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(71) Applicant: **MERCEDES-BENZ GROUP AG** [DE/DE];
Mercedesstrasse 137, D-70327 Stuttgart (DE).

(71) Applicant (for BR only): **DAIMLER GREATER CHI-
NA LTD.** [CN/CN]; Building C, Daimler Building, No. 8
Wangjing Street, Chaoyang District, Beijing 100102 (CN).

(72) Inventors: **LI, Yumin**; Building C, Daimler Building,
No. 8 Wangjing Street, Chaoyang District, Beijing 100102
(CN). **ZHANG, Jiwei**; Building C, Daimler Building, No. 8
Wangjing Street, Chaoyang District, Beijing 100102 (CN).

(74) Agent: **NTD UNIVATION INTELLECTUAL PROP-
ERTY AGENCY LTD.**; 10th Floor, Tower C, Beijing
Global Trade Center, 36 North Third Ring Road East,
Dongcheng District, Beijing 100013 (CN).

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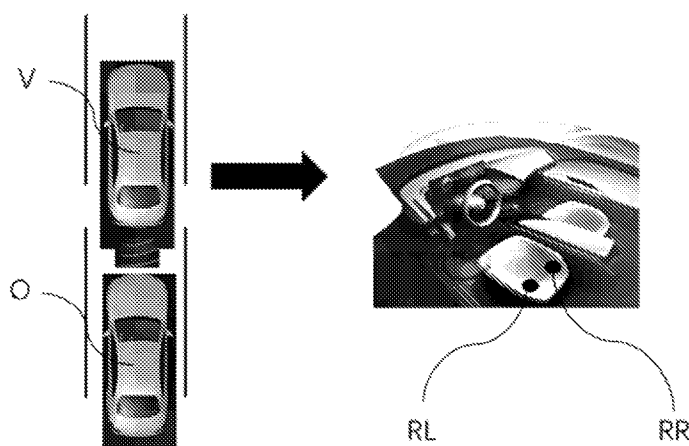


FIG. 5a

(57) Abstract: The present invention relates to a driving assistance device (1) for proximity warning, wherein the driving assistance device comprises: a seat device (10) comprising at least one vibration generating device (FL, RL, FR, RR); a sensor device (20) configured to detect surroundings of a vehicle (V) and to detect motion data regarding an approach of another object (O) in the surroundings of the vehicle (V) with respect to the vehicle; and a controller (30) device configured to trigger the at least one vibration generating device of the seat device according to the motion data detected by the sensor device in order to warn a driver of the approach of other object with respect to the vehicle. The invention also relates to a method for proximity warning, a corresponding vehicle and a computer program product. The invention enables directly perceptible and efficient proximity warning during the travelling of the vehicle, thereby further improving the driving experience and safety. (FIG. 5a)



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DRIVING ASSISTANCE DEVICE AND METHOD FOR PROXIMITY WARNING, VEHICLE AND PROGRAM PRODUCT

TECHNICAL FIELD

5 This disclosure relates to the field of driver assistance, and also relates to a driving assistance device and a method for proximity warning. The disclosure further relates to a vehicle with such a driving assistance device for proximity warning. In addition, the disclosure relates to a computer program product.

BACKGROUND ART

At present, driving assistance systems have been widely applied in vehicles. Particularly in the field of assisted or automated driving, the driving assistance system can provide drivers with support functions while driving.

15 Common driving assistance devices for warning are, for example, voice warning devices. For example, when there is an obstacle ahead, or a vehicle is overtaking or the present vehicle is overtaking, the sensor system will detect an approach of the vehicle and inform the driver of the approach of the associated obstacle or vehicle through the voice warning device. However, this type of voice warning usually cannot achieve a good warning effect when there is a loud
20 noise in the surroundings or when a sound or video is being played in the vehicle. In particular, the situation where the driver suffers from hearing impairment is not fully considered, which also affects user friendliness and user experience.

In addition, common driving assistance devices for warning are, for example, visual warning
25 devices. For example, various warning symbols or texts are set on an instrument panel or a display screen. However, the driver has to divert his/her attention to observe the warning symbols or texts while concentrating on driving, which also results in poor warning effect and user experience. In particular in case of emergency, this type of visual warning may even cause safety hazards.

30 Therefore, there is still a need for an effective and directly perceptible driving assistance device for proximity warning.

SUMMARY OF THE INVENTION

35 For this reason, this disclosure proposes an efficient solution, which can not only overcome the deficiencies in the existing technical solutions, but also efficiently enable vehicle proximity warning through a simple modular integration of the devices already installed in the vehicle on the basis of the existing driving assistance device, without increasing complexity of the existing system.

According to a first aspect of the disclosure, a driving assistance device for proximity warning is provided, the driving assistance device comprising:

5 a seat device comprising at least one vibration generating device;

a sensor device configured to detect surroundings of a vehicle and to detect motion data regarding an approach of another object in the surroundings of the vehicle with respect to the vehicle; and

10 a controller device configured to trigger the at least one vibration generating device of the seat device according to the motion data detected by the sensor device, in order to warn a driver of the approach of the other object with respect to the vehicle.

15 The basic idea of the disclosure is to enable the warning of an approach of an object in the surroundings of the vehicle relative to the present vehicle by means of integrating a vibration generating device, in particular a plurality of vibration generating devices, into the existing seat device. In particular, such proximity warning does not require any major changes to the existing system, and it can achieve efficient and directly perceptible proximity warning based
20 on vibration modes of the plurality of vibration generating devices.

An advantageous configuration of the driving assistance device for proximity warning of the disclosure can be obtained from alternative embodiments.

25 According to the arrangement of an embodiment of the driving assistance device for proximity warning of the disclosure, a first vibration generating device, a second vibration generating device, a third vibration generating device and a fourth vibration generating device are arranged in a seat cushion and/or a backrest of the seat device, and the first vibration generating device, the second vibration generating device, the third vibration generating
30 device and the fourth vibration generating device are arranged in a rectangle and each corner of the rectangle represents a front left direction, a rear left direction, a front right direction and a rear right direction of the vehicle, respectively. By way of such an arrangement, four directions of the vehicle can be each represented by one of the vibration generating devices, thereby achieving an effective vibration warning through the vibration of the vibration
35 generating devices arranged in different positions.

According to the arrangement of an alternative embodiment of the driving assistance device for proximity warning of the disclosure, the sensor device comprises at least one of the following sensors: a radar sensor, a LiDAR sensor, a millimeter wave sensor, an infrared

sensor, an ultrasonic sensor and a camera. By means of the above sensors capable of distance and speed measurement as well as detection, the motion data of the object in the surroundings relative to the vehicle can be accurately and effectively identified.

5 According to the arrangement of an alternative embodiment of the driving assistance device for proximity warning of the disclosure, the first vibration generating device, the second vibration generating device, the third vibration generating device and the fourth vibration generating device can be triggered individually or in combinations, wherein the motion data include an approach direction of the object with respect to the vehicle, and the first vibration
10 generating device, the second vibration generating device, the third vibration generating device and the fourth vibration generating device are triggered correspondingly according to the approach direction. By means of vibration combinations of the plurality of vibration generating devices, one-to-one correspondence of vibration combinations and approach directions of vehicles can be effectively established. Such an embodiment can provide the
15 driver with proximity warning in a clear and directly perceptible manner, thereby improving driving safety and user acceptance.

According to the arrangement of an alternative embodiment of the driving assistance device for proximity warning of the disclosure, the motion data include an approach speed and/or an
20 approach distance of the object with respect to the vehicle, and a vibration intensity and/or a vibration frequency of the first vibration generating device, the second vibration generating device, the third vibration generating device and the fourth vibration generating device is adapted correspondingly according to the approach speed and/or the approach distance, wherein a higher vibration intensity and/or a higher vibration frequency represents a more
25 imminent approach of the object with respect to the vehicle. In addition to the warning of the approach direction, adjustment of vibration parameters of the vibration generating devices can also output the proximity warning in conjunction with the vibration combinations of the vibration generating devices in a more efficient and clearer manner. In this way, the driver can be informed more directly and clearly of the dangers in the surroundings, thereby further
30 improving the driving safety.

According to the arrangement of an alternative embodiment of the driving assistance device for proximity warning according to the disclosure, the vehicle is a passenger vehicle or a commercial vehicle, and/or the object is a pedestrian, bicycle, another vehicle, in particular a
35 passenger vehicle or commercial vehicle in the surroundings of the vehicle. Such an embodiment of the disclosure can be applied not only to a passenger vehicle, but also to a commercial vehicle. In particular, it can be applied to a passenger vehicle, such as a truck, and it additionally warns the driver of blind spots while driving.

According to a second aspect of the disclosure, a vehicle is provided, which comprises one of the above driving assistance devices for proximity warning.

According to a third aspect of the disclosure, a method for proximity warning is provided, the method comprising:

S1: detecting motion data of an approach of an object in surroundings of a vehicle with respect to the vehicle; and

S2: triggering at least one vibration generating device correspondingly according to the motion data.

According to the arrangement of an embodiment of the method for proximity warning of the disclosure, a first vibration generating device, a second vibration generating device, a third vibration generating device and a fourth vibration generating device are provided, and the first vibration generating device, the second vibration generating device, the third vibration generating device and the fourth vibration generating device are arranged in a rectangle and each corner of the rectangle represents a front left direction, a rear left direction, a front right direction and a rear right direction of the vehicle, respectively; and/or

the motion data include an approach direction of the object with respect to the vehicle, and the first vibration generating device, the second vibration generating device, the third vibration generating device and the fourth vibration generating device are triggered correspondingly according to the proximity direction; and/or

the motion data include an approach speed and/or an approach distance of the object with respect to the vehicle, and a vibration intensity and/or a vibration frequency of the first vibration generating device, the second vibration generating device, the third vibration generating device and the fourth vibration generating device is adapted correspondingly according to the approach speed and/or the approach distance.

According to the arrangement of an embodiment of the method for proximity warning of the disclosure, additionally, a proximity warning corresponding to the motion data is output in the form of a voice warning to the driver by means of an acoustic device. Alternatively or additionally, a proximity warning corresponding to the motion data is output in the form of a visual warning to the driver by means of a display device. In this way, the driver is provided with voice warnings and/or visual warnings in addition to the vibration warnings of the vibration devices, thereby achieving an efficient proximity warning and improving driving safety.

According to a fourth aspect of the disclosure, a computer program product is provided, comprising computer program instructions which, when executed by a processor, are at least used to assist in implementation of the method for proximity warning.

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Within the scope of the disclosure, “approach” refers to a relative movement, and may also refer to the approach of a moving vehicle with respect to a stationary object in the environment.

10 Further features of the disclosure will become obvious based on the claims, the drawings and the description of the drawings. Features and feature combinations mentioned in the above description as well as features and feature combinations mentioned in the following description of the drawings and/or shown only in the drawings can be used not only in correspondingly specified combinations, but also in other combinations without departing
15 from the scope of the disclosure. Therefore, the following contents are also considered to be covered and disclosed by the disclosure: contents which are not explicitly shown in the drawings or explicitly explained, but are derived from combinations consisting of separate features from the already explained contents and are produced by these combinations. The following contents and feature combinations are also considered to be disclosed: those which
20 do not have all the features of the originally drafted independent claims. Furthermore, the following contents and feature combinations are considered to be disclosed in particular by the above contents: those which exceed or depart from the feature combinations defined in the reference relationships of the claims.

25 BRIEF DESCRIPTION OF THE DRAWINGS

The principles, characteristics and advantages of the disclosure can be better understood by describing the disclosure in greater detail below with reference to the accompanying drawings. The drawings are as follows:

30 FIG. 1 shows a schematic diagram of a driving assistance device for proximity warning according to an exemplary embodiment of the disclosure;

FIG. 2 shows a schematic view of a seat device;

35 FIG. 3 shows a schematic view of a layout of vibration generating devices;

FIGS. 4a to 4d show schematic diagrams of different vibration generating devices according to an approach direction of an object with respect to the vehicle;

FIGS. 5a to 5d show schematic diagrams of different combinations of vibration generating devices according to an approach direction of an object with respect to the vehicle;

FIG. 6 shows a flowchart of a method for proximity warning according to an exemplary embodiment of the disclosure.

DETAILED DESCRIPTION OF THE INVENTION

For a clearer understanding of the technical problems to be solved, technical solutions and advantageous technical effects of the disclosure, the disclosure will be further elaborated below in conjunction with the drawings and a number of embodiments. It is to be understood that the specific embodiments described herein are merely for explaining the disclosure, rather than limiting the scope of protection of the disclosure.

FIG. 1 shows a schematic diagram of a driving assistance device 1 for proximity warning according to an exemplary embodiment of the disclosure. The driving assistance device 1 comprises a seat device 10, a sensor device 20 and a controller device 30. The seat device 10 comprises at least one vibration generating device. The sensor device 20 can detect surroundings of a vehicle V and detect motion data regarding an approach of another object O in the surroundings of the vehicle V with respect to the vehicle V. The controller device 30 is configured to trigger vibration generating devices, FL, RL, FR and RR, of the seat device 10 according to the motion data detected by the sensor device 20, in order to warn a driver of the approach of the other object O with respect to the vehicle V. In this exemplary embodiment, sensor devices 20 are arranged in four corners, i.e. the front left corner, the rear left corner, the front right corner, and the rear right corner, of the vehicle, respectively. In this exemplary embodiment, the other object O is another vehicle O in the surroundings of the vehicle V.

FIG. 2 shows a schematic view of the seat device 10. As can be seen from FIG. 2, the seat device 10 comprises a seat cushion and a backrest. In this exemplary embodiment, the seat device 10 comprises four vibration generating devices, FL, RL, FR and RR, which are arranged in the seat cushion. Of course, these vibration generating devices may be alternatively or additionally arranged in the backrest.

FIG. 3 shows a schematic view of a layout of vibration generating devices. As shown in FIG. 3, the first vibration generating device FL, i.e. the front left vibration generating device, the second vibration generating device RL, i.e. the rear left vibration generating device, the third vibration generating device FR, i.e. the front right vibration generating device, and the fourth vibration generating device RR, i.e. the rear right vibration generating device, are arranged in four corners of the seat cushion, respectively, and can vibrate individually or in combinations. In this exemplary embodiment, the four vibration generating devices, FL, RL, FR and RR,

are configured as motors.

Exemplary embodiments of the disclosure are explained in detail below in conjunction with FIGS. 4a to 4d and FIGS. 5a to 5d.

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FIG. 4a shows a first scenario. In the first scenario, the vehicle V is travelling on a two-lane road in the same direction, and it detects with the sensor device 20 (not shown) arranged at the rear left side that another vehicle O is approaching the vehicle V from the rear left direction. In this scenario, the other vehicle O is at a short distance from the vehicle V and meanwhile is at a higher speed relative to the vehicle. In other words, the other vehicle O is approaching the vehicle V and is about to overtake the vehicle V from the left side. Here, the sensor device 20 detects the direction of the other vehicle O and determines a relative speed and a relative distance of the other vehicle O with respect to the vehicle V, and then sends these data to the controller device 30. Based on the received data, the controller device 30 triggers the first vibration generating device FL arranged in the seat cushion. The first vibration generating device FL vibrates in response to a triggering instruction. In this way, the driver of the vehicle V can receive a clear and directly perceptible warning that another vehicle O is approaching the vehicle V from the rear left direction and is about to overtake.

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FIG. 4b shows a second scenario corresponding to the first scenario, in which second scenario, the vehicle V is still travelling on a two-lane road in the same direction, and it detects with the sensor device 20 (not shown) arranged at the rear left side that another vehicle O is approaching the vehicle V from the rear left direction. Different from the first scenario, the second scenario shows that the other vehicle O is at a long distance from the vehicle V and meanwhile is at a lower speed relative to the vehicle. In other words, the other vehicle O is not in close proximity to the vehicle V. Here, the sensor device 20 detects the direction of the other vehicle O and determines a relative speed and a relative distance of the other vehicle O with respect to the vehicle V, and then sends these data to the controller device 30. Based on the received data, the controller device 30 triggers the second vibration generating device RL arranged in the seat cushion. The second vibration generating device RL vibrates in response to a triggering instruction. In this way, the driver of the vehicle V can receive a clear and directly perceptible warning that another vehicle O in the rear left direction is at a relatively long distance from the vehicle V and is not in close proximity thereto.

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Similar to FIGS. 4a and 4b, FIGS. 4c and 4d show a third scenario and a fourth scenario, respectively. In FIG. 4c, i.e. the third scenario, the vehicle V is travelling on a two-lane road in the same direction, and it detects with the sensor device 20 (not shown) arranged at the rear right side that another vehicle O is approaching the vehicle V from the rear right direction.

The other vehicle O is at a short distance from the vehicle V and meanwhile is at a higher speed relative to the vehicle. Therefore, the third vibration generating device FR vibrates. In this way, the driver can receive a clear and directly perceptible warning that another vehicle O is approaching the vehicle V from the rear right direction and is about to overtake. While in FIG. 4d, i.e. the fourth scenario, another vehicle O is at a long distance from the vehicle V and meanwhile is at a lower speed relative to the vehicle. Therefore, the fourth vibration generating device RR vibrates. In this way, the driver can receive a clear and directly perceptible warning that another vehicle O in the rear right direction is at a relatively long distance from the vehicle V and is not in close proximity thereto.

Now referring to FIGS. 5a and 5b, it can be seen that the vehicle V detects with the sensor device 20 that another vehicle O is approaching the vehicle V from behind or in the front. Both the situations may lead to a rear-end collision. In FIG. 5a, for example, the other vehicle O is in the same lane with the vehicle V and is travelling right behind the vehicle V, in which case the vehicle V detects a shortening relative distance between the other vehicle O and the vehicle V and also a greater relative speed therebetween (for example, the vehicle O is accelerating). Based on the received data, the controller device 30 simultaneously triggers the second vibration generating device RL and the fourth vibration generating device RR arranged in the seat cushion. In this way, the driver of the vehicle V can receive a clear and directly perceptible warning that another vehicle O is approaching the vehicle V from behind. In FIG. 5b, it can be seen that another vehicle O is in the same lane with the vehicle V and is travelling right in the front, in which case the vehicle V detects a shortening relative distance between the other vehicle O and the vehicle V and also a greater relative speed therebetween (for example, the other vehicle O is slowing down). By means of triggering the first vibration generating device FL and the third vibration generating device FR to vibrate simultaneously, the driver of the vehicle V can be clearly and directly warned that another vehicle O ahead is approaching the vehicle V.

Similar to FIGS. 5a and 5b, FIG. 5c shows that the vehicle V detects that another vehicle O is approaching from the left side, and FIG. 5d shows that the vehicle V detects that another vehicle O is approaching from the right side. Therefore, the first vibration generating device FL and the second vibration generating device RL in the seat cushion vibrate simultaneously to warn the driver of the vehicle V that another vehicle O is approaching from the left side; or the third vibration generating device FR and the fourth vibration generating device RR in the seat cushion vibrate simultaneously to warn the driver of the vehicle V that another vehicle O is approaching from the right side.

In addition, in the scenarios of FIGS. 4a to 4d and in FIGS. 5a to 5d, the driver of the vehicle V may be additionally warned of an approach degree of the other vehicle O through

adjustment of the vibration intensity and vibration frequency of the vibration generating devices. For example, a higher vibration intensity and a higher vibration frequency represent another rapidly approaching vehicle O relative to the vehicle V, and the distance between the two vehicles shortens with the increasing vibration intensity and/or vibration frequency, or the relative speed between the two vehicles increases with the increasing vibration intensity and/or vibration frequency, so that the driver of the vehicle V can be directly and effectively informed of the traffic condition in the surroundings of the vehicle V, in order to provide him with sufficient time for responding and operating.

Certainly, the proximity warning corresponding to the motion data may additionally be output in the form of a voice warning to the driver with an acoustic device. In addition, the proximity warning corresponding to the motion data may also be output in the form of a visual warning to the driver through a display device. In this way, the driver can get effectively informed in visual, auditory and tactile aspects simultaneously.

FIG. 6 shows a flowchart of a method for proximity warning according to an exemplary embodiment of the disclosure. In step S1, motion data of an approach of another object O in surroundings of a vehicle V with respect to the vehicle V is detected. In step S2, at least one of vibration generating devices, FL, RL, FR, RR, is triggered correspondingly according to the motion data.

Certainly, any other forms of vibration trigger mode can also be set through this disclosure. Other advantages and alternative embodiments of the disclosure are obvious to those skilled in the art. Therefore, the disclosure in its broader meaning is not limited to the specific details, representative structures and exemplary embodiments shown and described here. On the contrary, a person skilled in the art can make various modifications and alternatives without departing from the basic spirit and scope of the disclosure.

Claims

1. A driving assistance device (1) for proximity warning, wherein the driving assistance device (1) comprises:
a seat device (10) comprising at least one vibration generating device (FL, RL, FR, RR);
a sensor device (20) configured to detect surroundings of a vehicle (V) and to detect motion data regarding an approach of another object (O) in the surroundings of the vehicle (V) with respect to the vehicle (V); and
a controller device (30) configured to trigger the at least one vibration generating device (FL, RL, FR, RR) of the seat device (10) according to the motion data detected by the sensor device (20) in order to warn a driver of the approach of the other object (O) with respect to the vehicle (V).
2. The driving assistance device (1) for proximity warning according to claim 1, wherein a first vibration generating device (FL), a second vibration generating device (RL), a third vibration generating device (FR) and a fourth vibration generating device (RR) are arranged in a seat cushion (100) and/or a backrest (101) of the seat device (10), wherein the first vibration generating device (FL), the second vibration generating device (RL), the third vibration generating device (FR) and the fourth vibration generating device (RR) are arranged in a rectangle and each corner of the rectangle represents a front left direction, a rear left direction, a front right direction and a rear right direction of the vehicle (V), respectively.
3. The driving assistance device (1) for proximity warning according to claim 1 or 2, wherein the sensor device (20) comprises at least one of the following sensors: a radar sensor, a LiDAR sensor, a millimeter wave sensor, an infrared sensor, an ultrasonic sensor, and a camera.
4. The driving assistance device (1) for proximity warning according to claim 2 or 3, wherein the first vibration generating device (FL), the second vibration generating device (RL), the third vibration generating device (FR) and the fourth vibration generating device (RR) can be triggered individually or in combinations, wherein the motion data include an approach direction of the other object (O) with respect to the vehicle (V), and wherein the first vibration generating device (FL), the second vibration generating device (RL), the third vibration generating device (FR) and the fourth vibration generating device (RR) are triggered correspondingly according to the approach direction.
5. The driving assistance device (1) for proximity warning according to any one of claims 2 to 4, wherein the motion data include an approach speed and/or an approach distance of the other object (O) with respect to the vehicle (V), wherein a vibration intensity and/or a

vibration frequency of the first vibration generating device (FL), the second vibration generating device (RL), the third vibration generating device (FR) and the fourth vibration generating device (RR) is adapted correspondingly according to the approach speed and/or the approach distance, wherein a higher vibration intensity and/or a higher vibration frequency represents a more imminent approach of other object (O) with respect to the vehicle (V) .

6. The driving assistance device (1) for proximity warning according to any one of claims 1 to 5, wherein

the vehicle (V) is a passenger vehicle or a commercial vehicle, and/or

the other object (O) is a pedestrian, a bicycle, another vehicle, in particular a passenger vehicle or commercial vehicle, in the surroundings of the vehicle (V).

7. A vehicle (V), comprising the driving assistance device (1) for proximity warning according to any one of the claims 1 to 6.

8. A method for proximity warning, comprising:

S1: detecting motion data of an approach of other object (O) in surroundings of a vehicle (V) with respect to the vehicle (V); and

S2: triggering at least one vibration generating device (FL, RL, FR, RR) correspondingly according to the motion data.

9. The method according to claim 8, wherein

a first vibration generating device (FL), a second vibration generating device (RL), a third vibration generating device (FR) and a fourth vibration generating device (RR) are provided, wherein the first vibration generating device (FL), the second vibration generating device (RL), the third vibration generating device (FR) and the fourth vibration generating device (RR) are arranged in a rectangle and each corner of the rectangle represents a front left direction, a rear left direction, a front right direction and a rear right direction of the vehicle (V), respectively; and/or

the motion data include an approach direction of the other object (O) with respect to the vehicle (V), wherein the first vibration generating device (FL), the second vibration generating device (RL), the third vibration generating device (FR) and the fourth vibration generating device (RR) are triggered correspondingly according to the proximity direction; and/or

the motion data include an approach speed and/or an approach distance of the other object (O) with respect to the vehicle (V), wherein a vibration intensity and/or a vibration frequency of the first vibration generating device (FL), the second vibration generating device (RL), the third vibration generating device (FR) and the fourth vibration generating device (RR) is

adapted correspondingly according to the approach speed and/or the approach distance.

10. A computer program product, comprising computer program instructions which, when executed by a processor, are at least used to assist in implementation of the method according to one of claims 8 to 9.

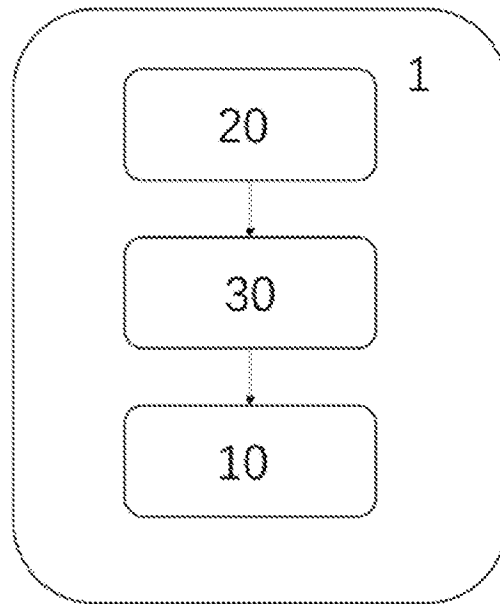


FIG. 1

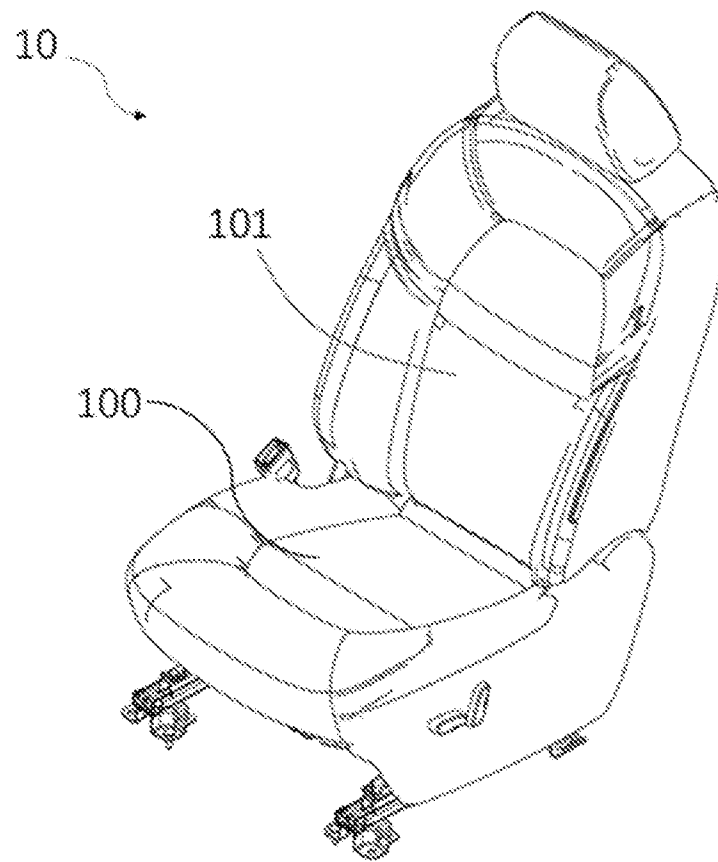


FIG. 2

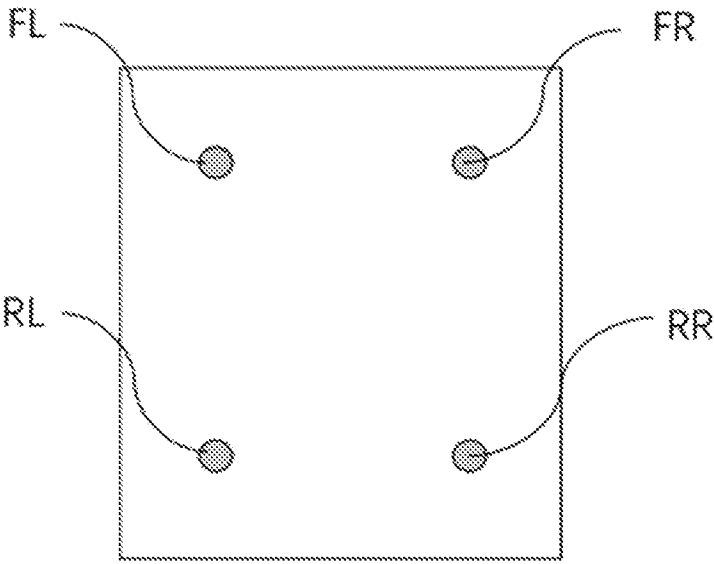


FIG. 3

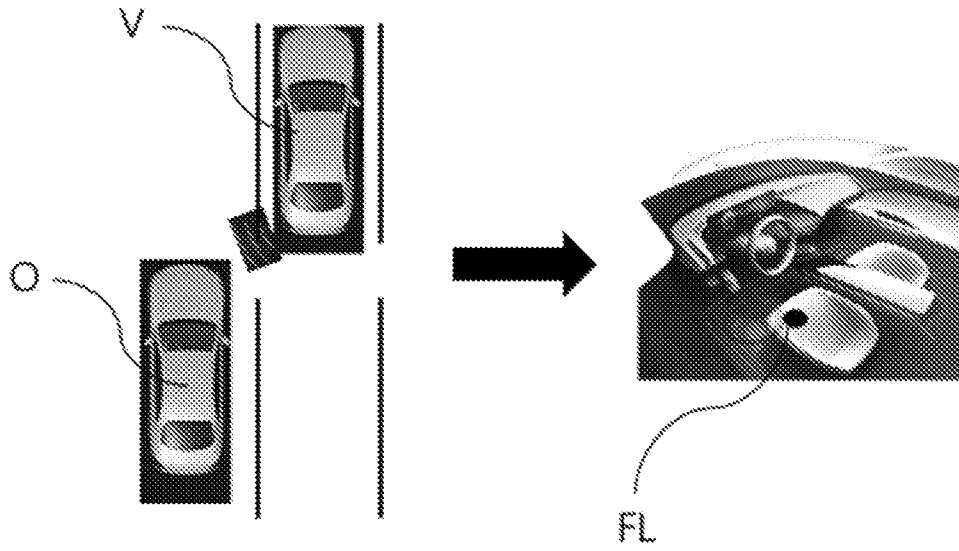


FIG. 4a

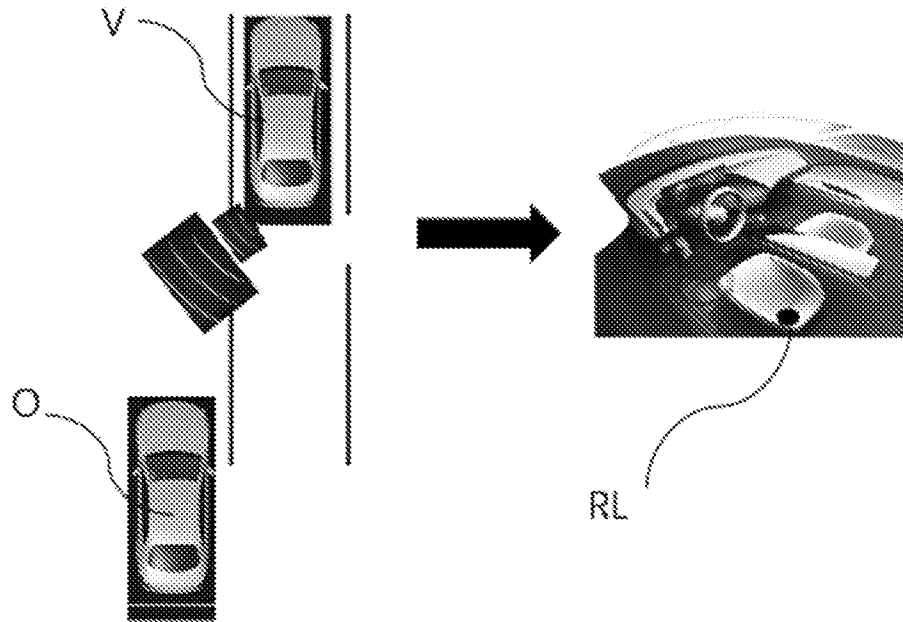


FIG. 4b

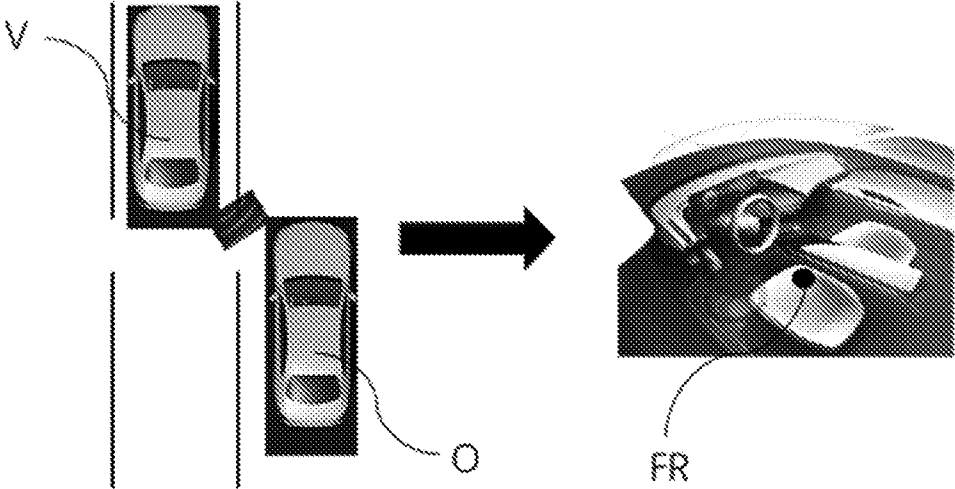


FIG. 4c

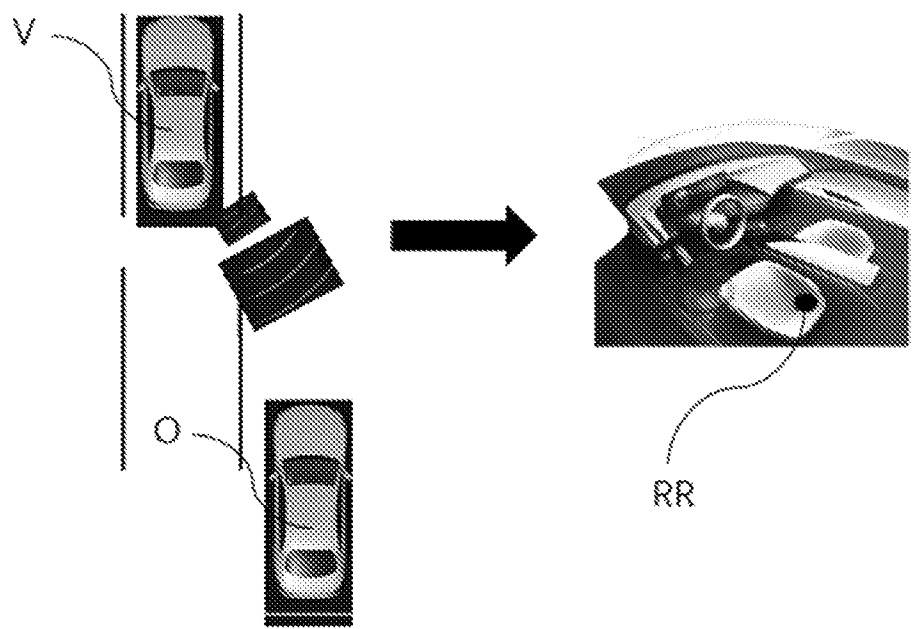


FIG. 4d

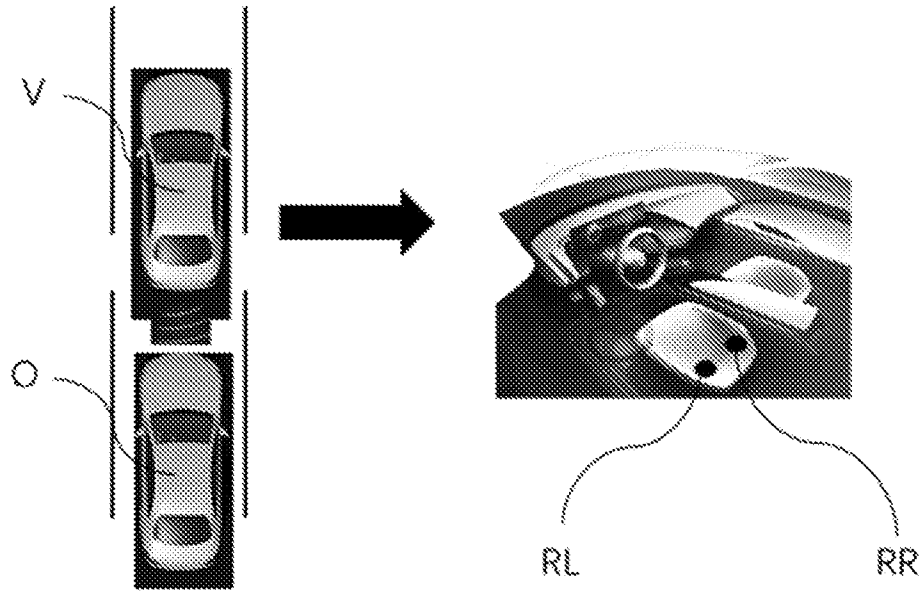


FIG. 5a

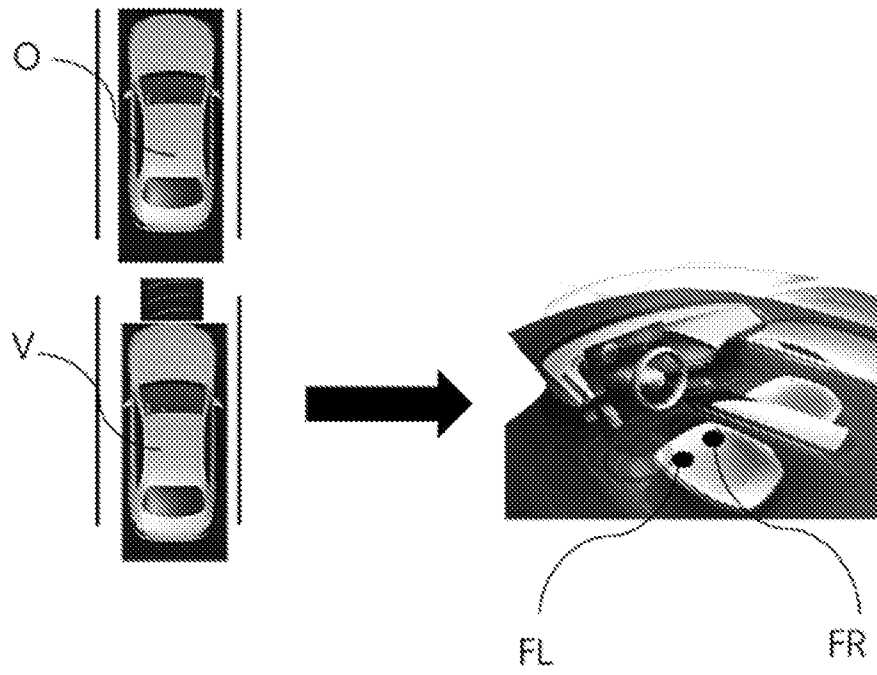


FIG. 5b

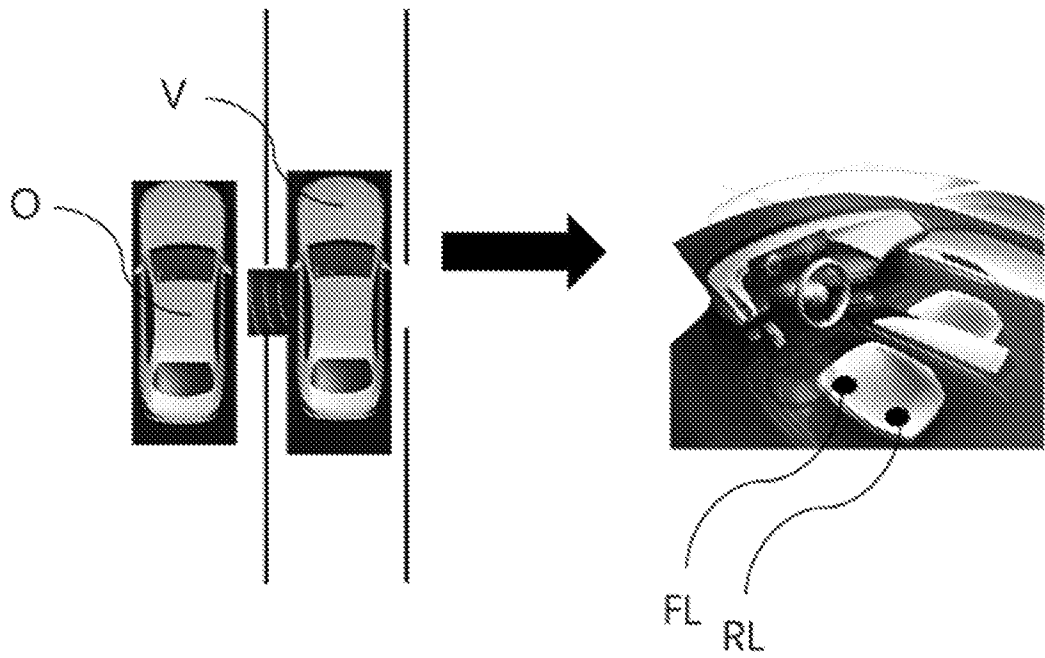


FIG. 5c

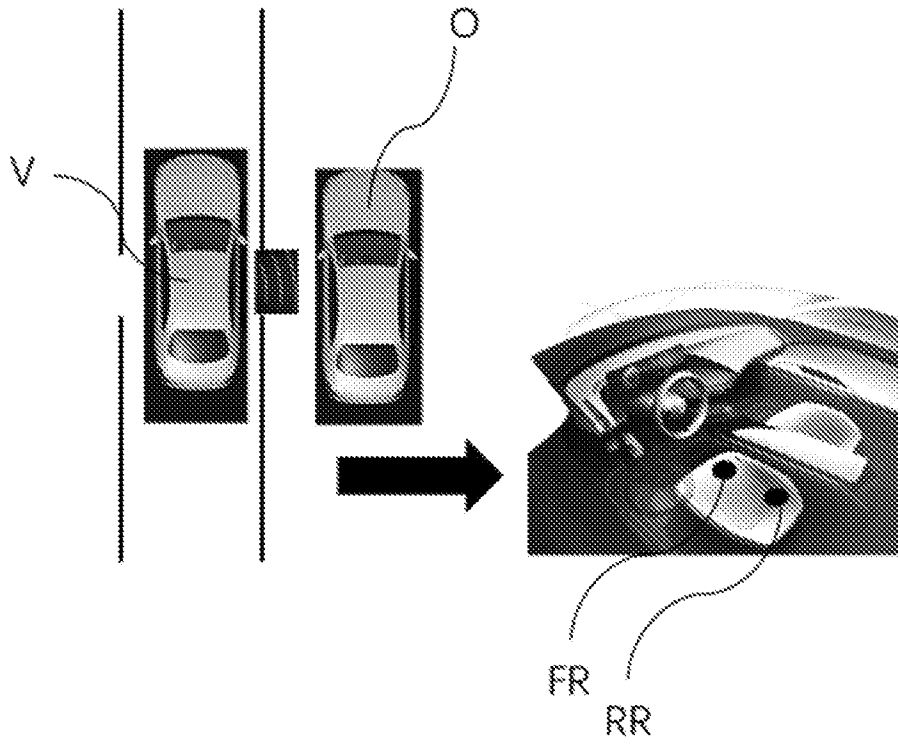
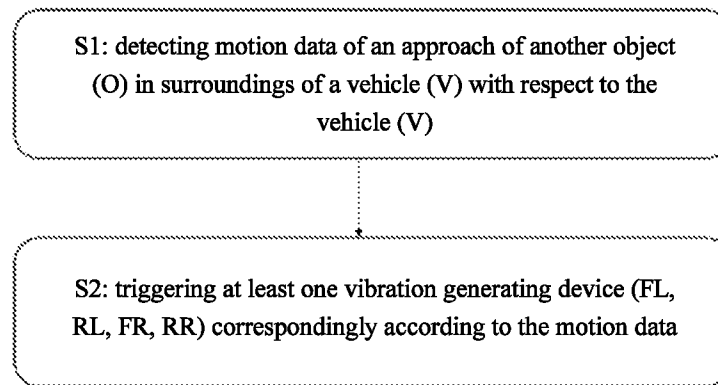


FIG. 5d

**FIG. 6**

INTERNATIONAL SEARCH REPORT

International application No
PCT/CN2023/086832

A. CLASSIFICATION OF SUBJECT MATTER INV. B60N2/90 B60W50/16 B60W30/095 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) B60N B60W B60K B60Q		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2020/104083 A1 (BOSCH GMBH ROBERT [DE]) 28 May 2020 (2020-05-28) page 7, line 10 - page 11, line 4; figures 1-3 -----	1-10
X	US 2006/097857 A1 (OSAKA TADASHI [JP] ET AL) 11 May 2006 (2006-05-11) paragraphs [0052] - [0083]; figures 1-14 -----	1-10
X	JP 2020 152377 A (TS TECH CO LTD) 24 September 2020 (2020-09-24) figures 1-8 -----	1-10
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
13 July 2023		24/07/2023
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Lotz, Klaus-Dieter

INTERNATIONAL SEARCH REPORT

Information on patent family members

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