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(54) Title: SYSTEM AND METHOD FOR DYNAMIC STEERING CONTROL ASSISTANCE IN A VEHICLE

(57) Abstract: The present disclosure recites a system and a method of providing steering control assistance. In some implementations, the system may include a controller communicatively coupled to a plurality of sensors placed at different positions in the vehicle and at least a steering control motor. The controller may be configured to receive inputs from the plurality of sensors indicative of different parameters related to the vehicle and calculate a steering angle for the vehicle based on the received inputs. The system may be further configured to display the calculated steering angle on a display unit of the vehicle and simultaneously monitor output torque generated by the steering control motor in order to achieve the calculated steering angle and generate an alert, if the output torque of the steering control motor is not within a target torque range, to allow the dynamic steering control assistance.

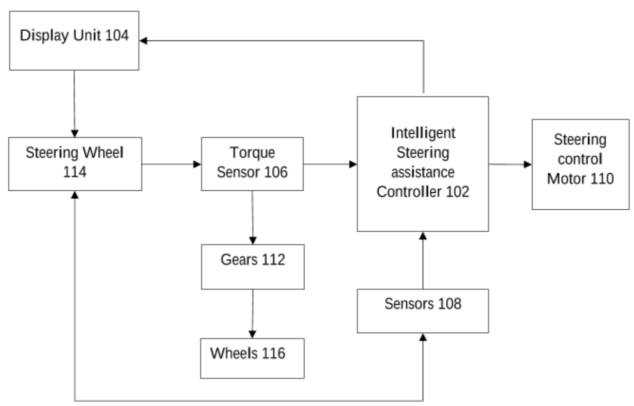

FIG. 1A

<u>FORM 2</u>

THE PATENTS ACT 1970
(39 OF 1970)
&
The Patent Rules, 2003

Complete Specification

(See Section 10 and Rule 13)

1. TITLE OF THE INVENTION

SYSTEM AND METHOD FOR DYNAMIC STEERING CONTROL ASSISTANCE IN A VEHICLE

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3. PREAMBLE TO THE DESCRIPTION

COMPLETE

The following specification describes the invention and the manner in which it is to be performed

DESCRIPTION

TECHNICAL FIELD

[001] The present invention generally relates to the field of semi-automated driving, and more particularly to dynamic steering control assistance in the vehicles to safely turn the vehicles.

BACKGROUND

[002] The following description includes information that may be useful in understanding the present invention. It is not an admission that any of the information provided herein is prior art or relevant to the presently claimed invention, or that any publication specifically or implicitly referenced is prior art.

[003] Nowadays driver assistance systems are being widely used in vehicles. The driver assistance systems enhance safety and also increase driving comfort. The society of automotive engineers (SAE) has defined six levels of driving automation from level 0 to level 5, where level 0 represents no driving automation and level 5 represents full driving automation. Level 1 is the lowest level of automation. The vehicles of the level 1 automation comprise automated features such as adaptive cruise control. For example, the adaptive cruise control function provides vehicle control in which the speed of the vehicle is maintained at a driver-determined value whilst suitable sensor systems monitor the highway ahead to ensure that the vehicle does not approach too close to a vehicle. The driver workload is reduced as they no longer have to regulate brake and throttle inputs in response to approaching vehicles.

[004] The ACC function may work in combination with, or independent of, another function that provides lateral vehicle control, for example, a Lane Centering Assist (LCA) function, more generally known as a lateral assist function. In known lateral assist functions, on-board sensor systems, which may be camera-based, monitor the highway and feed a steering control system that ensures the vehicle remains in the center of its lane. However, the driver is fully responsible for monitoring the environment and would need to control the vehicle collaboratively in scenarios where lane markings do not necessarily identify the correct driving line, for example during lane changes or if there was an obstruction such as roadworks in the lane. When combined with lateral assist function with adaptive cruise control function (ACC), this becomes a Level 2 system according to the SAE-defined automation levels.

[005] Further functionality and robustness may be added to provide a Level 3 system where the driver is no longer required to actively monitor the driving environment. However, such driver-assist functions must allow for the driver the resume control at any time in response to driver intent or the vehicle leaving the conditions under which it can operate autonomously.

[006] However, it may be difficult for some drivers to properly estimate the steering wheel rotation in order to turn the vehicle. Also, the above-mentioned vehicles do not have the capability to assist the driver while turning the vehicle.

[007] Thus, there exists a need in the art for techniques to assist the driver while making a turn. It is against this background that the embodiments of the invention have been devised.

SUMMARY

[008] The present disclosure overcomes one or more shortcomings of the prior art and provides additional advantages discussed throughout the present disclosure. Additional features and advantages are realized through the techniques of the present disclosure. Other embodiments and aspects of the disclosure are described in detail herein and are considered a part of the claimed disclosure.

[009] In one non-limiting embodiment of the present disclosure, a system for dynamic steering control assistance in a vehicle is disclosed. The system may include a controller communicatively coupled to a plurality of sensors placed at different positions in the vehicle and at least a steering control motor. The controller is configured to: receive inputs from the plurality of sensors, where said inputs indicate different parameters related to the vehicle; calculate a steering angle for the vehicle based on the received inputs, where the calculated steering angle indicates a degree at which a steering wheel is to be operated to safely turn the vehicle; transmit the calculated steering angle to a display unit of the vehicle and simultaneously monitor output torque generated by the steering control motor in order to achieve the calculated steering angle; and generate an alert, if the output torque of the steering control motor is not within a target torque range, to allow the dynamic steering control assistance.

[0010] In another non-limiting embodiment of the present disclosure, the plurality of sensors comprises at least one of a vehicle speed sensor, a backlash sensor, a piezoelectric sensor, a torque sensor, a GPS sensor, a steering angle sensor, a wheel position sensor, and a LIDAR sensor.

[0011] In yet another non-limiting embodiment of the present disclosure, the display unit is mounted at least on one of the steering wheel, a dashboard, and a heads-up display of the vehicle.

[0012] In yet another non-limiting embodiment of the present disclosure, the target torque range is fetched from a database, wherein the database is configured to store pluralities of pre-calculated target torque range corresponding to a plurality of steering angles.

[0013] In yet another non-limiting embodiment of the present disclosure, a method for dynamic steering control assistance in a vehicle is disclosed. The method may include receiving inputs from a plurality of sensors, where said inputs indicate different parameters related to the vehicle; calculating a steering angle for the vehicle based on the received inputs, where the calculated steering angle indicates a degree at which a steering wheel is to be operated to safely turn the vehicle; transmitting the calculated steering angle to a display unit of the vehicle and simultaneously monitoring output torque generated by a steering control motor of the vehicle in order to achieve the calculated steering angle; and generating an alert, if the output torque of the steering control motor is not within a target torque range, to allow the dynamic steering control assistance. Other embodiments of this aspect include corresponding computer systems, apparatus, and computer programs recorded on one or more computer storage devices, each configured to perform the actions of the methods.

[0014] The foregoing summary is illustrative only and is not intended to be in any way limiting. In addition to the illustrative aspects, embodiments, and features described above, further aspects, embodiments, and features will become apparent by reference to the drawings and the following detailed description.

BRIEF DESCRIPTION OF DRAWINGS

[0015] The embodiments of the disclosure itself, as well as a preferred mode of use, further objectives and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings. One or more embodiments are now described, by way of example only, with reference to the accompanying drawings in which:

[0016] **FIG.1A** illustrates a high-level block diagram of a system for dynamic steering control assistance in the vehicle, in accordance with an embodiment of the present disclosure.

[0017] **FIG.1B** illustrates a low-level block diagram of a system for dynamic steering control assistance in the vehicle, in accordance with an embodiment of the present disclosure.

[0018] **FIGS. 2** illustrates a flowchart of a method for dynamic steering control assistance in the vehicle, in accordance with an embodiment of the present disclosure.

[0019] The figures depict embodiments of the disclosure for purposes of illustration only. One skilled in the art will readily recognize from the following description that alternative embodiments of the structures and methods illustrated herein may be employed without departing from the principles of the disclosure described herein.

DETAILED DESCRIPTION

[0020] The foregoing has broadly outlined the features and technical advantages of the present disclosure in order that the detailed description of the disclosure that follows may be better understood. It should be appreciated by those skilled in the art that the conception and specific embodiment disclosed may be readily utilized as a basis for modifying or designing other structures for carrying out the same purposes of the present disclosure.

[0021] Various embodiments of the present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all embodiments of the invention are shown. Indeed, the invention may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. The term “or” is used herein in both the alternative and conjunctive sense, unless otherwise indicated. The terms “illustrative,” “example,” and “exemplary” are used to be examples with no indication of quality level. Like numbers refer to like elements throughout.

[0022] The phrases “in an embodiment,” “in one embodiment,” “according to one embodiment,” and the like generally mean that the particular feature, structure, or characteristic following the phrase may be included in at least one embodiment of the present disclosure and may be included in more than one embodiment of the present disclosure (importantly, such phrases do not necessarily refer to the same embodiment).

[0023] The word “exemplary” is used herein to mean “serving as an example, instance, or illustration.” Any implementation described herein as “exemplary” is not necessarily to be construed as preferred or advantageous over other implementations.

[0024] If the specification states a component or feature “can,” “may,” “could,” “should,” “would,” “preferably,” “possibly,” “typically,” “optionally,” “for example,” “often,” or “might” (or other such language) be included or have a characteristic, that particular component or feature is not required to be included or to have the characteristic. Such component or feature may be optionally included in some embodiments, or it may be excluded.

[0025] Although, the vehicles with automation of level 1 and level 2 provide certain features to assist the drivers while driving. However, a driver with less experience may find it difficult to drive the vehicle in certain situations, especially while turning the vehicle. The driver may find it very difficult to determine how much to turn the steering wheel of the vehicle to make a safe turn. Due to this, he may under-turn and over-turn the vehicle that may also lead to accidents.

[0026] Therefore, there is a need for a steering control assistance to assist the driver to safely turn the vehicle. At the same time, it is necessary to provide alerts to the driver in case he is under-turning or over-turning the vehicle so that the driver is able to make the safe turn.

[0027] Disclosed herein is a system and a method for dynamic steering control assistance in a vehicle. The system may receive inputs from various sensors placed at different positions in the vehicle. The system may process the received input and may calculate an appropriate steering angle to safely turn the vehicle based on the received inputs. The received inputs may indicate different parameters related to the vehicle. The system may communicate the calculated steering angle to a driver of the vehicle by displaying the calculated steering angle on a display unit of the vehicle. A skilled person would appreciate the fact that the display unit for displaying the steering angle may be located at any appropriate location within the vehicle. The system may also calculate a target torque range which may be applied to safely turn the vehicle based on the calculated steering turning angle. Further, the system may simultaneously monitor torque being applied by the driver to the make the turn and may determine whether the applied torque is within the target torque range. In case the torque being applied is not within the target torque range, the system may generate an alert to warn the driver so that he may take appropriate action.

[0028] In this manner, the system of the present disclosure provides the dynamic steering control assistance to the driver to safely drive and turn the vehicle.

[0029] Referring now to the drawings, the detailed description set forth below in connection with the appended drawings is intended as a description of various configurations and is not intended to represent the only configurations in which the concepts described herein may be practiced. The detailed description includes specific details for the purpose of providing a thorough understanding of various concepts with like numerals denote like components throughout the several views. However, it will be apparent to those skilled in the art that these concepts may be practiced without these specific details.

[0030] **FIG. 1A** illustrates a high-level block diagram of a system 100 for dynamic steering control assistance in the vehicle. It must be understood to a person skilled in the art that architecture may also be implemented in various environments, other than as shown in FIG. 1. The system 100 may comprise an intelligent steering assistance controller 102, a display unit 104, a torque sensor 106, and a plurality of other sensors 108, but not limited thereto, discussed in detail in forthcoming paragraphs of the disclosure. The intelligent steering assistance controller 102 may be communicatively coupled with a steering control motor 110 of the vehicle and may also be coupled with the electronic control unit (ECU) of the vehicle.

[0031] The controller 102 may comprise one or more processors (e.g., central processing units (CPUs), microprocessors, microcontrollers, digital signal processors (DSPs), reduced instruction set computing (RISC) processors, field programmable gate arrays (FPGAs), programmable logic devices (PLDs), state machines, gated logic, discrete hardware circuits, and other suitable hardware) configured to execute one or more software programs. Software may be construed broadly to mean instructions, instruction sets, code, code segments, program code, programs, subprograms, software components, applications, software applications, software packages, routines, subroutines, objects, executables, threads of execution, procedures, functions, etc., whether referred to as software, firmware, middleware, microcode, hardware description language, or otherwise. Accordingly, in one or more example embodiments, the functions described herein may be implemented in hardware, software, or any combination thereof.

[0032] It may be understood by a skilled person that the system 100 shown in **FIG. 1A** is for the exemplary purpose only and should not be considered limiting in any sense. That is, there may be any number of alternatives through which the present disclosure may be implemented. In the figure, all entities are shown as single entities for ease of illustration and understanding, but it must be understood that there may be multiple numbers of entities. These entities may communicate with each other via wired and/or wireless communication link.

[0033] As shown in FIG. 1A, the torque sensor 106 may be communicatively coupled with gears 112 of the vehicle. Further, the gears 112 may be remain coupled to wheels 114 of the vehicle. The steering wheel 114 may be connected with the sensors 108 which may detect various parameters related to the steering wheel 114 and may provide the detected parameters to the controller 102.

[0034] **FIG. 1B** illustrates a low-level block diagram of the system 100 illustrated in fig. 1A. In an exemplary embodiment, Fig. 1B illustrates various sensors which may be used to detect information related to the vehicle. As illustrated in fig. 1B, the sensors may comprise a piezoelectric sensor 118, a wheel position sensor 120, a vehicle speed sensor 122, a GPS (Global Positioning System) sensor 124, LIDAR 126, a steering angle sensor 138, a backlash sensor 130, but not limited thereto.

[0035] According to an embodiment, the controller 102 may be communicatively coupled to the plurality of sensors as shown in fig. 1A and 1B, which may be placed at different positions in the vehicle. The controller 102 may receive inputs from the sensors, which may be indicative of the different parameters related to the vehicle. For example, the piezoelectric sensor 118 may be used to collect information related to the pressure and acceleration. For example, the piezoelectric sensor 118 may be used to detect the position of hands of the driver on the steering wheel 114. Such detection may be useful while displaying the steering angle to the driver to assist him to make the turn. The wheel position sensor 120 may be used to collect information related to the positions of the wheel and the alignment of the wheels. Further, the vehicle speed sensor 122 may be used to collect information related to the speed of the vehicle.

Further, the GPS sensor 124 may be used to receive information related to the road/path of the travel. In addition, the GPS sensor may provide information related to arc of the road or turning angle of the road. Furthermore, the system 100 may use LIDAR 126 to sense object in the proximity of the vehicle. The LIDAR 126 may be used to determine the distance from static and moving objects. It may also be used to determine the relative velocity of the vehicle from the objects in the proximity. In another embodiment, the system 100 may also use the steering angle sensor 128 to detect the angle of rotation of the steering wheel of the vehicle. The steering angle sensor 128 may be coupled with a steering shaft which may be further connected with the steering wheel 114 and the gears 112 of the vehicle. The steering wheel 114 may be coupled to a steering rack through a steering shaft 132 (also called a torsion bar) and the gears 112. The gears 112 may be a pinion that converts the rotation of the steering shaft 132 to lateral movement of the steering rack, as is a known configuration of the steering system. Further, the torque sensor 106 may be used to collect information related to force applied on the steering wheel of the vehicle by the driver. The torque sensor 124 may detect the applied force and may provide the detected torque value to the controller 102 for further processing. The backlash sensor 130 may be used to determine the distance between the gears 112.

[0036] After receiving the inputs from the plurality of sensors, the controller 102 may calculate a steering angle for the vehicle based on the received inputs which indicate a degree at which the steering wheel may be operated to safely turn the vehicle. According to an embodiment, the controller 102 may calculate the steering angle using on-board algorithms and look-up tables. The controller 102 may provide the calculated steering angle to the driver. In order to provide the calculated steering angle to the driver, the controller 102 may transmit the calculated steering angle to the display unit 104 of the vehicle. The display unit 104 may be mounted at least on one of: the steering wheel 114, a dashboard, and a heads-up display of the vehicle, but not limited thereto. According to another embodiment, the controller 102 may provide the calculated steering angle to the vehicle in any suitable mode such as audio, video, audio-visual mode or any other suitable mode.

[0037] The controller 102 may simultaneously monitor output torque generated by the steering control motor 110 to achieve the calculated steering angle. In an embodiment, the output torque of the steering control motor 110 may be monitored via the wheel position sensor 120 which may detect the change in the position of the wheels 116 due to torque from the gears 112. This change in the position of the wheels 116 may be the result of the output torque from the steering control motor 110. Thus, the information received from the wheel position sensor 120 may be indicative of the output torque from the steering control motor 110.

[0038] The controller 102 may then determine a target torque range required to turn the steering wheel 114 based on the calculated steering angle and may compare the torque output from the steering control motor 110. In an embodiment, the controller 102 may fetch the target torque range from a database (not shown in figures). The database may store pluralities of pre-calculated target torque range corresponding to a plurality of steering angles. Thus, when the steering angle is calculated, the controller 102 may map the calculated steering angle with the steering angle values stored in the database and may fetch the associated target torque value. The database may be generated by any suitable means. The controller 102 may then generate an alert if the output torque of the steering control motor 110 is not within the target torque range in order to warn the drive. The alert may be provided by any suitable means in any form such as audio, video or audio-visual form. This allows the dynamic steering control assistance to the vehicle.

[0039] In this manner, the system 100 of the present disclosure may provide the dynamic steering control assistance to the driver.

[0040] **FIG. 2** illustrates a flowchart of a method for dynamic steering control assistance in a vehicle, in accordance with an embodiment of the present disclosure. The vehicle may comprise various sensors placed at different positions in the vehicle. As illustrated in **FIG. 2**, the method 200 includes one or more blocks illustrating for dynamic steering control assistance in the vehicle. The method 200 may be described in the general context of computer executable instructions. Generally, computer executable instructions may include routines, programs, objects, components, data structures, procedures, modules, and functions, which perform specific functions or implement specific abstract data types.

[0041] The order in which the method 200 is described is not intended to be construed as a limitation, and any number of the described method blocks may be combined in any order to implement the method. Additionally, individual blocks may be deleted from the methods without departing from the spirit and scope of the subject matter described.

[0042] At step 202, method 200 may start with receiving inputs from the plurality of sensors. The inputs may be received by the controller 102 which is communicatively coupled to the plurality of sensors (as shown in figs. 1A and 1B) placed at different positions in the vehicle. The sensors may comprise a torque sensor 106, a piezoelectric sensor 118, a wheel position sensor 120, a vehicle speed sensor 122, a GPS sensor 124, LIDAR 126, a steering angle sensor 128, a backlash sensor 130, but not limited thereto. The received inputs may indicate different parameters related to the vehicle.

[0043] At step 204, method 200 may recite that a steering angle for the vehicle may be calculated based on the received inputs which may indicate a degree at which the steering wheel 114 is to be operated to safely turn the vehicle. The steering angle may be calculated by the controller 102 using on-board algorithms and look-up tables. The method 200 at step 206 recites that the calculated steering angle may be transmitted to the display unit 104 of the vehicle and an output torque generated by the steering control motor 110 of the vehicle in order to achieve the calculated steering angle, may be simultaneously monitored. The display unit 104 may be mounted at least on one of: the steering wheel 114, a dashboard, and a heads-up display of the vehicle, but not limited thereto. According to another embodiment, the controller 102 may provide the calculated steering angle to the vehicle in any suitable mode such as audio, video, audio-visual mode or any other suitable mode.

[0044] The method 200 at step 208 may recite that an alert may be generated if the output torque of the steering control motor 110 is not within a target torque range to allow the dynamic steering control assistance. The controller 102 may determine a target torque range required to turn the steering wheel 114 based on the calculated steering angle and may compare the torque output from steering control motor 110. In an embodiment, the controller 102 may fetch the target torque range from a database (not shown in figures). The database may store pluralities of pre-calculated target torque range corresponding to a plurality of steering angles. Thus, when the steering angle is calculated, the controller 102 may map the calculated steering angle with the steering angle values stored in the database and may fetch the associated target torque value. The database may be generated by any suitable means.

[0045] The controller 102 may generate an alert if the output torque of the steering control motor 100 is not within the target torque range in order to warn the drive. The alert may be provided by any suitable means in any form such as audio, video or audio-visual form. This allows the dynamic steering control assistance to the vehicle.

[0046] The foregoing method descriptions and the process flow diagrams are provided merely as illustrative examples and are not intended to require or imply that the steps of the various embodiments must be performed in the order presented. As will be appreciated by one of skill in the art the order of steps in the foregoing embodiments may be performed in any order. Words such as “thereafter,” “then,” “next,” etc., are not intended to limit the order of the steps; these words are simply used to guide the reader through the description of the methods. Further, any reference to claim elements in the singular, for example, using the articles “a,” “an” or “the” is not to be construed as limiting the element to the singular.

[0047] In some example embodiments, certain ones of the operations herein may be modified or further amplified as described below. Moreover, in some embodiments additional optional operations may also be included. It should be appreciated that each of the modifications, optional additions or amplifications described herein may be included with the operations herein either alone or in combination with any others among the features described herein.

[0048] The hardware used to implement the various illustrative logics, logical blocks, modules, and circuits described in connection with the aspects disclosed herein may include a general purpose processor, a digital signal processor (DSP), a special-purpose processor such as an application specific integrated circuit (ASIC) or a field programmable gate array (FPGA), a programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A general-purpose processor may be a microprocessor, but, in the alternative, the processor may be any conventional processor, controller, microcontroller, or state machine. A processor may also be implemented as a combination of computing devices, e.g., a combination of a DSP and a microprocessor, a plurality of microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration. Alternatively or additionally, some steps or methods may be performed by circuitry that is specific to a given function.

[0049] In one or more example embodiments, the functions described herein may be implemented by special-purpose hardware or a combination of hardware programmed by firmware or other software. In implementations relying on firmware or other software, the functions may be performed as a result of execution of one or more instructions stored on one or more non-transitory computer-readable media and/or one or more non-transitory processor-readable media. These instructions may be embodied by one or more processor-executable software modules that reside on the one or more non-transitory computer-readable or processor-readable storage media. Non-transitory computer-readable or processor-readable storage media may in this regard comprise any storage media that may be accessed by a computer or a processor. By way of example but not limitation, such non-transitory computer-readable or processor-readable media may include random access memory (RAM), read-only memory (ROM), electrically erasable programmable read-only memory (EEPROM), FLASH memory, disk storage, magnetic storage devices, or the like. Disk storage, as used herein, includes compact disc (CD), laser disc, optical disc, digital versatile disc (DVD), floppy disk, and Blu-ray disc™, or other storage devices that store data magnetically or optically with lasers. Combinations of the above types of media are also included within the scope of the terms non-transitory computer-readable and processor-readable media. Additionally, any combination of instructions stored on the one or more non-transitory processor-readable or computer-readable media may be referred to herein as a computer program product.

[0050] Many modifications and other embodiments of the inventions set forth herein will come to mind to one skilled in the art to which these inventions pertain having the benefit of teachings presented in the foregoing descriptions and the associated drawings. Although the figures only illustrate certain components of the apparatus and systems described herein, it is understood that various other components may be used in conjunction with the supply management system. Therefore, it is to be understood that the inventions are not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Moreover, the steps in the method described above may not necessarily occur in the order depicted in the accompanying diagrams, and in some cases one or more of the steps depicted may occur substantially simultaneously, or additional steps may be involved. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

[0051] The various illustrative logical blocks, modules, circuits, and algorithm steps described in connection with the embodiments disclosed herein may be implemented as electronic hardware, computer software, or combinations of both. To clearly illustrate this interchangeability of hardware and software, various illustrative components, blocks, modules, circuits, and steps have been described above generally in terms of their functionality. Whether such functionality is implemented as hardware or software depends upon the particular application and design constraints imposed on the overall system. Skilled artisans may implement the described functionality in varying ways for each particular application, but such implementation decisions should not be interpreted as causing a departure from the scope of the present invention.

WE CLAIM:

1. A system for dynamic steering control assistance in a vehicle, the system comprising:

a controller communicatively coupled to a plurality of sensors placed at different positions in the vehicle and at least a steering control motor, the controller being configured to:

receive inputs from the plurality of sensors, wherein said inputs indicate different parameters related to the vehicle;

calculate a steering angle for the vehicle based on the received inputs, wherein the calculated steering angle indicates a degree at which a steering wheel is to be operated to safely turn the vehicle;

transmit the calculated steering angle to a display unit of the vehicle and simultaneously monitor output torque generated by the steering control motor in order to achieve the calculated steering angle; and

generate an alert, if the output torque of the steering control motor is not within a target torque range, to allow the dynamic steering control assistance.

2. The system of claim 1, wherein the plurality of sensors comprises at least one of a vehicle speed sensor, a backlash sensor, a piezoelectric sensor, a torque sensor, a GPS sensor, a steering angle sensor, a wheel position sensor, and a LIDAR sensor.

3. The system of claim 1, wherein the display unit is mounted at least on one of the steering wheel, a dashboard, and a heads-up display of the vehicle.

4. The system of claim 1, wherein the target torque range is fetched from a database, wherein the database is configured to store pluralities of pre-calculated target torque range corresponding to a plurality of steering angles.

5. A method for dynamic steering control assistance in a vehicle, the method comprising:

receiving inputs from a plurality of sensors, wherein said inputs indicate different parameters related to the vehicle;

calculating a steering angle for the vehicle based on the received inputs, wherein the calculated steering angle indicates a degree at which a steering wheel is to be operated to safely turn the vehicle;

transmitting the calculated steering angle to a display unit of the vehicle and simultaneously monitoring output torque generated by an steering control motor of the vehicle in order to achieve the calculated steering angle; and

generating an alert, if the output torque of the steering control motor is not within a target torque range, to allow the dynamic steering control assistance.

6. The method of claim 5, wherein the plurality of sensors comprises one or more of: a vehicle speed sensor, a backlash sensor, a piezoelectric sensor, a torque sensor, a GPS sensor, a steering angle sensor, a wheel position sensor, and a LIDAR sensor.

7. The method of claim 5, wherein the display unit is mounted at least on one of the steering wheel, a dashboard, and a heads-up display of the vehicle.

8. The method of claim 5, is fetched from a database, wherein the database is configured to store pluralities of pre-calculated target torque range corresponding to a plurality of steering angles.

Dated this 23rd day of June 2023

-- Digitally Signed--

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ABSTRACT

"SYSTEM AND METHOD FOR DYNAMIC STEERING CONTROL ASSISTANCE IN A VEHICLE"

The present disclosure recites a system and a method of providing steering control assistance. In some implementations, the system may include a controller communicatively coupled to a plurality of sensors placed at different positions in the vehicle and at least a steering control motor. The controller may be configured to receive inputs from the plurality of sensors indicative of different parameters related to the vehicle and calculate a steering angle for the vehicle based on the received inputs. The system may be further configured to display the calculated steering angle on a display unit of the vehicle and simultaneously monitor output torque generated by the steering control motor in order to achieve the calculated steering angle and generate an alert, if the output torque of the steering control motor is not within a target torque range, to allow the dynamic steering control assistance.

[Fig. 1A]

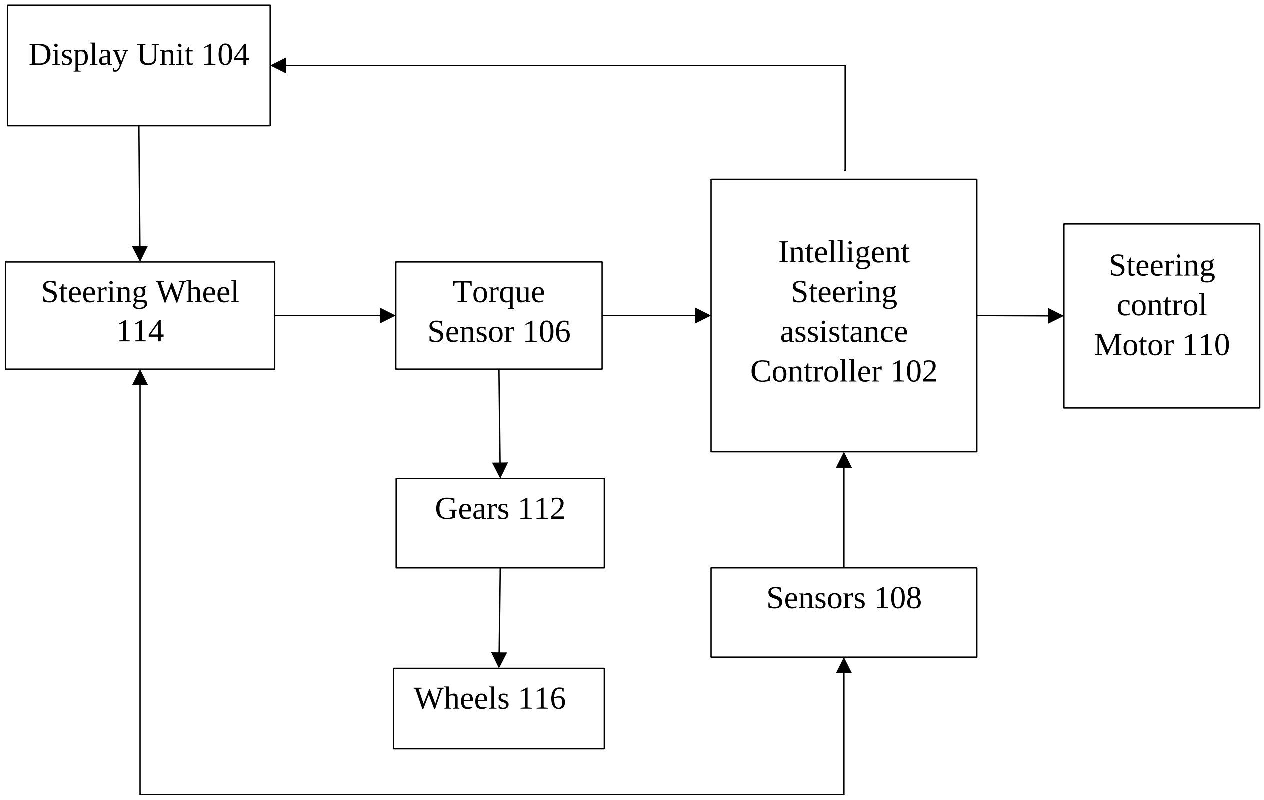

FIG. 1A

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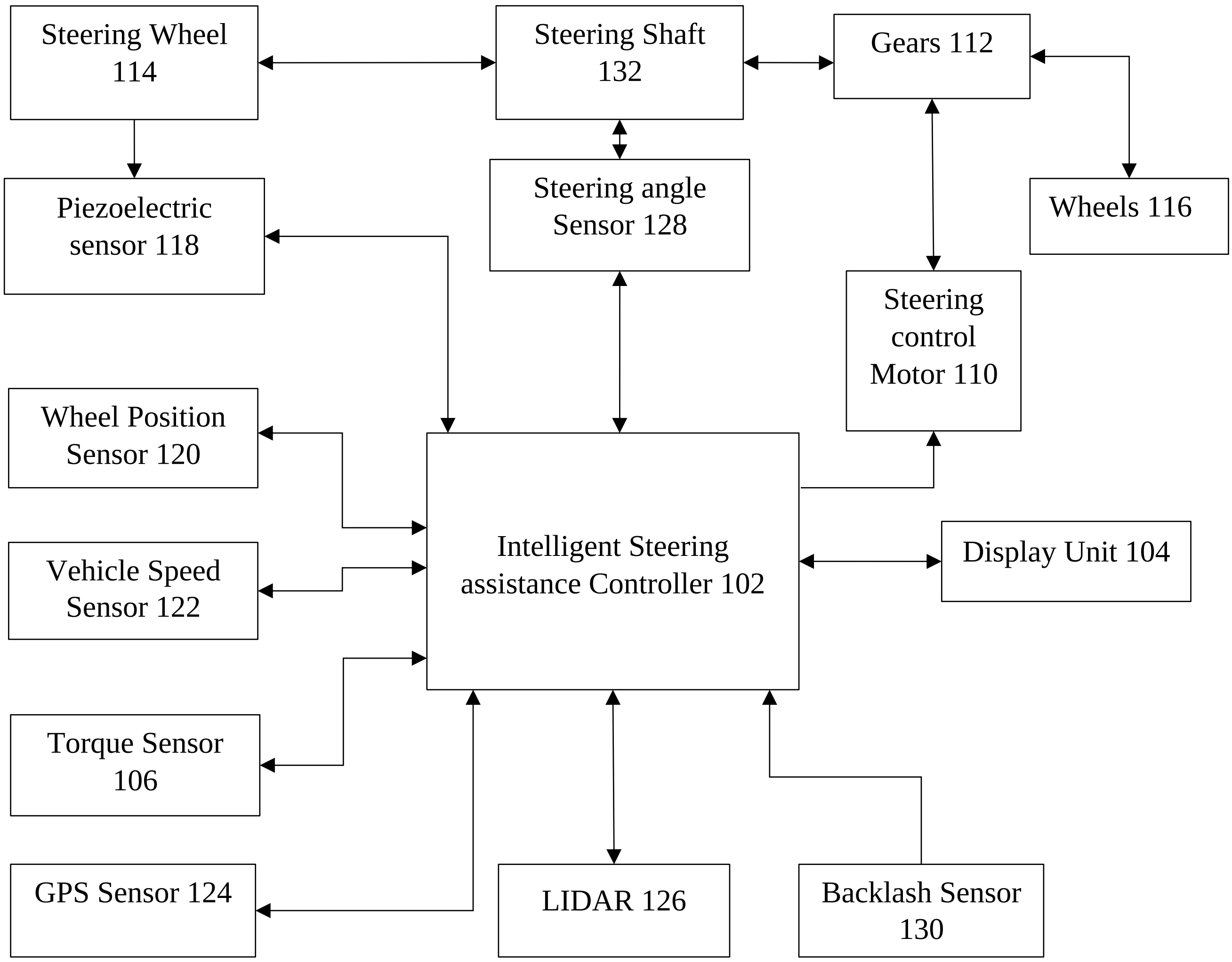

FIG. 1B

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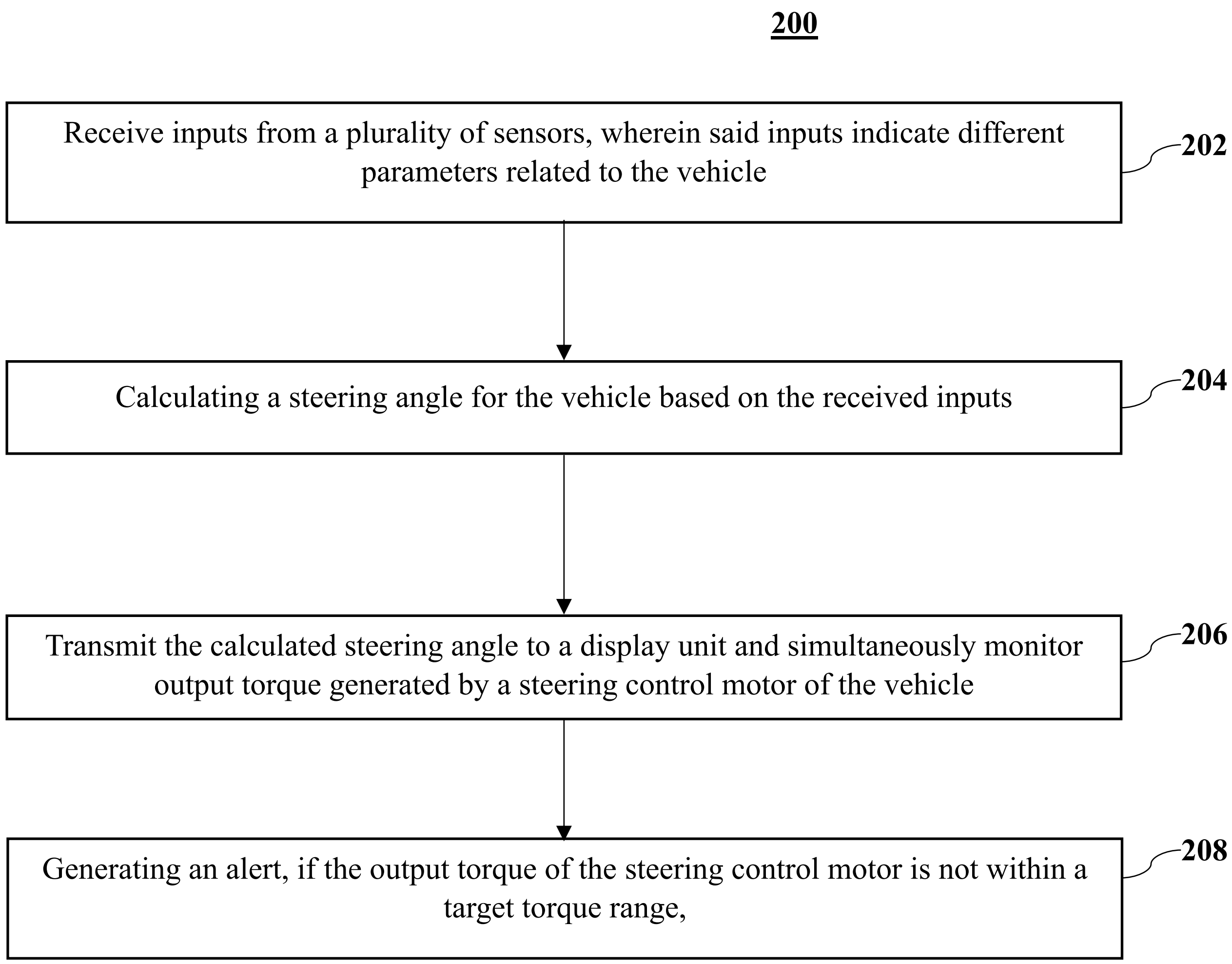

FIG. 2

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