PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference **BLANG00005PCT**		**FOR FURTHER ACTION** see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. **PCT/US2024/015118**	International filing date *(day/month/year)* **09 February 2024 (09.02.2024)**	(Earliest) Priority Date *(day/month/year)* **05 June 2023 (05.06.2023)**
Applicant **BULLETPROOF PROPERTY MANAGEMENT, LLC**		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of **2** sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language**, the international search was carried out on the basis of:
      ☑ the international application in the language in which it was filed.
      ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
   b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.
2. ☐ **Certain claims were found unsearchable** (see Box No. II).
3. ☐ **Unity of invention is lacking** (see Box No. III).
4. With regard to the **title**,
   ☑ the text is approved as submitted by the applicant.
   ☐ the text has been established by this Authority to read as follows:
5. With regard to the **abstract**,
   ☑ the text is approved as submitted by the applicant.
   ☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. With regard to the **drawings**,
   a. the figure of the **drawings** to be published with the abstract is Figure No.
      ☐ as suggested by the applicant.
      ☐ as selected by this Authority, because the applicant failed to suggest a figure.
      ☐ as selected by this Authority, because this figure better characterizes the invention.
   b. ☑ none of the figures is to be published with the abstract.

Form PCT/ISA/210 (first sheet) (July 2022)

TESLA-1174
Tesla v. Bulletproof
IPR2026-00219

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2024/015118

A. CLASSIFICATION OF SUBJECT MATTER

IPC: ***B60W 10/04*** (2024.01); ***B60W 10/18*** (2024.01); ***B60W 10/20*** (2024.01); ***B60W 30/06*** (2024.01); *B60W 50/10* (2024.01)

CPC: ***B60W 30/06; B60W 10/18; B60W 10/04; B60W 10/20;*** *B60W 50/10*

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)

See Search History Document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

See Search History Document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History Document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	US 2021/0269019 A1 (BAYERISCHE MOTOREN WERKE AKTIENGESELLSCHAFT) 02 September 2021 (02.09.2021)	
X	entire document	1-5, 7-10
Y	entire document	6, 11-20
	US 2013/0144492 A1 (TAKANO et al.) 06 June 2013 (06.06.2013)	
Y	entire document	6, 16
	US 2020/0207334 A1 (HYUNDAI MOTOR COMPANY et al.) 02 July 2020 (02.07.2020)	
Y	entire document	11-20
	US 2011/0080305 A1 (TOLEDO et al.) 07 April 2011 (07.04.2011)	
A	entire document	1-20

☐ 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
"D" document cited by the applicant in the international application
"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
26 April 2024 (26.04.2024)	**08 May 2024 (08.05.2024)**
Name and mailing address of the ISA/US **Mail Stop PCT, Attn: ISA/US** **Commissioner for Patents** **P.O. Box 1450, Alexandria, VA 22313-1450** Facsimile No. **571-273-8300**	Authorized officer **MATOS** **TAINA** Telephone No. **571-272-4300**

Form PCT/ISA/210 (second sheet) (July 2022)

Search History:

Limited Classification Search

The Patent Analyst performed a limited classification search within the following US, IPC, CPC, ECLA, or F-Term classification areas:

CPC Class/Subclass(es): B60W 10/04; B60W 10/18; B60W 10/20; B60W 30/06; B60W 50/10 (202401)

IPC (8) Class/Subclass(es): B60W 10/04; B60W 10/18; B60W 10/20; B60W 30/06; B60W 50/10 (202401)

U.S. Class/Subclass(es): 74/335; 477/34; 701/51; 701/60

See Global Search Results.

Global Patent Literature Text Search

The Patent Analyst performed the following global text search, which was not limited by classification but may or may not have been limited by other criteria:

Questel Orbit: https://www.orbit.com

#	Search query	Results
1	**((LANGLOTZ 2D BENNET)/IN/OIN/INH/INV)**	**14**
2	((PD < 2023-06-05) OR (PD = 2023-06-05))	81603836
3	**1 AND 2**	**11**
4	**"BULLETPROOF PROPERTY MAN"/FPAN**	**1**
5	**"BULLETPROOF PROPERTY MANAGEMENT"/FPAN**	**7**
6	(((AUTOMAT+)/TI/AB/TX AND (SHIFT)/TI/AB/TX AND (STEERING 1W ANGLE)/TI/AB/TX) AND ((PD < 2023-06-05) OR (PD = 2023-06-05)))	24192
7	(((AUTOMAT+)/TI/AB/TX AND (SHIFT)/TI/AB/TX AND (DISTANCE)/TI/AB/TX AND (HISTORY)/TI/AB/TX AND (PREVIOUS)/TI/AB/TX) AND ((PD < 2023-06-05) OR (PD = 2023-06-05)))	48320
8	(((AUTOMAT+)/TI/AB/TX AND (SHIFT)/TI/AB/TX AND (DISTANCE)/TI/AB/TX AND (HISTORY)/TI/AB/TX AND (PREVIOUS)/TI/AB/TX AND (TRANSMISSION)/TI/AB/TX) AND ((PD < 2023-06-05) OR (PD = 2023-06-05)))	38693
9	(((AUTOMAT+)/TI/AB/TX AND (SHIFT)/TI/AB/TX AND (DISTANCE)/TI/AB/TX AND (HISTORY)/TI/AB/TX AND (PREVIOUS)/TI/AB/TX AND (TRANSMISSION)/TI/AB/TX AND (STEERING 1W ANGLE)/TI/AB/TX) AND ((PD < 2023-06-05) OR (PD = 2023-06-05)))	894
10	((TRANSMISSION)/TI/AB/TX AND (SHIFT)/TI/AB/TX AND (HISTORY)/TI/AB/TX AND (DISTANCE)/TI/AB/TX AND (DRIVE OR FORWARD)/TI/AB/TX AND (REVERSE OR BACKWARD)/TI/AB/TX)	39769
11	((TRANSMISSION)/TI/AB/TX AND (SHIFT)/TI/AB/TX AND (HISTORY)/TI/AB/TX AND (DISTANCE 1W	1445

	TRAVELED)/TI/AB/TX AND (DRIVE OR FORWARD)/TI/AB/TX AND (REVERSE OR BACKWARD)/TI/AB/TX)	
12	((TRANSMISSION)/TI/AB/TX AND (SHIFT)/TI/AB/TX AND (HISTORY)/TI/AB/TX AND (DISTANCE 1W TRAVELED)/TI/AB/TX AND (MEMORY OR REMEMBER)/TI/AB/TX AND (AUTOMATICALLY)/TI/AB/TX)	1771
13	((074335000)/PCL OR (475000000)/PCL OR (477034000)/PCL OR (701051000)/PCL OR (701060000)/PCL)	3606
14	((B60W-030/06)/CPC OR (B60W-010/18)/CPC OR (B60W-010/04)/CPC OR (B60W-010/20)/CPC OR (B60W-050/10)/CPC)	22749
15	((B60W-030/06)/IPC OR (B60W-010/18)/IPC OR (B60W-010/04)/IPC OR (B60W-010/20)/IPC OR (B60W-050/10)/IPC)	44264
16	**(US20210269019)/PN**	**1**
17	..CITBF NOSOURCE SS 16 1 RANKED	22
18	**(US20130144492)/PN**	**1**
19	..CITBF NOSOURCE SS 18 1 RANKED	78
20	**(US20200207334)/PN**	**1**
21	..CITBF NOSOURCE SS 20 1 RANKED	46
22	**(US20110080305)/PN**	**1**
23	..CITBF NOSOURCE SS 22 1 RANKED	55

Google Patents: https://patents.google.com

#	Search query	Results
1	automatic shifting "steering angle" parking	56340
2	"steering angle" "forward" "backward" "threshold"	16990
3	"steering angle" "drive" "reverse" shifter	13203
4	"steering angle" "forward" "backward" "threshold" "fleet"	263

Computer Accessed Text Databases Searched

The Patent Analyst searched the following computer accessed text databases:

Google Scholar: https://scholar.google.com/

#	Search query	Results
1	automatic parking shift transmission	54700
2	automatic parking shift transmission "steering angle"	3700
3	automatic parking shift transmission "steering angle" "threshold"	1740
4	automatic parking shift transmission "steering angle" "threshold" "fleet"	309

Date search was completed: 26 April 2024

DT/AK

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference BLANG00005PCT	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2024/015118	International filing date *(day/month/year)* 09 February 2024 (09.02.2024)	Priority date *(day/month/year)* 05 June 2023 (05.06.2023)
International Patent Classification (IPC) or national classification and IPC See relevant information in Form PCT/ISA/237		
Applicant BULLETPROOF PROPERTY MANAGEMENT, LLC		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 9 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 09 December 2025 (09.12.2025)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Sun Hwa Lee e-mail pct.team1@wipo.int

Form PCT/IB/373 (revised January 2020)

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:
BRAXTON PERRONE, PLLC
5 COWBOYS WAY, SUITE 300, UNIT 32
FRISCO, TX 75034
UNITED STATES OF AMERICA

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	**08 May 2024 (08.05.2024)**
Applicant's or agent's file reference **BLANG00005PCT**	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2024/015118	**09 February 2024 (09.02.2024)**	**05 June 2023 (05.06.2023)**

International Patent Classification (IPC) or both national classification and IPC
IPC: See continuation sheet
CPC: ***B60W 30/06; B60W 10/18; B60W 10/04; B60W 10/20;*** *B60W 50/10*

Applicant
BULLETPROOF PROPERTY MANAGEMENT, LLC

1. This opinion contains indications relating to the following items:

- ☑ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☑ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer
Mail Stop PCT, Attn: ISA/US **Commissioner for Patents** **P.O. Box 1450, Alexandria, VA 22313-1450**	**26 April 2024 (26.04.2024)**	**MATOS, Taina**
Facsimile No. **571-273-8300**		Telephone No. **571-272-4300**

Form PCT/ISA/237 (cover sheet) (July 2022)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2024/015118

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
   - ☑ the international application in the language in which it was filed.
   - ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(b)).

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
   - a. ☐ forming part of the international application as filed.
   - b. ☐ furnished subsequent to the international filing date for the purposes of international search (Rule 13*ter*.1(a)),
     - ☐ accompanied by a statement to the effect that the sequence listing does not go beyond the disclosure in the international application as filed.

4. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established to the extent that a meaningful opinion could be formed without a WIPO Standard ST.26 compliant sequence listing.

5. Additional comments:

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	6, 11-20	YES
	Claims	1-5, 7-10	NO
Inventive step (IS)	Claims	None	YES
	Claims	1-20	NO
Industrial applicability (IA)	Claims	1-20	YES
	Claims	None	NO

2. Citations and explanations:

---------- EXPLANATION ----------

Claims 1-5 and 7-10 lack novelty under PCT Article 33(2) as being anticipated by US 2021/0269019 to Bayerische Motoren Werke Aktiengesellschaft.

Regarding Claim 1, Bayerische Motoren Werke Aktiengesellschaft discloses a motor vehicle comprising: a frame (a motor vehicle with an automated pulling out system; BMW; Abstract; it is inherent that a motor vehicle will have a frame) having wheels (wheels 5a and 5b; Fig. 2b; [0053]); a motor connected to the frame (it is inherent that a motor vehicle will have a frame and motor); a steering control connected to the wheels to establish a steering angle (steerable wheels 5a and 5b are fully locked in the direction of the pulling-out side, and a forward move 20 can be carried out with full steering lock; Fig. 2b; [0053]); a controller (the processor of a motor vehicle controller which has software for carrying out the method; Para. [0042]) operably connected to the steering control, to the motor, and to the wheels; the controller operable to selectably drive the wheels in a forward direction in a drive mode and in a rearward direction in a reverse mode (in step 100, the driver activates the pulling-out function, and at step 110 a linear reversing move is completed; Fig. 1; [0049]; after carrying out the initial reversing move, the steerable wheels 5a, and 5b are fully locked in the direction of the pulling out side, and an automatic switching of travel direction and forward move 20 is carried out; Fig. 2b; [0053]); and the controller (the processor of a motor vehicle controller which has software for carrying out the method; Para. [0042]) operable to select a direction for driving the wheels in response to a pattern of steering angle movements, without operator indication of a direction (in step 100, the driver activates the pulling-out function, and at step 110 a linear reversing move is completed; Fig. 1; [0049]; after carrying out the initial reversing move, the steerable wheels 5a, and 5b are fully locked in the direction of the pulling out side, and an automatic switching of travel direction and forward move 20 is carried out; Fig. 2b; [0053]).

Regarding Claim 2, Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle of claim 1 wherein the controller is operable to change from reverse mode to drive mode without operation of a selector by a driver (after carrying out the initial reversing move, the steerable wheels 5a, and 5b are fully locked in the direction of the pulling out side, and an automatic switching of travel direction and forward move 20 is carried out; Fig. 2b; [0053]).

Regarding Claim 3, Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle of claim 1 wherein the controller is operable while the vehicle is underway in one of the forward and reverse directions, and has stopped momentarily, to determine whether to remain in the same direction or to change direction (during the forward move 20 or immediately after the end of the forward move, it is checked in the query 130 whether the vehicle 1 could leave the parking space, if this is the case, after switching the travel direction and straightening the wheels 5a and 5b, the linear reversing move 30 is carried out; Fig. 2c; [0055-0056]).

Regarding Claim 4, Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle of claim 1 wherein the pattern of steering angle movements includes steering in a first direction, then steering in the opposite direction (a forward move 20 is carried out with full steering lock; Fig. 2b; [0053]; during

the forward move 20 or immediately after the end of the forward move, it is checked in the query 130 whether the vehicle 1 could leave the parking space, if this is the case, after switching the travel direction and straightening the wheels 5a and 5b, the linear reversing move 30 is carried out; Fig. 2c; [0055-0056]).

Regarding Claim 5, Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle of claim 1 wherein the controller is operable to offer an auto-shift in response to a prior pattern of vehicle operation based on at least one of distance traveled, velocity profile, and steering angle profile (in step 100, the driver activates the pulling-out function by selecting a parking menu on the display screen; Fig. 1; [0046]; the first move does not necessarily have to be a linear reversing move but rather instead a steered forward move can be selected as the first move; in dependence on the distances to the front boundary vehicle 2 and to the rear boundary vehicle 3; Fig. 1; [0050]).

Regarding Claim 7, Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle of claim 1 wherein the controller is operable to offer an auto-shift only if velocities are less than a selected threshold (a forward move 20 is carried out with full steering lock; Fig. 2b; [0053]; during the forward move 20 or immediately after the end of the forward move, it is checked in the query 130 whether the vehicle 1 could leave the parking space, if this is the case, after switching the travel direction and straightening the wheels 5a and 5b, the linear reversing move 30 is carried out; Fig. 2c; [0055-0056]; the vehicle comes to a stop before any change in direction).

Regarding Claim 8, Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle of claim 1 wherein the controller is operable to offer an auto-shift only if distance traveled is less than a selected threshold (the first move does not necessarily have to be a linear reversing move but rather instead a steered forward movement; if there is very small distance to the rear vehicle 3 before beginning the parking maneuver and greater distance to the front vehicle 2, a steered forward movement may be selected; Fig. 1; [0050]; a steered forward movement includes fully locked wheels in the direction of a pull-out side and an automatic switching of the travel direction; Fig. 2b; [0053]).

Regarding Claim 9, Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle of claim 1 wherein the controller is operable to offer an auto-shift only if a first limited distance associated with vehicle length was covered with a steeling angle less than a first threshold (the automated parking maneuver begins in step 110 with a linear reversing move 10 in parallel to the curbstone 4, wherein the vehicle is moved back until it reaches or falls below a specific threshold value for the distance to the rear vehicle 3; Fig. 1; [0049]), and a second distance was traveled with a steering angle greater than a second selected threshold and in a first direction, and the vehicle subsequently stops, and the steering angle is adjusted to a second direction opposite the first direction (Fig. 2b illustrates the situation after carrying out the initial reversing move; steerable wheels 5a and 5b are now fully locked in the direction of the pulling-out side and after switching the travel direction, a forward move 20 is carried out with full steering lock; Fig. 2b; [0053-0055]).

Regarding Claim 10, Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle of claim 1 including a driver input device operably connected to the controller (a parking menu shown on a display screen in the center console; Fig. 1; [0046]), and wherein the controller is operable to offer an auto-shift and enact the auto shift in response to a user acceptance action on the driver input device (in step 100, the driver activates the pulling out function by selecting a parking menu on the display screen in the center console by actuating a parking button, selecting the pulling out-side, and releasing the brake pedal; Fig. 1; [0046]; the automated parking maneuver begins in step 110 with a linear reversing move 10; for this purpose the reverse gear is engaged by the parking assistance system and the vehicle is accelerated and brought to a standstill in front of the rear vehicle; Fig. 1; [0049]).

Claim 6 lacks an inventive step under PCT Article 33(3) as being obvious over US 2021/0269019 to Bayerische Motoren Werke Aktiengesellschaft in view of US 2013/0144492 to Takano et al. (hereinafter, "Takano").

Regarding Claim 6, Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle of claim 1.

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

Bayerische Motoren Werke Aktiengesellschaft fails to explicitly disclose wherein the controller is operable to offer an auto-shift only if steering angles in a limited prior period were greater than a selected threshold.

Takano teaches a parking mode selection apparatus for a vehicle (Takano; Abstract) wherein the controller is operable to offer an auto-shift only if steering angles in a limited prior period were greater than a selected threshold (when the steer angle is equal-to or smaller-than -30 degrees, it is judged whether or not the steer angle is equal to smaller than -60 degrees; when the steer angle is larger than -60 degrees it is judged that a left-side perpendicular parking is selected; Fig. 7; [0062-0063]; a left-side perpendicular parking includes a run forward on the right and then run backward to park perpendicularly on the left side; Para. [0003]).

It would have been obvious to one of ordinary skill in the art before the priority date to modify Bayerische Motoren Werke Aktiengesellschaft with the steering angle features of Takano. The motivation for doing so would have been to allow judging of steering angles in order to determine selection of parking modes (Takano; [0065]), thereby improving operability and making parking target position easier to set (Takano; [0006]).

Claims 11-15 and 17-20 lack an inventive step under PCT Article 33(3) as being obvious over US 2021/0269019 to Bayerische Motoren Werke Aktiengesellschaft in view of US 2020/0207334 to Hyundai Motor Company et al. (hereinafter, "Hyundai Motor Company").

Regarding Claim 11, Bayerische Motoren Werke Aktiengesellschaft discloses a motor vehicle control system comprising: a central processor; a vehicle having a frame (a motor vehicle with an automated pulling out system; BMW; Abstract; it is inherent that a motor vehicle will have a frame) having wheels (wheels 5a and 5b; Fig. 2b; [0053]); a motor connected to the frame (it is inherent that a motor vehicle will have a frame and motor); a steering control connected to the wheels to establish a steering angle steerable wheels 5a and 5b are fully locked in the direction of the pulling-out side, and a forward move 20 can be carried out with full steering lock; Fig. 2b; [0053]); a vehicle controller operably connected to central processor, and to the steering control, to the motor, and to the wheels (the processor of a motor vehicle controller which has software for carrying out the method; Para. [0042]); the controller operable to selectably drive the wheels in a forward direction in a drive mode and in a rearward direction in a reverse mode (in step 100, the driver activates the pulling-out function, and at step 110 a linear reversing move is completed; Fig. 1; [0049]; after carrying out the initial reversing move, the steerable wheels 5a, and 5b are fully locked in the direction of the pulling out side, and an automatic switching of travel direction and forward move 20 is carried out; Fig. 2b; [0053]); and the vehicle controller (the processor of a motor vehicle controller which has software for carrying out the method; Para. [0042]) operable in response to gear changing information from the central controller to select a direction for driving the wheels, without operator indication of a direction (in step 100, the driver activates the pulling-out function, and at step 110 a linear reversing move is completed; Fig. 1; [0049]; after carrying out the initial reversing move, the steerable wheels 5a, and 5b are fully locked in the direction of the pulling out side, and an automatic switching of travel direction and forward move 20 is carried out; Fig. 2b; [0053]).

Bayerische Motoren Werke Aktiengesellschaft fails to explicitly disclose a fleet of multitudes of vehicles operably connected to the processor to transmit fleet driving and gear changing data to the processor; and the central processor operable based on the fleet driving and gear changing data to generate gear changing information.

Hyundai Motor Company teaches a system, method, infrastructure and vehicle for supporting automated valet parking (Hyundai Motor Co; Abstract), comprising a fleet of multitudes of vehicles (the infrastructure facility identifies a multitude of drivers and vehicles to determine whether the driver and the vehicle are qualified to park in the parking lot; Fig. 4A; [0055]) operably connected to the processor (the infrastructure facility; Fig. 4A; [0055]) to transmit fleet driving and gear changing data to the processor; and the central processor operable based on the fleet driving and gear changing data to generate gear changing information (when the vehicle proceeds to an autonomous parking step, the driving authority of the vehicle is delegates from the vehicle to the infrastructure facility; the driving authority means an

authority to drive and control vehicle operations such as steering, accelerating, braking, and gear shifting; Fig. 4A; [0055]).

It would have been obvious to one of ordinary skill in the art before the priority date to modify Bayerische Motoren Werke Aktiengesellschaft with the centralized fleet features of Hyundai Motor Company. The motivation for doing so would have been to allow a vehicle to autonomously park using established communications with an infrastructure facility; (Hyundai Motor Company; [0007]), thereby making vehicle parking safer and more convenient; (Hyundai Motor Company; [0004]).

Regarding Claim 12, modified Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle control system of claim 11 wherein the vehicle controller is operable to change from reverse mode to drive mode without operation of a selector by a driver (after carrying out the initial reversing move, the steerable wheels 5a, and 5b are fully locked in the direction of the pulling out side, and an automatic switching of travel direction and forward move 20 is carried out; Fig. 2b; [0053]).

Regarding Claim 13, modified Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle control system of claim 11 wherein the vehicle controller is operable while the vehicle is underway in one of the forward and reverse directions, and has stopped momentarily, to determine whether to remain in the same direction or to change direction (during the forward move 20 or immediately after the end of the forward move, it is checked in the query 130 whether the vehicle 1 could leave the parking space, if this is the case, after switching the travel direction and straightening the wheels 5a and 5b, the linear reversing move 30 is carried out; Fig. 2c; [0055-0056]).

Regarding Claim 14, modified Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle control system of claim 11 wherein the fleet driving and gear changing data includes steering in a first direction, then steering in the opposite direction (a forward move 20 is carried out with full steering lock; Fig. 2b; [0053]; during the forward move 20 or immediately after the end of the forward move, it is checked in the query 130 whether the vehicle 1 could leave the parking space, if this is the case, after switching the travel direction and straightening the wheels 5a and 5b, the linear reversing move 30 is carried out; Fig. 2c; [0055-0056]).

Regarding Claim 15, modified Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle control system of claim 11 wherein the vehicle controller is operable to offer an auto-shift in response to a prior pattern of fleet vehicle operation based on at least one of distance traveled, velocity profile, and steering angle profile (in step 100, the driver activates the pulling-out function by selecting a parking menu on the display screen; Fig. 1; [0046]; the first move does not necessarily have to be a linear reversing move but rather instead a steered forward move can be selected as the first move; in dependence on the distances to the front boundary vehicle 2 and to the rear boundary vehicle 3; Fig. 1; [0050]).

Regarding Claim 17, modified Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle control system of claim 11 wherein the prior pattern of fleet vehicle operation includes if fleet vehicle velocities were less than a selected threshold (a forward move 20 is carried out with full steering lock; Fig. 2b; [0053]; during the forward move 20 or immediately after the end of the forward move, it is checked in the query 130 whether the vehicle 1 could leave the parking space, if this is the case, after switching the travel direction and straightening the wheels 5a and 5b, the linear reversing move 30 is carried out; Fig. 2c; [0055-0056]; the vehicle comes to a stop before any change in direction).

Regarding Claim 18, modified Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle control system of claim 11 wherein the prior pattern of fleet vehicle operation includes if fleet vehicle distance traveled is less than a selected threshold (the first move does not necessarily have to be a linear reversing move but rather instead a steered forward movement; if there is very small distance to the rear vehicle 3 before beginning the parking maneuver and greater distance to the front vehicle 2, a steered forward movement may be selected; Fig. 1; [0050]; a steered forward movement includes fully locked wheels in the direction of a pull-out side and an automatic switching of the travel direction; Fig. 2b; [0053]).

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

Regarding Claim 19, modified Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle control system of claim 11 wherein the prior pattern of fleet vehicle operation includes if, for fleet vehicles, a first limited distance associated with vehicle length was covered with a steering angle less than a first threshold (the automated parking maneuver begins in step 110 with a linear reversing move 10 in parallel to the curbstone 4, wherein the vehicle is moved back until it reaches or falls below a specific threshold value for the distance to the rear vehicle 3; Fig. 1; [0049]), and a second distance was traveled with a steering angle greater than a second selected threshold and in a first direction, and the vehicle subsequently stops, and the steering angle is adjusted to a second direction opposite the first direction (Fig. 2b illustrates the situation after carrying out the initial reversing move; steerable wheels 5a and 5b are now fully locked in the direction of the pulling-out side and after switching the travel direction, a forward move 20 is carried out with full steering lock; Fig. 2b; [0053-0055]).

Regarding Claim 20, modified Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle control system of claim 11 including a driver input device operably connected to the vehicle controller (a parking menu shown on a display screen in the center console; Fig. 1; [0046]), and wherein the vehicle controller is operable to offer an auto-shift and enact the auto shift in response to a user acceptance action on the driver input device (in step 100, the driver activates the pulling out function by selecting a parking menu on the display screen in the center console by actuating a parking button, selecting the pulling out-side, and releasing the brake pedal; Fig. 1; [0046]; the automated parking maneuver begins in step 110 with a linear reversing move 10; for this purpose the reverse gear is engaged by the parking assistance system and the vehicle is accelerated and brought to a standstill in front of the rear vehicle; Fig. 1; [0049]).

Claim 16 lacks an inventive step under PCT Article 33(3) as being obvious over US 2021/0269019 to Bayerische Motoren Werke Aktiengesellschaft in view of US 2020/0207334 to Hyundai Motor Company et al. (hereinafter, "Hyundai Motor Company") and US 2013/0144492 to Takano et al. (hereinafter, "Takano").

Regarding Claim 16, modified Bayerische Motoren Werke Aktiengesellschaft discloses the motor vehicle control system of claim 11.

Bayerische Motoren Werke Aktiengesellschaft fails to explicitly disclose wherein the prior pattern of fleet vehicle operation includes if fleet vehicle steering angles leading to a shift were greater than a selected threshold.

Takano teaches a parking mode selection apparatus for a vehicle (Takano; Abstract) wherein the prior pattern of fleet vehicle operation includes if fleet vehicle steering angles leading to a shift were greater than a selected threshold (when the steer angle is equal-to or smaller-than -30 degrees, it is judged whether or not the steer angle is equal to smaller than -60 degrees; when the steer angle is larger than -60 degrees it is judged that a left-side perpendicular parking is selected; Fig. 7; [0062-0063]; a left-side perpendicular parking includes a run forward on the right and then run backward to park perpendicularly on the left side; Para. [0003]).

It would have been obvious to one of ordinary skill in the art before the priority date to modify Bayerische Motoren Werke Aktiengesellschaft with the steering angle features of Takano. The motivation for doing so would have been to allow judging of steering angles in order to determine selection of parking modes (Takano; [0065]), thereby improving operability and making parking target position easier to set (Takano; [0006]).

Claims 1-20 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**

Continuation of IPC: ***B60W 10/04*** (2024.01); ***B60W 10/18*** (2024.01); ***B60W 10/20*** (2024.01); ***B60W 30/06*** (2024.01); *B60W 50/10* (2024.01)

VEHICLE GEAR SELECTION CONTROL

Cross-Reference to Related Application

[0001] This Patent Cooperation Treaty (PCT) application claims priority to U.S. Patent Application Number 18/403,221 filed on January 3, 2024 which claims priority to, and is a Continuation-in-Part of U.S. Patent Application Number 18/205,823 filed on June 5, 2023, entitled "VEHICLE GEAR SELECTION CONTROL," which is hereby incorporated by reference in its entirety for all that is taught and disclosed therein.

Field of the Invention

[0002] The present invention relates to motor vehicles and operational control systems.

Background and Summary

[0003] Traditional motor vehicles have gear selection controls using a lever or physical buttons. Modern vehicles may employ computer touchscreen control, such as swiping up on the left edge of the screen to go forward and down to go in reverse. All these controls have a direction or element associated with each direction, and the driver indicates by the control operation which direction is desired.

[0004] In contrast, some vehicles have advanced gear or direction selection is special circumstances. Some may select a direction automatically when initially proceeding from a parked condition. Vehicle vision of other sensors may detect a circumstance in which there is an obstacle such as a wall in one direction and only one apparent direction to proceed. The system may then offer the driver that proposed direction, and the driver then for safety reasons indicates (such as by a tap on the brake) that the proposed direction is safe and correct.

[0005] It is notable that the driver confirmation of the direction is provided by a control input that conveys no direction information and is the same input regardless of direction proposed. The switch is a simple binary switch, without multiple positions as in a traditional shift stalk, or different directions to swipe such as on a touch screen interface. In this version, the only input from the driver is acceptance, unless the driver disagrees and inputs the other direction with the usual input selection interface.

[0006] It is further noted that the automated vehicle-proposed direction system is limited to starting from a stopped condition, when the vehicle initially is not in gear or being

operated. Parking spaces normally may have obstacles on one direction opposite the direction of entry. The existing system is unsuitable for gear changes while underway and operating the vehicle, which are rare except when encountering unexpected obstacles and in routine parking and unparking maneuvers, in which case the user selection of direction is always indicated deliberately each time.

[0007] While effective, these gear direction systems may have disadvantages, or have an opportunity for automation to provide convenience. This especially occurs during routine parking when backing out of a parking space, stopping, then selecting the forward drive direction. This may be the only frequent need for a screen swipe to indicate direction in vehicles with sensor initial direction proposals. The screen swipe may be a distraction, require visual observation to reach a small area, and may be a non-intuitive direction for some users. The distractions may arise when in a parking lot context when traffic may come from different direction, when other drivers may have distracted attention, and in which pedestrians and obstacles may be present.

[0008] Accordingly, there is a need for a motor vehicle having a frame with wheels and a motor connected to the frame. A steering control is connected to the wheels to establish a steering angle. A controller is operably connected to the steering control, to the motor, and to the wheels, and is operable to selectably drive the wheels in a forward direction in a drive mode and in a rearward direction in a reverse mode. The controller is operable to select a direction for driving the wheels in response to a pattern of steering angle movements, without operator indication of a direction.

Brief Description of the Drawings

[0009] Figure 1 shows a schematic depiction of a vehicle according to a preferred embodiment of the invention.

[0010] Figure 2 shows a chart depicting vehicle operation in a selected maneuver.

[0011] Figure 3 shows a system including a network of vehicles training a central controller.

Detailed Description of a Preferred Embodiment

[0012] As shown schematically in Figure 1, the system operates in a vehicle 10 having a frame or body 12 having wheels 14 that are driven by a motor 16. Brakes 20 are associated with each wheel and a brake cylinder 22 operates the brakes. A steering system 24 steers the front wheels.

[0013] A computer or controller 30 is connected to each of the above systems, including sensors to

monitor operation of each system, and cameras or other sensors (not shown) that gather information about the vehicle's environment to enable autonomous or assisted driving. A passenger compartment includes a touchscreen display 32 connected to the controller and visible to a driver 34 and passenger 36 each occupying seats in the compartment. The display provides data entry capability and the controller also connects to audio speakers and microphones in the compartment for sending and receiving audio information with the occupants.

[0014] At the driver's side of the display near the left edge as shown, a vertical bar 38 may be displayed to provide a gear shift control. An upward swipe indicates a selection of forward travel in "drive" gear, and downward swipe indicates "reverse" for driving rearward for backing up.

[0015] Vehicle controls include a steering wheel or yoke 40 that is connected to the controller and may in some instances be selectably mechanically connected to the steering system 24 to enable direct mechanical control by the driver, electronic control by the driver via the controller, autonomous control by the controller with actuators or the mechanical connection moving the steering wheel in concert with the wheel angle, and combinations of these as selected or indicated by conditions. Similarly, an accelerator pedal 42 and brake pedal 44 are connected respectively to the motor 16, brake system 22, via the controller and optionally with some direct connection for driver and controller control over these functions.

[0016] The typical operation of the system is in the context of "unparking," when a driver backs out of a parking spot in reverse, steers to adjust direction while reversing, then shifts to drive, steers the other direction, then straightens out to proceed. This is most typically illustrated in perpendicular head-in parking lot parking, in which the parking space is perpendicular to the aisle for the flow of traffic along the parking spots. An angled parking lot with parking spots indicated with a herringbone pattern of stripes has a similar pattern of operation, with gentler steering angles. Parallel parking has its own configuration. Residential garages and driveways are often like perpendicular parking, but there are many variations.

[0017] Each parking context has its own sequence of operations including steering angle and velocity profile. Parking operation normally takes place at slow speeds, so the operation and functions disclosed herein may be limited to circumstances below a selected speed, or within parameters of a function based in part on speed.

[0018] Figure 2 is a chart 100 that illustrates the sequence of unparking. The upper trace 110

indicates steering wheel angle on a time-based horizontal chart. The lower trace 120 indicates velocity. The lower images A-F depict the vehicle 130 in a parking space 132, and are located at their relative positions on the time axis. At position A, the vehicle is parked, with steering wheel straight, front wheels in line with the axis of the vehicle, and zero velocity. The vehicle maintains the steering wheel at zero steering angle as it accelerates to a slow speed to move straight rearward.

[0019] As it moves to the rear, position B indicates when the nose of the vehicle is clear of adjacent parked cars and may now be turned to a significant angle to enable the vehicle to curve with a tight radius due to presumed obstacles on the other side of the parking lot aisle 134 it is backing into.

[0020] The vehicle continues rearward through position C, with wheels turned sharply, then after it passes C and approaches an angle that enables forward departure past the adjacent vehicle that was to its left, the vehicle slows to a stop at D.

[0021] The wheel angle may begin reducing before D, but between D and E, the vehicle is briefly stopped, and the vehicle is manually shifted from reverse to drive as shown in the existing prior art screen swipe 136 or (in the case of the preferred embodiment) may be suggested by the vehicle based on presumptions discussed in detail below, and preferably confirmed by the driver by an approval response such as a brake tap sequence 140 or other non-direction indicating signal such as a button click, voice command, or visually-detected gesture. During the stopped D-E period, the wheel is turned sharply from one direction away from straight, back past straight, and to the opposite direction to clear the adjacent vehicle as it proceeds forward.

[0022] Beyond E, the vehicle drives forward at increasing speeds that are above a threshold normally reserved for parking operations and higher for parking lot transit, or roadways that may serve as the "aisle."

[0023] An important concern for the preferred embodiment is in which limited circumstances to have the controller enable auto-shifting, and to propose or enact a shift in direction without user indication of the direction, and preferably with only an indication of approval.

[0024] The controller may be programmed with specific functions or algorithms as to when an auto-shift is clearly safe to offer or enact, and when if offered, acceptance by the driver is likely desired and not an unwanted distraction. The controller may be programmed by artificial intelligence data derived from multitudes of parking lot navigations to determine actual patterns when auto-shifting might be safely offered, avoiding simpler criteria and functions as offered below for simplicity. However, if the disclosed functions are based on

wheel angle patterns, velocity patterns, with certain thresholds of their various amounts, derivatives, and integrals, it is believed that typical drivers will naturally be following certain functions of the same parameters, and AI systems would simply derive the rules from typical driver behavior. In such embodiments the driver may be offered an auto-shift (or an auto shift implemented without consent) only when the likelihood of it being desired is greater than a preselected threshold, and when other safety criteria are met.

[0025] Figure 3 shows an AI system 200 employing these principles. The system operates with a network or fleet 210 of a multitude of vehicles operating normally by private owners to train a central system 220 with immense processing ability to receive and analyze the video and input data from the fleet. The central system may be otherwise occupied to gather driving data to provide all other aspects of self-driving or autonomous vehicle operation. The fleet vehicles may be selected or curated as superior or model drivers. The fleet vehicle behavior when naturally engaging in gear changing (typically Reverse to Drive) is recorded over multitudes of cases, including edge cases with unusual circumstances. The recorded behavior data may be video streams from vehicle cameras, and vehicle control inputs such as steering angle, accelerator and brake usage, and gear changing inputs. From these interactions, the central system learns the patterns and combinations of inputs that suggest with a selected degree of confidence that a gear change is desired, and should be enacted or offered for the user driver ratification. The user driver vehicle processor employs the network-learned behavior patterns without necessarily having preprogrammed algorithms or rules for the conditions (ranges of velocities, accelerations, durations, or angles, etc.) suggesting a gear change is desired. The system simply refers to the mass of fleet behavioral data to find confident commonalities of circumstances.

[0026] One criterion is vehicle speed. Obviously, the shifting is offered only for when the vehicle is essentially stationary or at near zero speed. But the speed prior to this, when departing the parking spot between positions B and C, may be pertinent to the question of whether the vehicle is intentionally unparking. The function may be based on maximum speed, or an average speed over a certain distance. Above a certain speed, auto shift would never be offered, and even speeds that might be common but not ideal for unparking might not receive an auto-shift offer. This would serve to train cautious driver behavior, especially if the entity determining the thresholds were associated with vehicle insurance liability.

[0027] Another criterion is steering angle. Large steering angles are associated with slower speeds, and only slight angles are used at high speeds. But beyond speed alone, steering angles are larger for unparking. While a capacious parking lot with wide aisles might not

require as sharp steering angles, they may still follow clear patterns to offer auto-shift.

[0028] Position is another element. Velocity and steering angle thresholds may be adequate, but more details patterns will tend to be associated with unparking. As shown, the vehicle proceeds for about one car length from A to B before introducing steering angle. It then proceeds for another limited distance related to conditions and vehicle length with a substantial steering angle.

[0029] Speed, steering angle, and position may be determined by sensors on the vehicle, or may be calculated or inferred by other sources, including vehicle cameras or vision systems that create a model of the environment and the vehicle's relationship to it, and GPS and other sensors.

[0030] Reversing the steering angle when slowing or after stopping is the final signal preferably to verify the appropriateness of an auto-shift offer.

[0031] Errors of enacted shifts are intolerable as they may cause accidents, so approval preferably needs to be indicated before an offered shift is enacted. Approval may be withheld in cases in which the driver may reverse for a time, give some indications of unparking, then proceed farther to the rear. The system should assess whether the vehicle has backed out enough and to a suitable angle to enable departure without conflict, so that if inadequately backed out, a premature auto-shift offer is not made.

[0032] Approval may be indicated in a wide range of ways. With the driver's foot on the brake for slowing to a stop after reversing, brake operation is one option. After stopping, the driver might release and tap the brake to accept the shift. With many vehicles offering one-pedal driving, and slowing automatically as the accelerator pedal is released, the driver's foot might shift over to tap the brake.

[0033] Acceptance can be indicated by clicking any button, operating any control, tapping the screen (but without needing to indicate a direction as the vehicle has offered the direction and no indication is needed). Voice consent may be provided, and a driver may gesture to accept, such as by a head nod indicating approved forward movement, as recognized by a cabin camera viewing the driver. Vehicles with scroll buttons on opposite sides of the steering wheel accessible to thumbs are well suited to serve as consent input, such as by clicking both wheels simultaneously.

[0034] Unparking from angled spaces on a street curb or a parking lot with aisles will be similar, and have some differences due to different geometries. For instance, steering angles will differ, and velocities may be necessarily brisker when pulling into a roadway to clear traffic. Auto-shifting may reduce exposer to traffic and enable safe unparking with smaller

traffic gaps by reducing the D-E time period that would be taken enacting a manual shift, with the attendant distraction.

[0035] Unparking from parallel parking is more complex and has its own patterns, but the system could learn or implement these patterns. Parallel parking is much like backing into a perpendicular parking spot, in that the driver begins by going past an open parking spot, should have signaled, and then backs up into the spot. This is potentially challenging because one normally doesn't shift to reverse upon simply pausing in a parking lot or a city street with parallel spaces beside. But in special detected circumstances the auto- shift can be proposed by the system. Based on sensing an available spot, preferably in the context of a known arrival at a navigated destination, optionally based on turn signal actuation to indicate a desire to park in a detected available space at the destination. Auto-park offering may be limited only when navigating and having arrived at a programmed destination.

[0036] In some embodiments, the system may be trained based on location, with the vehicle controller having a GPS system that identities the vehicle location. This may be employed to provide confident suggestions of auto shift at a frequent location (such as home and packing out of a garage or driveway before turning and shifting into drive) where the vehicle follows the same pattern essentially every time. "Always shift here" is a useful command to enable to driver to ensure that a shift is suggested. In certain circumstances, the shift may even be optionally made automatically without requiring driver approval. Locations other than home (such as work, or any place frequented) may be used to offer an auto-shift option by the vehicle prompting the user to ask whether they want to always auto shift at that location.

[0037] Some systems may gain enough information about whether to offer auto-shift upon initial arrival at a parking space, based on the images collected by the vehicle vision system as it approaches and enters the parking space. It may be unnecessary to gather more info by the vehicle's operation upon exiting the spot as is proposed above.

[0038] Other systems may simply employ distance traveled information, offering an auto-shift any time a vehicle reverses and stops within a selected distance typical for such parking lots (such as 2-3 car lengths). This would avoid offering an auto shift upon vehicle stoppage such as might occur to yield to cross traffic when having reversed less than a car length, although an offer of auto-shift may be ignored.

[0039] The system may also employ vehicle location data from GPS or geofence and enable or disable the auto-shift based on location. The feature may be limited to a user's home where the driving action is consistent every day, and disabled in public parking lots. It

may be enabled at "favorite" locations where there may be consistency or other basis for driver confidence or need for convenience. This may be treated like suspension adjustments that are enabled at certain locations and may be offered as a "do you want to auto-shift at this location in the future?" prompt.

1. A motor vehicle comprising:

   a frame having wheels;

   a motor connected to the frame;

   a steering control connected to the wheels to establish a steering angle;

   a controller operably connected to the steering control, to the motor, and to the wheels;

   the controller operable to selectably drive the wheels in a forward direction in a drive mode and in a rearward direction in a reverse mode; and

   the controller operable to select a direction for driving the wheels in response to a pattern of steering angle movements, without operator indication of a direction.

2. The motor vehicle of claim 1 wherein the controller is operable to change from reverse mode to drive mode without operation of a selector by a driver.

3. The motor vehicle of claim 1 wherein the controller is operable while the vehicle is underway in one of the forward and reverse directions, and has stopped momentarily, to determine whether to remain in the same direction or to change direction.

4. The motor vehicle of claim 1 wherein the pattern of steering angle movements includes steering in a first direction, then steering in the opposite direction.

5. The motor vehicle of claim 1 wherein the controller is operable to offer an auto-shift in response to a prior pattern of vehicle operation based on at least one of distance traveled, velocity profile, and steering angle profile.

6. The motor vehicle of claim 1 wherein the controller is operable to offer an auto-shift only if steering angles in a limited prior period were greater than a selected threshold.

7. The motor vehicle of claim 1 wherein the controller is operable to offer an auto-shift only if velocities are less than a selected threshold.

8. The motor vehicle of claim 1 wherein the controller is operable to offer an auto-shift only if distance traveled is less than a selected threshold.

9. The motor vehicle of claim 1 wherein the controller is operable to offer an auto-shift only if a first limited distance associated with vehicle length was covered with a steering angle less than a first threshold, and a second distance was traveled with a steering angle greater than a second selected threshold and in a first direction, and the vehicle subsequently stops, and the steering angle is adjusted to a second direction opposite the first direction.

10. The motor vehicle of claim 1 including a driver input device operably connected to the controller, and wherein the controller is operable to offer an auto-shift and enact the auto shift in response to a user acceptance action on the driver input device.

11. A motor vehicle control system comprising:
a central processor;
a fleet of multitudes of vehicles operably connected to the processor to transmit fleet driving and gear changing data to the processor;
the central processor operable based on the fleet driving and gear changing data to generate gear changing information;
a vehicle having a frame having wheels;
a motor connected to the frame;
a steering control connected to the wheels to establish a steering angle;
a vehicle controller operably connected to central processor, and to the steering control, to the motor, and to the wheels;
the controller operable to selectably drive the wheels in a forward direction in a drive mode and in a rearward direction in a reverse mode; and
the vehicle controller operable in response to gear changing information from the central controller to select a direction for driving the wheels, without operator indication of a direction.

12. The motor vehicle control system of claim 11 wherein the vehicle controller is operable to change from reverse mode to drive mode without operation of a selector by a driver.

13. The motor vehicle control system of claim 11 wherein the vehicle controller is operable while the vehicle is underway in one of the forward and reverse directions, and has

stopped momentarily, to determine whether to remain in the same direction or to change direction.

14. The motor vehicle control system of claim 11 wherein the fleet driving and gear changing data includes steering in a first direction, then steering in the opposite direction.

15. The motor vehicle control system of claim 11 wherein the vehicle controller is operable to offer an auto-shift in response to a prior pattern of fleet vehicle operation based on at least one of distance traveled, velocity profile, and steering angle profile.

16. The motor vehicle control system of claim 11 wherein the prior pattern of fleet vehicle operation includes if fleet vehicle steering angles leading to a shift were greater than a selected threshold.

17. The motor vehicle control system of claim 11 wherein the prior pattern of fleet vehicle operation includes if fleet vehicle velocities were less than a selected threshold.

18. The motor vehicle control system of claim 11 wherein the prior pattern of fleet vehicle operation includes if fleet vehicle distance traveled is less than a selected threshold.

19. The motor vehicle control system of claim 11 wherein the prior pattern of fleet vehicle operation includes if, for fleet vehicles, a first limited distance associated with vehicle length was covered with a steering angle less than a first threshold, and a second distance was traveled with a steering angle greater than a second selected threshold and in a first direction, and the vehicle subsequently stops, and the steering angle is adjusted to a second direction opposite the first direction.

20. The motor vehicle control system of claim 11 including a driver input device operably connected to the vehicle controller, and wherein the vehicle controller is operable to offer an auto-shift and enact the auto shift in response to a user acceptance action on the driver input device.

VEHICLE GEAR SELECTION CONTROL

Abstract of the Disclosure

A motor vehicle for operation by a driver has a frame with wheels and a motor connected to the frame. A steering control is connected to the wheels to establish a steering angle.
A controller is operably connected to the steering control, to the motor, and to the wheels, and is operable to selectably drive the wheels in a forward direction in a drive mode and in a rearward direction in a reverse mode. The controller is operable to select a direction for driving the wheels in response to a pattern of steering angle movements, without operator indication of a direction.

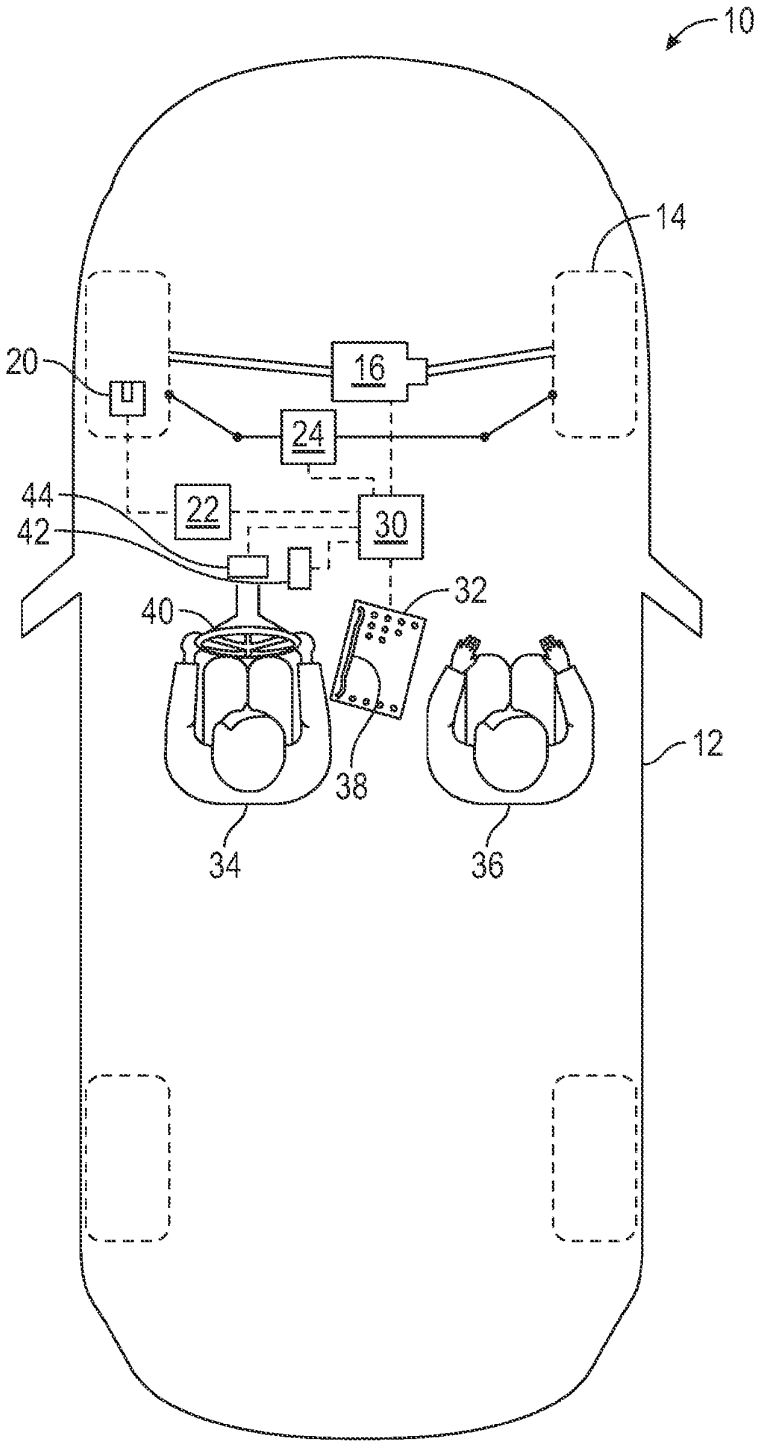

FIG. 1

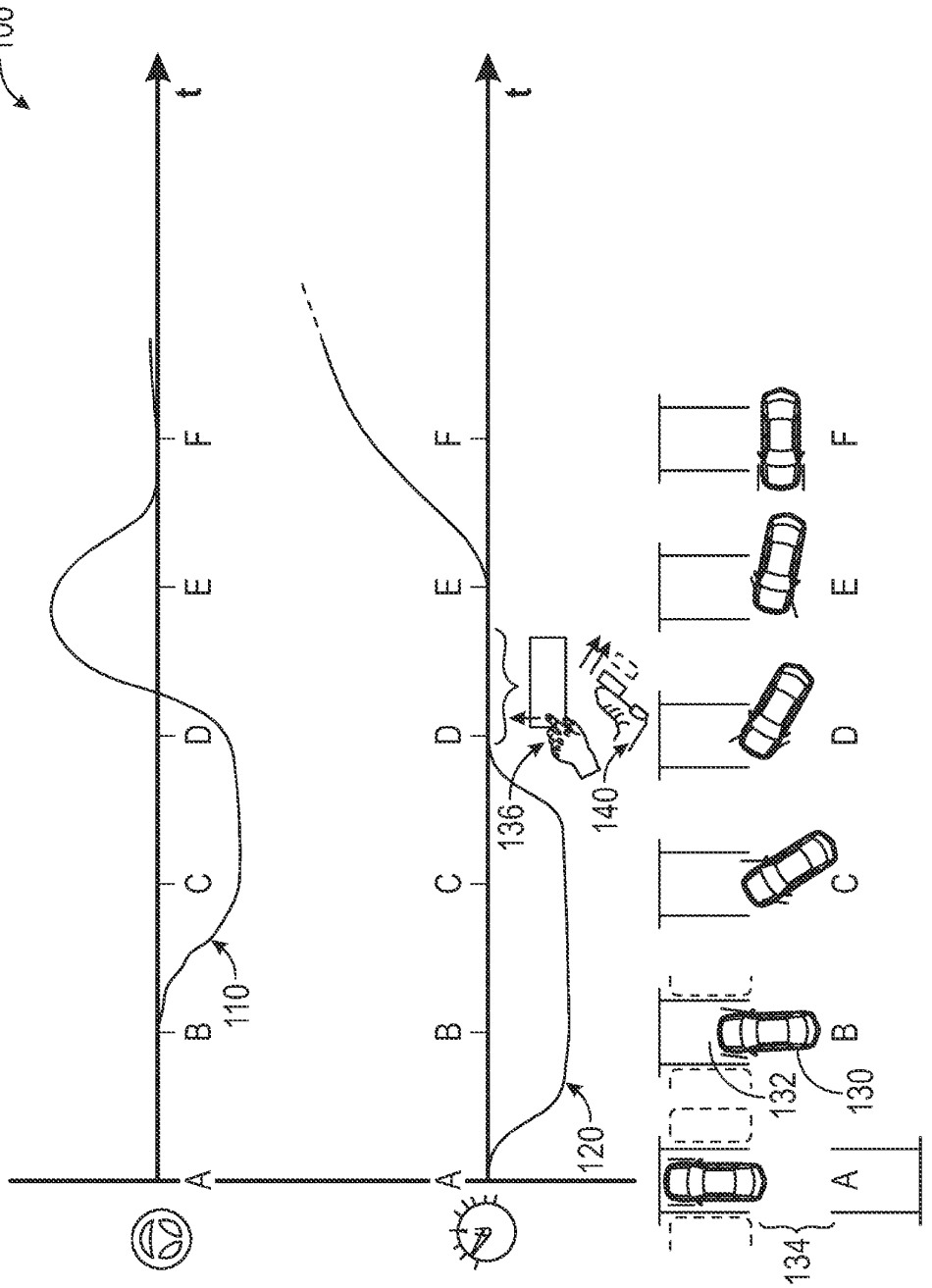

FIG. 2

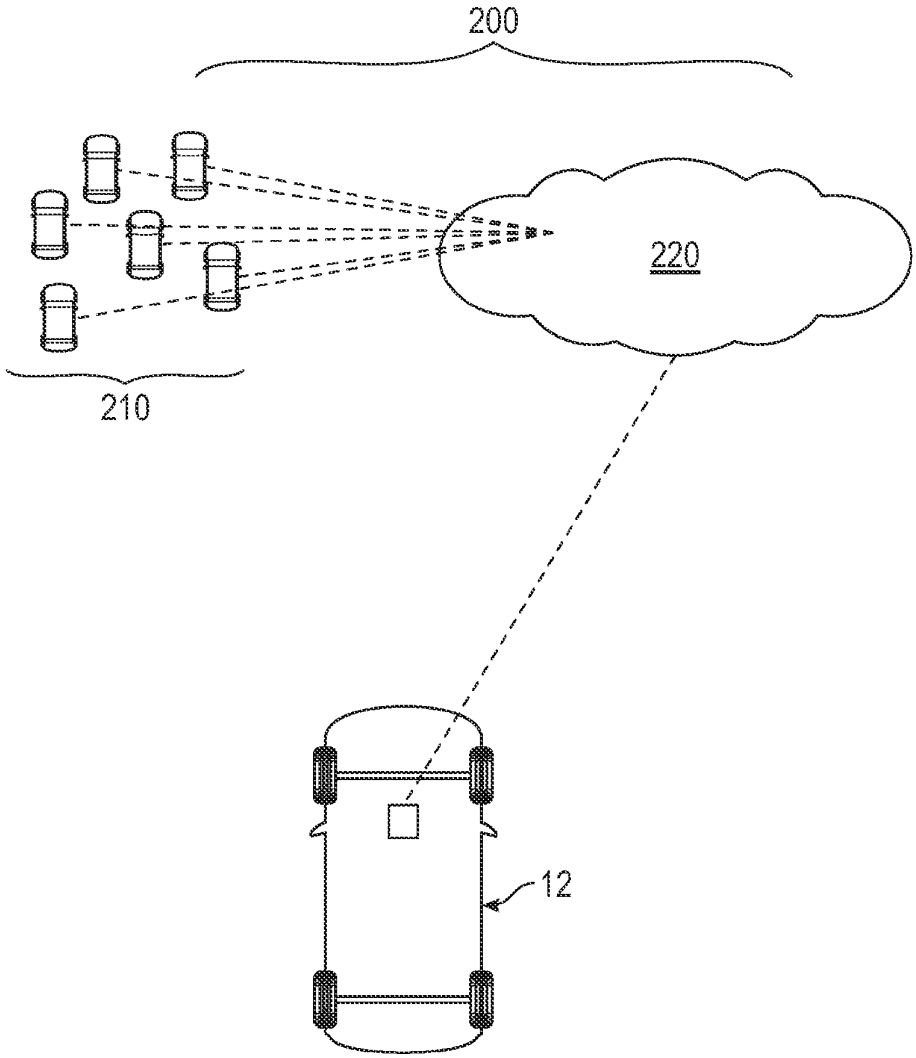

FIG. 3