a plurality of operation sections provided in a vicinity of a driving seat, due to the one operation section being operated;

detecting a preliminary action directly prior to the one operation section being operated; and

notifying an occupant by displaying, on a display section at a vehicle front side of the

driving seat, ~~images that represent each of the plurality of operation sections~~ information relating to the onboard unit allocated to the one operation section in a case in which the preliminary action has been detected, prior to the one operation section being operated,

wherein the vehicle input processing further comprises:

detecting the input to the onboard unit allocated to the one operation section when the one operation section is pressed;

detecting touching of the one operation section by the occupant as the preliminary action directly prior to the one operation section being pressed;

displaying on the display section, with every image layer, at least one of an icon or text indicating the onboard unit allocated to the one operation section being touched by the occupant; and

allocating a different function to at least one operation section of the plurality of operation sections, depending on the image layer displayed on the display section, when the at least one of an icon or text displayed on the display section is switched.

~~14. The non-transitory storage medium of claim 13, wherein the vehicle input processing further comprises:~~

~~detecting the input to the onboard unit allocated to the one operation section when the one operation section is pressed; and~~

~~detecting touching of the one operation section by the occupant as the preliminary action directly prior to the one operation section being pressed.~~

~~15~~9. The non-transitory storage medium of claim ~~14~~8, wherein the vehicle input processing further comprises:

emphatically displaying, from ~~the~~ images representing each of the plurality of operation sections, an image corresponding to the one operation section that the occupant is touching.

~~16. The non-transitory storage medium of claim 14 or claim 15, wherein the vehicle input processing further comprises:~~

~~displaying on the display section at least one of an icon or text indicating the onboard unit allocated to the one operation section being touched by the occupant.~~