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(54) **METHOD FOR OPERATING A LOCKING SYSTEM, DATA PROCESSING APPARATUS, COMPUTER PROGRAM, COMPUTER-READABLE STORAGE MEDIUM, AND LOCKING SYSTEM FOR A VEHICLE**

(57) Claim 1 relates to a method for operating a locking system (52) for a vehicle (10) which is configured to allow opening of an associated door (28) from an interior of the vehicle (10) in a de-activated state and to block opening of the associated door (28) in an activated state. The method comprises obtaining an obstacle information indicating whether an obstacle (36) is present in the surroundings of the vehicle (10) and determining whether the obstacle (36) is at least in part located within a door range (R). Then, the locking system (52) is transferred in the de-activated state if the obstacle (36) is determined to be located outside the door range (R) or transferred in the activated state if the obstacle (36) is determined to be located at least in part within the door range (R). Furthermore, a data processing apparatus (58), a computer program (74), a computer-readable storage medium (72), and a locking system (52) for a vehicle (10) are claimed.

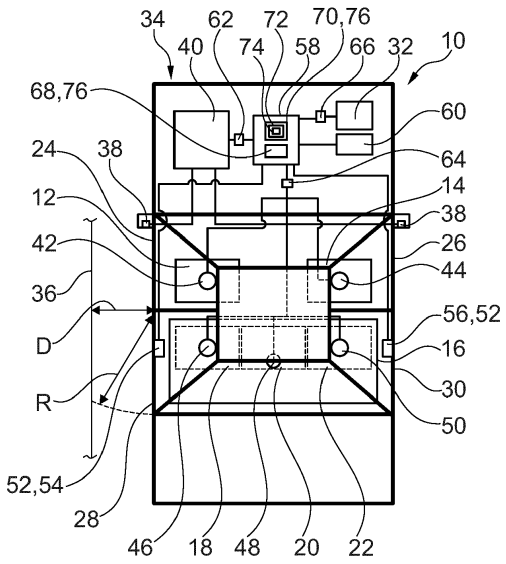

Fig. 1

EP 4 477 824 A1

Description

[0001] The present disclosure relates to a method for operating a locking system for a vehicle. The locking system is configured to allow opening of an associated door from an interior of the vehicle in a de-activated state. Moreover, the locking system is configured to block opening of the associated door from the interior of the vehicle in an activated state.

[0002] The present disclosure additionally relates to a data processing apparatus comprising means for carrying out such a method.

[0003] Moreover, the present disclosure is directed to a computer program comprising instructions which, when the program is executed by a computer, cause the computer to carry out such a method, and a computer-readable storage medium comprising instructions which, when executed by a computer, cause the computer to carry out such a method.

[0004] Moreover, the present disclosure relates to a locking system for a vehicle.

[0005] In the present context, a locking system is to be understood as an installation which allows an adult user of a vehicle, e.g. the driver, to selectively allow opening of an associated door from an interior of the vehicle or block opening of the associated door from the interior of the vehicle. Such a locking system may be called a child-proof locking system. The locking system may form part of an entry control system being configured to selectively lock the door such that it may not be opened from an exterior of the vehicle.

[0006] Locking systems and methods for operating them are known in the art. Such locking systems may usually be activated using a button which is accessible from a driver's position within the vehicle. Alternatively, the button may be placed on the door which is associated to the locking system. In the latter case, the button is not accessible if the doors closed.

[0007] When using a locking system, situations may occur in which having the locking system in the activated state or the deactivated state may be inappropriate. For example, if adults are using the back seats while the locking system is in the activated state, these adults will need help to be able to get off the vehicle. In another example, if children are using the back seats, in some situations, having the locking system in the activated state may be more appropriate than having the locking system in the de-activated state. This can also be the other way around.

[0008] It is therefore an objective of the present disclosure to improve known locking systems such that they can be adapted easily to different use scenarios.

[0009] The problem is at least partially solved or alleviated by the subject matter of the independent claims of the present disclosure, wherein further examples are incorporated in the dependent claims.

[0010] According to a first aspect, there is provided a method for operating a locking system for a vehicle. The locking system is configured to allow opening of an associated door from an interior of the vehicle in a de-activated state. Moreover, the locking system is configured to block opening of the associated door from the interior of the vehicle in an activated state. The method comprises:

- obtaining an obstacle information indicating whether an obstacle is present in the surroundings of the vehicle,
- determining whether the obstacle is at least in part located within a door range, if the presence of the obstacle has been determined, and
- transferring the locking system in the de-activated state if the obstacle is determined to be located outside the door range or transferring the locking system in the activated state if the obstacle is determined to be located at least in part within the door range.

[0011] In one example, obtaining an obstacle information comprises determining the obstacle information, i.e. determining whether an obstacle is present in the surroundings of the vehicle. In another example, obtaining an obstacle information comprises receiving an obstacle information, i.e. receiving an information whether an obstacle is present in the surroundings of the vehicle. In the present context, a door range is the space needed by a door of the vehicle to be transferred from a closed state into an open state. In other words, the door range is the space swept by the door when being opened. Thus, the door range may as well be called a door sweeping space or a door opening space. The door range of the associated door may be individual for each vehicle. The door range for example depends on at least one of the manufacturer of the vehicle, the model and the variant of the vehicle. Additionally, the door range may even be individual for each door of the vehicle. Thus, the locking system is activated if, due to the fact that the obstacle is at least in part located within the door range, there is the risk that the door contacts the obstacle when being open. This may be the situation in a narrow parking space. In the opposite case, i.e. if the obstacle is located outside the door range, the locking system is de-activated. In the latter case, there is no risk that the door touches the obstacle when being opened. Consequently, even if the seat being associated with the door being equipped with the locking system is occupied by a child, the level of freedom may be increased for the child without risking damage on the obstacle or the vehicle. Altogether, when using the method according to the present disclosure, the comfort for occupants is increased while at the same time a high level of safety is ensured. The method may be performed automatically. Consequently, the driver does not need to assess whether the obstacle is located at least in part within or outside the door range and react appropriately as far as the activation or de-activation of the locking system is concerned. Consequently, the dri-

ver has more mental capacity to think about different things.

[0012] The general idea underlying the present disclosure is, thus, to automatically activate or automatically de-activate the locking system depending on a situation in which the vehicle is. In doing so, the comfort is increased for the passengers of the vehicle, be it adults or children, while the level of safety is maintained high.

[0013] The locking system maybe a child-proof locking system.

[0014] In an example, a camera unit or an ultrasound sensor unit is used for determining the presence of the obstacle and whether the obstacle is located at least in part within or outside the door range. Both the camera unit and the ultrasound sensor are able to reliably detect obstacles and provide a precise estimate of the obstacle's location and/or extension.

[0015] In an example, the method further comprises determining whether a vehicle seat being associated with the associated door is occupied and executing the method if the vehicle seat is determined to be occupied. In a case in which the seat is not occupied, there is no need to perform the method according to the present disclosure. In the present context, being occupied of course comprises a situation in which a child or an adult is sitting on the respective seat. The child may use a child seat. However being occupied also covers a case in which especially a child has been sitting on one seat but moves to a different seat while the vehicle is standing, e.g. in order to exit the vehicle. Thus, being occupied also covers postures such as kneeing and walking on a seat. If a vehicle seat is determined to be occupied, the method according to the present disclosure is performed. Consequently high comfort for the passengers and high safety are achieved at the same time.

[0016] In an example, the method further comprises determining whether a vehicle seat being associated with the associated door is occupied by a child or an adult or a child seat and executing the method if the vehicle seat is found to be occupied by a child or a child seat. In other words, the method may distinguish between an adult, a child and a child seat. In a case in which is seat is occupied by an adult, there is no need to perform the method according to the present disclosure. Thus, the method may be abandoned. If the seat is occupied by a child, the method according to the present disclosure is performed. In other words, activating the locking system is only taken into consideration if the associated seat is occupied by a child. In this case, the child may use a child seat or not.

[0017] In an example, a weight sensor being integrated into the seat may be used in order to determine whether the vehicle seat is occupied by an adult or by a child. In this context, an occupant may be considered to be a child if a weight being detected by the weight sensor is inferior to a weight threshold. If the weight equals or exceeds the weight threshold, the occupant may be considered to be an adult. Additionally or alternatively, a camera system may be used in order to determine whether the vehicle seat is occupied by an adult or by a child. The camera system may be configured to estimate a height of the occupant. If the detected height is inferior to a height threshold, the occupant may be considered to be a child. If the detected height equals or exceeds the height threshold, the occupant is considered to be an adult.

[0018] In an example, the method further comprises determining a vehicle speed or receiving a speed information describing a vehicle speed and comparing the vehicle speed to an activation threshold of the method. If the vehicle speed is inferior to the activation threshold, the method is performed. Otherwise, the method is not performed or abandoned. The vehicle speed threshold may be zero or a speed between zero and 10 km/h. In any case, the activation threshold describes that the vehicle is at a complete standstill or close thereto. The method is only performed in such a case. The activation threshold may be chosen to be also an activation threshold for an automatic door locking while driving.

[0019] The method may be at least partly computer-implemented, and may be implemented in software or in hardware, or in software and hardware. Further, the method may be carried out by computer program instructions running on means that provide data processing functions. The data processing means may be a suitable computing means, such as an electronic control module etc., which may also be a distributed computer system. The data processing means or the computer, respectively, may comprise one or more of a processor, a memory, a data interface, or the like.

[0020] According to a second aspect, there is provided a data processing apparatus comprising means for carrying out the method of the present disclosure. Using such a data processing apparatus leads to a high level of comfort for occupants while at the same time a high level of safety is ensured. Moreover, the mental load for a driver is reduced.

[0021] The means for carrying out the method of the present disclosure may be any suitable computing means, such as an electronic control module etc., which may also be a distributed computer system. The means or the computer, respectively, may comprise one or more of a processor, a memory, a data interface, or the like.

[0022] According to a third aspect, there is provided a computer program comprising instructions which, when the program is executed by a computer, cause the computer to carry out the method of the present disclosure. Consequently, a high level of comfort for occupants is achieved while at the same time a high level of safety is ensured. Moreover, the mental load for a driver is reduced.

[0023] According to a fourth aspect, there is provided a computer-readable storage medium comprising instructions which, when executed by a computer, cause the computer to carry out the method of the present disclosure. Consequently, a high level of comfort for occupants is achieved while at the same time a high level of safety is

ensured. Moreover, the mental load for a driver is reduced.

[0024] According to a fifth aspect, there is provided a locking system for a vehicle comprising a data processing apparatus according to the present disclosure. Such a locking system offers a high level of comfort for occupants while at the same time a high level of safety is ensured. Moreover, the mental load for a driver is reduced.

[0025] In an example, the locking system further comprises a surroundings information interface configured to be connected to a surroundings detection unit. Thus, via the surroundings information interface, an information relating to the presence of an obstacle and relating to a location of the obstacle at least in part within or outside the door range may be received. The surroundings detection unit may comprise a camera unit or an ultrasound sensor unit. Consequently, the locking system may be operated as a function of the presence of an obstacle and/or a location of the obstacle.

[0026] In another example, the locking system further comprises a seat information interface configured to be connected to a seat sensor unit. Via the seat information interface, an information relating to an occupation status of the seat and/or the fact whether an adult or a child is using the seat, may be received. A seat sensor unit may be connected to the seat information interface. The seat sensor unit may comprise a weight sensor and/or a camera unit. In a further alternative, the seat sensor unit comprises an interior radar. Consequently, the locking system may be operated as a function of an occupation status and/or the fact whether an adult or a child is using the seat.

[0027] In a further example, the locking system further comprises a speed information interface being configured to be connected to speed sensor unit. Consequently, the locking system may be operated as a function of a speed of the vehicle.

[0028] In an example, the locking system further comprises a storage unit being communicatively connected to the data processing apparatus. The at least one door range is stored on the storage unit. It is noted again, that the door range may be individual for each vehicle and/or each door of the vehicle. The door range may depend on at least one of a manufacturer of the vehicle, the model and the variant of the vehicle. Consequently, a very accurate information on the door range may be provided such that a very accurate determination whether the obstacle is located at least in part within or outside the door range may be performed.

[0029] It should be noted that the above examples may be combined with each other irrespective of the aspect involved.

[0030] These and other aspects of the present disclosure will become apparent from and elucidated with reference to the examples described hereinafter.

[0031] Examples of the disclosure will be described in the following with reference to the following drawings.

Figure 1 shows a vehicle comprising a locking system according to the present disclosure, having a data processing apparatus, a computer program and a computer-readable storage medium according to the present disclosure, wherein the locking system is operated by a method according to the present disclosure, and

Figure 2 illustrates steps of the method for operating a locking system according to the present disclosure.

[0032] The Figures are merely schematic representations and serve only to illustrate examples of the disclosure. Identical or equivalent elements are in principle provided with the same reference signs.

[0033] Figure 1 shows a vehicle 10.

[0034] The vehicle 10 comprises a driver seat 12, a front passenger seat 14 and a rear bench 16.

[0035] The rear bench 16 comprises three seats which are designated a first seat 18, a second seat 20 and the third seat 22 respectively from the left to the right in Figure 1.

[0036] Moreover, the vehicle 10 comprises four doors. In more detail, the vehicle comprises a driver door 24, a front passenger door 26, a first rear door 28 and a second rear door 30. In the present context, the first rear door 28 may also be designated as a left rear door and the second rear door may be designated as a right rear door.

[0037] Furthermore, the vehicle comprises a speed sensor unit 32 which is only represented schematically.

[0038] The speed sensor unit 32 is configured to detect a traveling speed of the vehicle 10.

[0039] The vehicle 10 also comprises a surroundings detection unit 34.

[0040] The surroundings detection unit 34 is configured to detect obstacles in the surroundings of the vehicle 10. Additionally, the surroundings detection unit 34 is configured to determine an obstacle location. The obstacle location is to be understood as a location relative to the vehicle 10.

[0041] In Figure 1, an exemplary obstacle 36 is shown. The obstacle 36 is for example another vehicle.

[0042] The surroundings detection unit 34 comprises a sensor unit 38 and a data processing apparatus 40 being communicatively connected to the sensor unit 38.

[0043] In the present example, the sensor unit 38 comprises a first component which is integrated into the rearview mirror of the driver door 24 and a second component which is integrated into the rearview mirror of the front passenger door 26.

[0044] The sensor unit 38 may comprise a camera unit being configured to capture images of the surroundings of the vehicle 10. Additionally or alternatively, the sensor unit 38 may comprise an ultrasound sensor unit being configured to emit ultrasound signals to the surroundings of the vehicle 10 and receive reflected ultrasound signals from the surroundings.

[0045] The data processing apparatus 40 is configured to detect the obstacle 36 in the surroundings of the vehicle 10 based on the captured images of the camera unit and/or on the received ultrasound signals of the ultrasound sensor unit.

[0046] Furthermore, each seat of the vehicle 10 is equipped with a seat sensor unit.

[0047] The seat sensor unit being associated with the driver seat 12 is designated with reference sign 42. The seat sensor unit being associated with the front passenger seat 14 is designated with reference sign 44.

[0048] The seat sensor units of the first, second and third seats 18, 20, 22 are designated with reference signs 46, 48, 50 respectively.

[0049] The seat sensor units 42 to 50 may be realized according to three examples.

[0050] In a first example, each seat sensor unit 42 to 50 comprises a weight sensor which is configured to detect a weight of an occupant of the vehicle 10 using the respective seat 12, 14, 18, 20, 22.

[0051] In a second example, each seat sensor unit 42 to 50 comprises a camera unit being configured to capture an image of the associated seat 12, 14, 18, 20, 22 and potentially an occupant of the vehicle 10 using the respective seat 12, 14, 18, 20, 22.

[0052] In a third example, each seat sensor unit 42 to 50 comprises a radar unit being configured to detect an occupant using the associated seat 12, 14, 18, 20, 22. Since the radar unit is used in the interior of the vehicle 10, it may be called an interior radar unit.

[0053] The vehicle 10 also comprises a locking system 52.

[0054] In the example shown in the Figures, the locking system 52 is a child-proof locking system.

[0055] In the present example, the locking system 52 comprises a first locking unit 54 which is installed on the first rear door 28 and a second locking unit 56 which is installed on the second rear door 30.

[0056] Following the definition of a locking system as indicated above, both the first locking unit 54 and the second locking unit 56 may assume a de-activated state in which the associated door, i.e. the first rear door 28 or the second rear door 30, may be opened from an inside of the vehicle 10.

[0057] Both the first locking unit 54 and the second locking unit 56 may also assume a an activated state in which the associated door, i.e. the first rear door 28 or the second rear door 30, is blocked from being opened from an inside of the vehicle 10.

[0058] The locking system 52 further comprises a data processing apparatus 58.

[0059] The data processing apparatus 58 is communicatively connected to the first locking unit 54 and the second locking unit 56 such that the first locking unit 54 and the second locking unit 56 may be switched between the above-mentioned states using the data processing apparatus 58.

[0060] The locking system 52 additionally comprises a storage unit 60.

[0061] The storage unit 60 is communicatively connected to the data processing apparatus 58.

[0062] Moreover, on the storage unit 60, a door range R of the first rear door 28 and a door range R of the second rear door 30 are stored.

[0063] The door range R of the first rear door 28 and the door range of the second rear door 30 are specific to the vehicle 10. As has been mentioned above, the door range R defines the space that is swept by each of the first rear door 28 and the second rear door 30 when being transferred from a closed state into an open state. For the ease of representation, this space is indicated by an arrow and a dashed line.

[0064] Furthermore, the locking system 52 comprises a surroundings information interface 62. In the present example, the surroundings information interface 62 is communicatively connected to the data processing apparatus 58 and to the surroundings detection unit 34.

[0065] The locking system 52 also comprises a seat information interface 64. The seat information interface 64 is communicatively connected to the data processing apparatus 58 and to the seat sensor units 46, 48, 50 of the first seat, the second seat and the third seat respectively. Also the seat sensor unit 42 of the driver seat 12 and the seat sensor unit 44 of the front passenger seat 14 are communicatively connected to the seat information interface 64.

[0066] Additionally, the locking system 52 comprises a speed information interface 66 being communicatively connected to the speed sensor unit 32 and the data processing apparatus 58.

[0067] The data processing apparatus 58 comprises a data processing unit 68 and a data storage unit 70.

[0068] It is noted that even though the storage unit 60 and the data storage unit 70 are introduced as separate elements, they may as well be formed as one single storage unit.

[0069] The data storage unit 70 comprises a computer readable storage medium 72.

[0070] On the computer readable storage medium 72 there is provided a computer program 74.

[0071] Both the computer program 74 and the computer readable storage medium 72 comprises instructions which, when executed by the data processing unit 68 or, more generally, a computer, cause the data processing unit 68 or the computer to carry out a method for operating a locking system.

[0072] In other words, the data processing unit 68 and the data storage unit 70 form means 76 for carrying out the method for operating a locking system.

[0073] In the following, the method for operating a locking system will be explained with reference to Figure 2.

[0074] In a first step S 1 a vehicle speed is determined using the speed sensor unit 32.

[0075] The determined vehicle speed is communicated to the data processing apparatus 58 via the speed

information interface 66. From the perspective of the data processing apparatus 58 a speed information describing a vehicle speed is received.

[0076] Subsequently, the vehicle speed is compared to an activation threshold of the method.

[0077] In the present example, the activation threshold may be 10 km/h.

[0078] If the vehicle speed exceeds the activation threshold, the method is abandoned. In this case it is assumed that the vehicle is not about to stop. Consequently, the situational activation or de-activation of the locking system 52 is not an issue.

[0079] If the vehicle speed equals the activation threshold or is smaller than the activation threshold, it is assumed that the vehicle 10 is about to stop. In this case, the method is continued.

[0080] It is noted that during the performance of the method, the vehicle speed is constantly monitored. In a case in which the vehicle speed first is equals the activation threshold or is smaller than the activation threshold and then, during the further performance of the method, exceeds the activation threshold, the method is abandoned.

[0081] In a second step S2 an obstacle information is obtained. The obstacle information indicates whether an obstacle 36 is present in the surroundings of the vehicle. In the example shown in the Figures, the obstacle information is determined, i.e. it is determined whether the obstacle 36 is present in the surroundings of the vehicle 10. To this end, the surroundings detection unit 34 and especially the sensor unit 38 is used. A detection result, i.e. an information whether or not an obstacle 36 is present in the surroundings of the vehicle 10, is communicated to the data processing apparatus 58 via the surroundings information interface 62.

[0082] In a case in which no obstacle 36 has been detected, the method is abandoned.

[0083] In a case in which an obstacle 36 has been detected, it is determined whether the obstacle 36 is at least in part located within the relevant door range R.

[0084] In the present example, this is done by executing a third step S3 and a fourth step S4.

[0085] In the present example, the obstacle 36 is detected on the left side of the vehicle 10.

[0086] In the third step S3, an obstacle distance D between the obstacle 36 and the associated door is determined. Based on the detection results of the sensor unit 38 this may be done by the data processing apparatus 40 or the data processing apparatus 58.

[0087] In the present example, only the first rear door 28 and the second rear door 30 are equipped with the first locking unit 54 and the second locking unit 56 respectively. Since the obstacle 36 has been detected on the left side of the vehicle 10, the method is performed for the first rear door 28. Consequently, in the present example, the first rear door may also be designated as the associated or relevant door.

[0088] It is noted that the obstacle distance D may comprise a plurality of distances relating to distances between different points on the relevant door, here the first rear door 28, and the obstacle 36. This depends on the form and orientation of the obstacle 36.

[0089] The representation of Figure 1 is a simplification in that the obstacle 36 has a straight surface which is oriented towards the vehicle 10 and in that the obstacle 36 is oriented in parallel to the vehicle. In such a case the obstacle distance D may be expressed by a single distance value.

[0090] Subsequently, in the fourth step S4, the obstacle distance D, i.e. the plurality of distances, if appropriate, is compared to a door range R of the associated door, i.e. the first rear door 28. In doing so, one may determine whether the obstacle 36 is at least in part located within the door range R.

[0091] If it is found that the obstacle 36 is located at least in part within the door range R, a risk of collision between the associated door 28 and the obstacle 36 is inferred. If it is found that the obstacle 36 is located outside the door range R, it is inferred that there is no risk of collision between the associated door 28 and the obstacle 36.

[0092] Thereafter, in a step S5, it is determined whether a vehicle seat 12, 14, 16, 18, 20 being associated with the associated door 28 is occupied.

[0093] If the method is performed for the first rear door 28, the first seat 18 is considered to be associated to this door.

[0094] In a case in which a passenger is sitting on the middle seat of the rear bench 16, i.e. on the second seat 20, the passenger first needs to move onto the first seat 18 or the third seat 22 before being able to leave the vehicle 10. Thus, in this case, the first seat 18 or the third seat 22 would be determined to be occupied.

[0095] Moreover, in a step S6, it is determined for all vehicle seats that have been determined to be occupied whether the occupant using the respective vehicle seat is a child or an adult.

[0096] As has already been mentioned before, in a first variant the seat sensor units 42 to 50 comprise a weight sensor. Thus, if the detected weight exceeds a predefined weight threshold, it is inferred that the occupant is an adult. Otherwise it is inferred that the occupant is a child.

[0097] In a second variant, the seat sensor units 42 to 50 comprise a camera unit or a radar unit. The camera unit or radar unit may be configured to determine a height of the occupant. If the detected height of the occupant exceeds a predefined height threshold, it is inferred that the occupant is an adult. Otherwise, the occupant is considered to be a child.

[0098] If it is determined that the occupant is an adult, the method is abandoned. In this case there is no need to use the locking system 52.

[0099] Thus, the method is only continued if it is determined that the occupant using the first seat 18 being associated to the door for which the method is performed,

is a child.

[0100] Subsequently, in a step S7, the activation state of the locking system 52 is set.

[0101] Two situations may be distinguished.

[0102] In a first situation, the locking system 52 is in the activated state.

[0103] If the obstacle 36 is located at least in part within the door range R, the locking system 52 remains activated.

[0104] If the obstacle 36 is located outside the door range R, the locking system 52 is transferred in the de-activated state.

[0105] In a second situation, the locking system is the de-activated state.

[0106] If the obstacle 36 is located outside the door range R, the locking system 52 remains de-activated.

[0107] If the obstacle 36 is at least in part located within the door range R, the locking system 52 is transferred in the activated state.

[0108] Thus, in a situation in which there is a risk of collision between a door 24, 26, 28, 30 of the vehicle 10 and an obstacle 36, and additionally a child is using a seat 12, 14, 18, 20, 22 being associated with the respective door, it is ensured that the locking system 52 is activated. Thereby, a collision is avoided.

[0109] In a situation where there is no risk of collision, an increased level of freedom and, thus, comfort may be given to the child by de-activating the locking system 52.

[0110] It is understood that even though the method of the present disclosure has been explained in connection with the first rear door 28, depending on the location of the obstacle 36, the method may as well be performed in connection with all other doors, especially the second rear door 30.

[0111] Other variations to the disclosed examples can be understood and effected by those skilled in the art in practicing the claimed disclosure, from the study of the drawings, the disclosure, and the appended claims. In the claims the word "comprising" does not exclude other elements or steps and the indefinite article "a" or "an" does not exclude a plurality. A single processor or other unit may fulfill the functions of several items or steps recited in the claims. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage. A computer program may be stored/distributed on a suitable medium such as an optical storage medium or a solid-state medium supplied together with or as part of other hardware, but may also be distributed in other forms, such as via the Internet or other wired or wireless telecommunication systems. Any reference signs in the claims should not be construed as limiting the scope of the claims.

LIST OF REFERENCE SIGNS

[0112]

10	vehicle
12	driver seat
14	front passenger seat
16	rear bench
18	first seat
20	second seat
22	third seat
24	driver door
26	front passenger door
28	first rear door, associated door
30	second rear door
32	speed sensor unit
34	surroundings detection unit
36	obstacle
38	sensor unit
40	data processing apparatus
42	seat sensor unit of the driver seat
44	seat sensor unit of the front passenger seat
46	seat sensor unit of the first seat
48	seat sensor unit of the second seat
50	seat sensor unit of the third seat
52	locking system
54	first locking unit
56	second locking unit
58	data processing apparatus
60	storage unit
62	surroundings information interface
64	seat information interface
66	speed information interface
68	data processing unit
70	data storage unit
72	computer-readable storage medium
74	computer program
76	means for carrying out the method for operating a locking system
D	obstacle distance
R	door range
S1	first step
S2	second step
S3	third step
S4	fourth step
S5	fifth step
S6	sixth step
S7	seventh step

Claims

1. A method for operating a locking system (52) for a vehicle (10), wherein the locking system (52) is configured to allow opening of an associated door (28) from an interior of the vehicle (10) in a de-activated state and wherein the locking system (52) is configured to block opening of the associated door (28) from the interior of the vehicle (10) in an activated state, the method comprising:

- obtaining an obstacle information indicating

whether an obstacle (36) is present in the surroundings of the vehicle (10) (S2),
- determining whether the obstacle (36) is at least in part located within a door range (R), if the presence of the obstacle (36) has been determined (S3, S4), and
- transferring the locking system (52) in the deactivated state if the obstacle (36)is determined to be located outside the door range (R) or transferring the locking system (52) in the activated state if the obstacle (36) is determined to be located at least in part within the door range (R) (S7).

2. The method of claim 1, further comprising determining whether a vehicle seat (18) being associated with the associated door (28) is occupied and executing the method if the vehicle seat (18) is determined to be occupied (S5).

3. The method of claim 1 or 2, further comprising determining whether a vehicle seat (18) being associated with the associated door (28) is occupied by a child or an adult or a child seat and executing the method if the vehicle seat (18) is found to be occupied by a child or a child seat (S6).

4. The method of any one of the preceding claims, further comprising determining a vehicle speed or receiving a speed information describing a vehicle speed and comparing the vehicle speed to an activation threshold of the method (S 1).

5. A data processing apparatus (58) comprising means (76) for carrying out the method of any one of the preceding claims.

6. A computer program (74) comprising instructions which, when the computer program (74) is executed by a computer, cause the computer to carry out the method of claims 1 to 4.

7. A computer-readable storage medium (72) comprising instructions which, when executed by a computer, cause the computer to carry out the method of claims 1 to 4.

8. A locking system (52) for a vehicle (10) comprising a data processing apparatus (58) according to claim 5.

9. The locking system (52) of claim 8, further comprising a surroundings information interface (62) configured to be connected to a surroundings detection unit (34).

10. The locking system (52) of claim 8 or 9, further comprising a seat information interface (64) configured to be connected to a seat sensor unit (42, 44, 46, 48, 50).

11. The locking system (52) of any of claims 8 to 10, further comprising a speed information interface (66) being configured to be connected to speed sensor unit (32).

12. The locking system (52) of any of claims 8 to 11, further comprising a storage unit (60) being communicatively connected to the data processing apparatus (58), wherein at least one door range (R) is stored on the storage unit (60).

Amended claims in accordance with Rule 137(2) EPC.

1. A method for operating a locking system (52) for a vehicle (10), wherein the locking system (52) is configured to allow opening of an associated door (28) from an interior of the vehicle (10) in a deactivated state and wherein the locking system (52) is configured to block opening of the associated door (28) from the interior of the vehicle (10) in an activated state, the method comprising:

- determining whether a vehicle seat (18) being associated with the associated door (28) is occupied and executing the method if the vehicle seat (18) is determined to be occupied (S5),
- obtaining an obstacle information indicating whether an obstacle (36) is present in the surroundings of the vehicle (10) (S2),
- determining whether the obstacle (36) is at least in part located within a door range (R), if the presence of the obstacle (36) has been determined (S3, S4), and
- transferring the locking system (52) in the deactivated state if the obstacle (36)is determined to be located outside the door range (R) or transferring the locking system (52) in the activated state if the obstacle (36) is determined to be located at least in part within the door range (R) (S7).

2. The method of claim 1, further comprising determining whether a vehicle seat (18) being associated with the associated door (28) is occupied by a child or an adult or a child seat and executing the method if the vehicle seat (18) is found to be occupied by a child or a child seat (S6).

3. The method of any one of the preceding claims, further comprising determining a vehicle speed or receiving a speed information describing a vehicle speed and comparing the vehicle speed to an activation threshold of the method (S1).

4. A data processing apparatus (58) comprising means

(76) for carrying out the method of any one of the preceding claims.

5. A computer program (74) comprising instructions which, when the computer program (74) is executed by a computer, cause the computer to carry out the method of claims 1 to 3.

6. A computer-readable storage medium (72) comprising instructions which, when executed by a computer, cause the computer to carry out the method of claims 1 to 3.

7. A locking system (52) for a vehicle (10) comprising a data processing apparatus (58) according to claim 4.

8. The locking system (52) of claim 7, further comprising a surroundings information interface (62) configured to be connected to a surroundings detection unit (34).

9. The locking system (52) of claim 7 or 8, further comprising a seat information interface (64) configured to be connected to a seat sensor unit (42, 44, 46, 48, 50).

10. The locking system (52) of any of claims 7 to 9, further comprising a speed information interface (66) being configured to be connected to speed sensor unit (32).

11. The locking system (52) of any of claims 7 to 10, further comprising a storage unit (60) being communicatively connected to the data processing apparatus (58), wherein at least one door range (R) is stored on the storage unit (60).

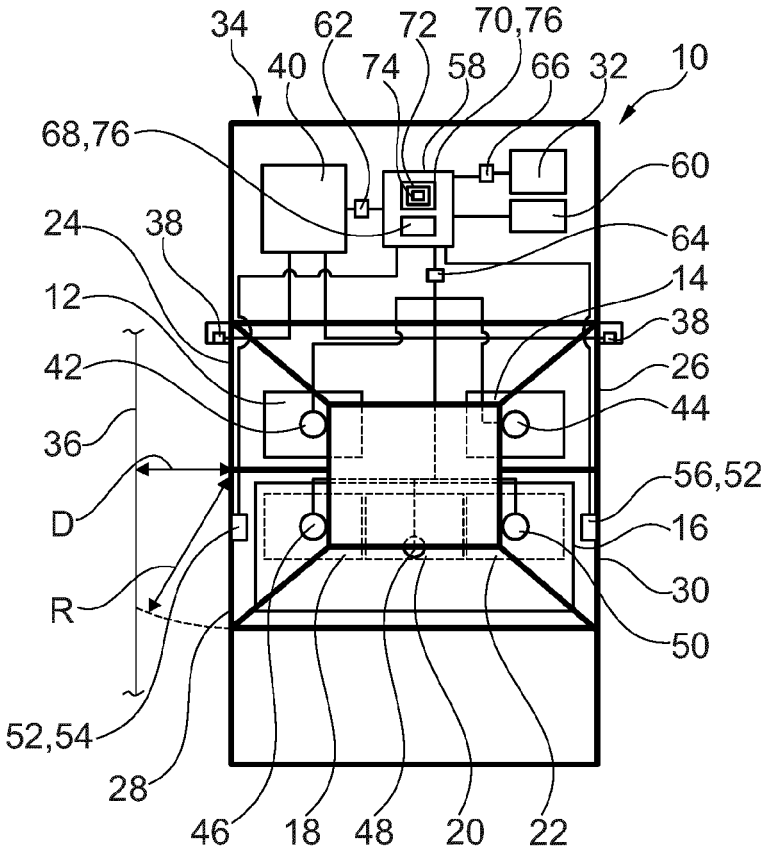
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Fig. 1

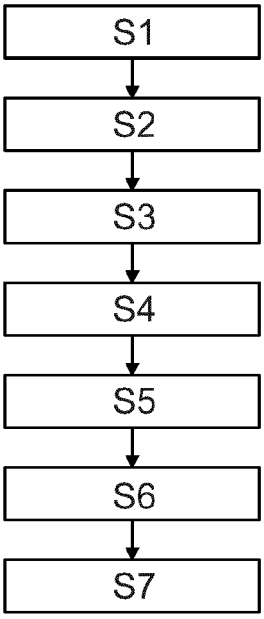
S1
S2
S3
S4
S5
S6
S7

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 23 17 9017

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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E05B
B60R
E05G
E05C
E05F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	4 December 2023	Koster, Michael

CATEGORY OF CITED DOCUMENTS

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