FORM 2
THE PATENTS ACT, 1970

(39 OF 1970)

AND

THE PATENT RULES, 2003

COMPLETE SPECIFICATION

(See section 10 and rule 13)

Title:

"A DRIVER-ASSISTANCE SYSTEM AND METHOD FOR ASSISTING A DRIVER DURING NIGHT AND FOGGY WEATHER"

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

FIELD OF THE INVENTION

[0001] The present disclosure relates to safety accessories in passenger vehicles. In particular, it pertains to a driver-assistance system and method for vehicles to provide cryptographic thermal visualization of a field of view of the vehicle to prevent vehicle collisions/road accidents during night and dense foggy weather.

BACKGROUND OF THE DISCLOSURE

[0002] The background 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.

[0003] Most of the vehicles, particularly passenger vehicles, are equipped with various safety accessories such as back-up cameras, automatic emergency braking, LED headlights,lane departure warning system, rear-view mirror, front camera, sensors etc. assist driver during driving. Still a number of road accidents/vehicle collisions are increasing resulting in increase in number of fatalities, injuries and property damage. These collisions seem to be occurring especially in night and foggy weather. In night as well as in foggy weather - visibility reduces and the driver is unable to clearly see other approaching and adjoining vehicle, pedestrians, animal or objects on the road leading to multiple vehicle collisions each year.

[0004] Typically, in a vehicle a display screen is generally provided in a centre of a vehicle dashboard to display information to assist the driver during driving. To see the information on the display screen, the driver needs to take their eyes off the road which reduces safety while driving.

[0005] Efforts have been made in the past to provide solutions for preventing the fatalities and injuries on roads due to vehicle collisions. However, the existing solution in the art are often based on sensors such as are LIDAR (Light Detection and Ranging), RADAR (Radio Detection and Ranging), ultrasound and typical cameras, and are not efficient to prevent vehicle collision during night and in foggy weather.

[0006] There is therefore a need in the art to provide efficient and cost-effective solution which can obviate the foregoing problems.

OBJECTS OF THE INVENTION

[0007] A general object of the present disclosure is to provide an efficient and cost-effective solution to prevent vehicle collision during night and in foggy weather.

[0008] An object of the present disclosure is to provide a system for vehicles to provide cryptographic thermal visualization of a field of view of the vehicle to prevent vehicle collision/road accidents during night and in dense foggy weather.

[0009] Another object of the present disclosure is to provide a system for vehicles to alert a driver during driving on detection of any object in proximity of the vehicle in night as well as in dense foggy weather.

[0010] Another object of the present disclosure is to provide a simple and cost-effective driver-assistance system and method for vehicles to provide cryptographic thermal visualization of a field of view of the vehicle to prevent vehicle collision/road accidents during night and in dense foggy weather.

[0011] These and other objects of the present invention will become readily apparent from the following detailed description taken in conjunction with the accompanying drawings.

SUMMARY OF THE INVENTION

[0012] The present disclosure relates to safety accessories in passenger vehicles. In particular, it pertains to a system and method for vehicles to provide cryptographic thermal visualization of a field of view of the vehicle to prevent vehicle collision/road accidents during night and dense foggy weather.

[0013] In an aspect, the present disclosure provides a driver-assistance system for a vehicle for assisting a driver of the vehicle, the system comprising one or more camera sensors mounted on the vehicle to capture a field of view of the vehicle, and a monitoring screen embedded on a windshield of the vehicle, and operatively coupled to the one or more sensors. The monitoring screen is configured to operate in a normal mode during a day when weather is clear to provide normal visibility of the field of view of the vehicle, and in a thermal mode to provide, in real-time, a thermal visualization of the field of view of the vehicle on the monitoring screen based on the captured field of view during night and in foggy weather. The system includes a control unit operatively coupled to the one or more sensors and the monitoring screen. The control unit includes a processor coupled with a memory, the memory storing a set of instructions executable by the processor to: receive, a set of input signals from the one or more camera sensors based on the captured field of view of the vehicle, and in response to the received set of input signals, determine one or more parameters associated with at least one of position, size and velocity of one or more objects in the field of view of the vehicle. The control unit estimates a time duration for collision of the vehicle with the one or more objects based on the determined one or more parameters and one or more attributes of the vehicle comprising position, velocity and size of the vehicle, and generate an alert signal if the determined time duration of collision is between a range of predefined

threshold time duration to alert the driver for immediate speed reduction of the vehicle.

[0014] The one or more parameters may include any or a combination of lateral distance, longitudinal distance, velocity vectors and orientation, and status of the one or more objects.

[0015] In an embodiment, the one or more objects may be any or combination of a vehicle, animal, pedestrian, and an article.

[0016] In an embodiment, the one or more camera sensors are thermal cryptographic cameras comprising an infrared light lens, a thermal camera lens, and a front view camera lens.

[0017] In an embodiment, the one or more camera sensors may be actuated by any or combination of the driver of the vehicle and the control unit.

[0018] In an embodiment, the monitoring screen is a transparent electric mirror, and wherein the monitoring screen is actuated by the control unit.

[0019] In an embodiment, the monitoring screen may be configured to adjust an intensity of incoming light rays into the vehicle based on control signals from the control unit.

[0020] In an embodiment, determination of the one or more parameters associated with the at least one of position, size and velocity of the one or more objects may be based on execution of a first set of instructions being performed at the one or more processors.

[0021] In an embodiment, the thermal visualization of the field of view of the vehicle on the monitoring screen is based on execution of a second set of instructions being performed at the one or more processors to facilitate clear visualization of the field of view of the vehicle on the monitor screen.

[0022] In another aspect, the present disclosure provides a method for assisting a driver of the vehicle, the method can include steps of capturing, at one or more camera sensors mounted on the vehicle, a field of view of the vehicle, andoperating, at a monitoring screen embedded on a

windshield of the vehicle, in a normal mode during a day when weather is clear to provide normal visibility of the field of view of the vehicle, and in a thermal mode to provide, in real-time, a thermal visualization of the field of view of the vehicle on the monitoring screen based on the captured field of view during night and in foggy weather.

[0023] In an embodiment, the method can include steps of receiving, at a control unit, a set of input signals from the one or more camera sensors based on the captured field of view of the vehicle, and determining, at the control unit, one or more parameters associated with at least one of position, size and velocity of one or more objects in the field of view of the vehicle in response to the received set of input signal.

[0024] In an embodiment, the method can include steps of estimating, at the control unit, a time duration for collision of the vehicle with the one or more objects based on the determined one or more parameters and one or more attributes of the vehicle comprising position, velocity and size of the vehicle, and generating, at the control unit, an alert signal if the determined time duration of collision is between a range of predefined threshold time duration to alert the driver for immediate speed reduction of the vehicle, thereby preventing vehicle collision.

[0025] Various objects, features, aspects and advantages of the present disclosure will become more apparent from the following detailed description of preferred embodiments, along with the accompanying drawing figures in which like numerals represent like features.

[0026] Within the scope of this application it is expressly envisaged that the various aspects, embodiments, examples and alternatives set out in the preceding paragraphs, in the claims and/or in the following description and drawings, and in particular the individual features thereof, may be taken independently or in any combination. Features described in connection with one embodiment are applicable to all embodiments, unless such features are incompatible.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] The accompanying drawings are included to provide a further understanding of the present disclosure, and are incorporated in and constitute a part of this specification. The drawings illustrate exemplary embodiments of the present disclosure and, together with the description, serve to explain the principles of the present disclosure. The diagrams are for illustration only, which thus is not a limitation of the present disclosure, and wherein:

[0028] FIG. 1 illustrates an exemplary module diagram of the proposed driver-assistance system for a vehicle for assisting a driver of the vehicle, in accordance with an embodiment of the present disclosure.

[0029] FIG. 2 illustrates an exemplary schematic representation of the proposed driver-assistance system, in accordance with embodiments of the present disclosure.

[0030] FIG. 3 illustrates a flow diagram of the proposed method for assisting a driver of the vehicle during night and in foggy weather, in accordance with embodiments of the present disclosure.

DETAILED DESCRIPTION

[0031] In the following description, numerous specific details are set forth in order to provide a thorough understanding of embodiments of the present invention. It will be apparent to one skilled in the art that embodiments of the present invention may be practiced without some of these specific details.

[0032] Various methods described herein may be practiced by combining one or more machine-readable storage media containing the code according to the present invention with appropriate standard computer hardware to execute the code contained therein. An apparatus

for practicing various embodiments of the present invention may involve one or more computers/controllers (or one or more processors within a single computer) and storage systems containing or having network access to computer program(s) coded in accordance with various methods described herein, and the method steps of the invention could be accomplished by engine s, routines, subroutines, or subparts of a computer program product.

[0033] If the specification states a component or feature “may”, “can”, “could”, or “might” be included or have a characteristic, that particular component or feature is not required to be included or have the characteristic.

[0034] As used in the description herein and throughout the claims that follow, the meaning of “a,” “an,” and “the” includes plural reference unless the context clearly dictates otherwise. Also, as used in the description herein, the meaning of “in” includes “in” and “on” unless the context clearly dictates otherwise.

[0035] The recitation of ranges of values herein is merely intended to serve as a shorthand method of referring individually to each separate value falling within the range. Unless otherwise indicated herein, each individual value is incorporated into the specification as if it were individually recited herein. All methods described herein can be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. The use of any and all examples, or exemplary language (e.g. “such as”) provided with respect to certain embodiments herein is intended merely to better illuminate the invention and does not pose a limitation on the scope of the invention otherwise claimed. No language in the specification should be construed as indicating any non-claimed element essential to the practice of the invention.

[0036] Groupings of alternative elements or embodiments of the invention disclosed herein are not to be construed as limitations. Each group member can be referred to and claimed individually or in any

combination with other members of the group or other elements found herein. One or more members of a group can be included in, or deleted from, a group for reasons of convenience and/or patentability. When any such inclusion or deletion occurs, the specification is herein deemed to contain the group as modified thus fulfilling the written description of all groups used in the appended claims.

[0037] Exemplary embodiments will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. These embodiments are provided so that this disclosure will be thorough and complete and will fully convey the scope of the invention to those of ordinary skill in the art. Moreover, all statements herein reciting embodiments of the invention, as well as specific examples thereof, are intended to encompass both structural and functional equivalents thereof. Additionally, it is intended that such equivalents include both currently known equivalents as well as equivalents developed in the future (i.e., any elements developed that perform the same function, regardless of structure).

[0038] Embodiments explained herein relate to a driver-assistance system and method for vehicles to provide cryptographic thermal visualization of a field of view of the vehicle on a monitoring screenlocated on a windshield of the vehicle during night and in dense foggy weather to enhance visibility of the vehicle field of view to the driver in order to prevent vehicle collision/road accidents. The disclosed system can alert the driver by generating an alert signal when an object is detected in close proximity of the vehicle for immediate speed reduction of the vehicle.

[0039] FIG. 1 illustrates an exemplary module diagram the proposed driver-assistance system 100 for a vehicle for assisting a driver of a vehicle, in accordance with an embodiment of the present disclosure.The system 100 may include one or more processor(s) 102. The one or more

processor(s) 102 may be implemented as one or more microprocessors, microcomputers, microcontrollers, digital signal processors, central processing units, logic circuitries, and/or any devices that manipulate data based on operational instructions. Among other capabilities, the one or more processor(s) 102 are configured to fetch and execute computer-readable instructions stored in a memory 104 of the system 100. The memory 104may store one or more computer-readable instructions or routines, which may be fetched and executed to create or share the data units over a network service. The memory 104 may comprise any non-transitory storage device including, for example, volatile memory such as RAM, or non-volatile memory such as EPROM, flash memory, and the like.

[0040] The system 100 may also include an interface(s) 106. The interface(s) 106 may include a variety of interfaces, for example, interfaces for data input and output devices, referred to as I/O devices, storage devices, and the like. The interface(s) 106 may facilitate communication of the system 100 with various devices coupled to the system 100. The interface(s) 106 may also provide a communication pathway for one or more components of the device. Examples of such components include, but are not limited to, a control unit 108 and a database 110.

[0041] In an embodiment, the processor(s) 102, memory 104 and the interface may be associated with the control unit 108.

[0042] The control unit 108 may be implemented as a combination of hardware and programming (for example, programmable instructions) to implement one or more functionalities of the control unit 108. In examples described herein, such combinations of hardware and programming may be implemented in several different ways. For example, the programming for the control unit 108 may be processor executable instructions stored on a non-transitory machine-readable storage medium and the hardware for the control unit 108 may include a processing resource (for example, one or more processors), to execute such instructions. In the present

examples, the machine-readable storage medium may store instructions that, when executed by the processing resource, implement the control unit 108. In such examples, the computing device may comprise the machine-readable storage medium storing the instructions and the processing resource to execute the instructions, or the machine-readable storage medium may be separate but accessible to the system 100 and the processing resource. In other examples, the control unit 108 may be implemented by electronic circuitry. The database 110 may include data that is either stored or generated as a result of functionalities implemented by any of the components of the control unit 108. The database can be any of a local server, remote located server or a memory.

[0043] In an exemplary embodiment, the control unit 108 may include a determination unit 112, an alert generation unit 216, and an estimation unit 114. It would be appreciated that units being described are only exemplary units and any other unit or sub-unit may be included as part of the system 100. These units too may be merged or divided into super- units or sub-units as may be configured.

[0044] In an embodiment, the system 100 can further include one more camera sensors 118 operatively coupled to the control unit 108, and a monitor screen 120 operatively coupled to the camera sensors 118 and the control unit 108. In an embodiment, the camera sensors 118 are mounted on the vehicle to capture a field of view of the vehicle. The camera sensors 118 can be mounted on a front side of the vehicle. The one or more camera sensors 118 can be thermal cryptographic cameras which can include an infrared light lens/infrared camera, a thermal camera lens/thermal camera, and a front view camera lens/front view camera.

[0045] In an embodiment, the cameras sensors 118 can be actuated by the driver of the vehicle during night and in foggy weather when visibility is reduced to capture a field of view of the vehicle. In another embodiment, the cameras sensors 118 can be actuated by the control unit 108, in an

automatic mode of operation of the system 100, during night and in foggy weather to capture the field of view of the vehicle.

[0046] In an embodiment, the monitoring screen 120 can be embedded on a windshield of the vehicle with respect to ergonomics of the driver. The monitoring screen 120 is configured to operate in a normal mode during a day when weather is clear to provide normal visibility of the field of view of the vehicle. The monitoring screen 120 can be configured to operatein a thermal mode to provide, in real-time, a thermal visualization/ cryptographic thermal visualization of the field of view of the vehicle on the monitoring screen 120 based on the captured field of view by the camera sensors 118 during night and in foggy weather.

[0047] In an embodiment, the monitoring screen 120 can be a transparent electric mirror. The monitoring screen 120 can be actuated by the control unit108 and/or the driver to operate in the thermal mode during night and foggy weather. In another embodiment, the monitoring screen 120 can be actuated automatically when the camera sensors 118 are actuated by the driver or the control unit 108.

[0048] In an embodiment, the monitoring screen120 may be configured to adjust an intensity of incoming light rays into the vehicle based on control signals from the control unit 108. In an embodiment, the control unit 108 can be configured to receive, a set of input signals from the camera sensors 118 based on the captured field of view of the vehicle when the camera sensors 118 are actuated.

[0049] In an embodiment, based on the received set of input signals from the camera sensors 118, the determination unit 112 can be configured to determine one or more parameters associated with at least one of position, size and velocity of one or more objects in the field of view of the vehicle. The determination unit 112 can also be refereed as an object detection unit to detect objects in the captured field of view of the vehicle based on the received set of input signals from the camera sensors 118.

[0050] In an embodiment, the one or more parameters may include any or a combination of lateral distance, longitudinal distance, velocity vectors and orientation, and status of the one or more objects. In an embodiment, the one or more objects may be any or combination of a vehicle, animal, pedestrian, and an article.

[0051] In an embodiment, determination of the one or more parameters associated with the at least one of position, size and velocity of the one or more objects may be based on execution of a first set of instructions being performed at the one or more processors 102 and/or control unit 108. In an exemplary embodiment, the first set of instructions can be an auto object detection algorithms which can be stored in the database 110 which is operatively coupled to the control unit 108.

[0052] In an embodiment, the estimation unit 114 can be configured to estimates a time duration for collision of the vehicle with the one or more objects based on the determined one or more parameters and one or more attributes of the vehicle comprising position, velocity and size of the vehicle.

[0053] In an embodiment, the alert generation unit 116 can be configured to generate an alert signal if the determined time duration of collision is betweena range of predefined threshold time duration to alert the driver to push a brake paddle/emergency brake of the vehicle for immediate speed reduction of the vehicle. The predetermined threshold time duration can be pre-stored in the database 110. In an embodiment, the alert signal can be nay of an audio signal or video signal.

[0054] In an embodiment, the thermal visualization of the field of view of the vehicle on the monitoring screen 120 can be based on execution of a second set of instructions being performed at the one or more processors 102/ control unit 108 to facilitate clear visualization of the field of view of the vehicle on the monitor screen 120. In an exemplary embodiment, the second set of instructions can be a thermal cryptography of image enhancement algorithm, which can be stored in the database 110.

[0055] FIG. 2 illustrates an exemplary schematic diagram representation of the proposed driver-assistance system, in accordance with embodiments of the present disclosure. As is illustrated, the camera sensors 118 are mounted on a front end of the vehicle to capture a field of view of the vehicle. During the night and/or in the foggy weather, the cameras sensors 118 can be actuated by the driver of the vehicle when visibility is reduced to capture the field of view of the vehicle. The one or more camera sensors 118 are thermal cryptographic cameras which includean infrared light lens/infrared camera 202, a thermal camera lens/thermal camera 204, and a front view camera lens/front view camera 206.

[0056] The monitoring screen 120 can be configured to operate in a normal mode as a normal mirror to provide normal visibility of the field of view of the vehicle during bright sunny day when the there is no fog on the road. The monitoring screen 120 can operate in a thermal mode to provide, in real-time, a thermal visualization/ cryptographic thermal visualization of the field of view of the vehicle on the monitoring screen 120 based on the captured field of view by the camera sensors 118 during night and in foggy weather. The monitoring screen 120 can be actuated by the control unit 108 and/or the driver to operate in the thermal mode during night and in foggy weather. The monitoring screen 120 displays the real time video captured by the camera sensors 118 with assistance of the control unit/controller 108.

[0057] In an embodiment, the monitoring screen 120 is a transparent electric transparent mirror which can be embedded on a windshield of the vehicle. In an embodiment, the windshield of the vehicle can be replaced with the transparent electric transparent mirror. In another embodiment, the monitoring screen 120 can be an electro-chromic smart film embedded on the windshield of the vehicle.

[0058] The control unit 108 can be configured to receive a set of input signals from the camera sensors 118 based on the captured field of view

of the vehicle when the camera sensors 118 are actuated. The control unit 108 can be configured to determine one or more parameters associated with at least one of position, size and velocity of one or more objects in the field of view of the vehicle based on the received set of input signals from the camera sensors 118. The control unit 108 can detect objects in the captured field of view of the vehicle based on the received set of input signals from the camera sensors 118.

[0059] In an embodiment, the controller/control unit 108 can be operatively coupled to a central control unit of the vehicle.

[0060] In an exemplary embodiment, the controller/control unit 108 can be a Raspberry Pi. The Raspberry Pi is a low cost, small sized computer that plugs into a monitor and facilitates to explore computing. The Raspberry Pi can interact with the user by receiving a set of instructions from say sensors to provide relevant results after processing the provided inputs.

[0061] In an embodiment, determination of the one or more parameters associated with the at least one of position, size and velocity of the one or more objects may be based on execution auto object detection algorithms. In an embodiment, detection of the one or more objects can be based on the execution of the auto object detection algorithms

[0062] The control unit 108 can be configured to generate an alert signal if the detected one or more objects are within a close proximity of the vehicle to alert the driver to push a brake paddle/emergency brake of the vehicle for immediate speed reduction of the vehicle.

[0063] In an embodiment, the thermal visualization of the field of view of the vehicle on the monitoring screen 120 can be based on execution of a thermal cryptography of image enhancement algorithm to facilitate clear visualization of the field of view of the vehicle on the monitor screen 120. The thermal cryptography of the image enhancement algorithm can serve multiple purposes such as by providing clear visualization in fog and during night and saving the driver from accidents and also reducing animal death rate due to

unnoticeable road accidents. The thermal cryptography of the image enhancement algorithm can be used, for example Chebyshev chaotic map and S8 Symmetric permutation techniques, which allow clear visualization of road view on the monitoring screen/electric mirror monitor 120. After the clear visualization is obtained on monitoring screen/electric mirror monitor 120, the algorithms for object detection can be executed for the real time object detection using, for example optimized OpenCV and Python, to detect the instantaneous presence of the objects/animals or any other object on the road.

[0064] The controller 108 can control the monitoring screen 120 to adjust the impact of environmental lights into the vehicle and allows the activation of monitoring screen 120 which is located in the front of the driver with respect to ergonomics of the driver.

[0065] The system 100 is compatible for performing in a low operating power mode. The system 100 can be powered by an electric power source of the vehicle. In another embodiment, the system 100 can be powered by a separate power battery power source.

[0066] FIG. 3 illustrates a flow diagram of the proposed method for assisting a driver of the vehicle during night and foggy weather, in accordance with embodiments of the present disclosure. In an embodiment, the disclosed method 300 can be implemented with the above disclosed system 100. In an embodiment, at block 302 one or more camera sensors mounted on the vehicle captures a field of view of the vehicle. At block 304, a monitoring screen embedded on a windshield of the vehicle, is operated in a normal mode during a day when weather is clear to provide normal visibility of the field of view of the vehicle, and in a thermal mode to provide, in real-time, a thermal visualization of the field of view of the vehicle on the monitoring screen based on the captured field of view during night and in foggy weather. Further, at block 306, a control unit receives a set of input signals from the one or more camera sensors based on the captured field of view of the vehicle. At block 308, the control

unit determines one or more parameters associated with at least one of position, size and velocity of one or more objects in the field of view of the vehicle in response to the received set of input signal. At block 310, the control unit estimates a time duration for collision of the vehicle with the one or more objects based on the determined one or more parameters and one or more attributes of the vehicle comprising position, velocity and size of the vehicle. Furthermore, at block 312, the control unit generates an alert signal if the determined time duration of collision is between a range of predefined threshold time duration to alert the driver for immediate speed reduction of the vehicle, there by preventing vehicle collision.

[0067] Thus, it will be appreciated by those of ordinary skill in the art that the diagrams, schematics, illustrations, and the like represent conceptual views or processes illustrating systems and methods embodying this invention. The functions of the various elements shown in the figures may be provided through the use of dedicated hardware as well as hardware capable of executing associated software. Similarly, any switches shown in the figures are conceptual only. Their function may be carried out through the operation of program logic, through dedicated logic, through the interaction of program control and dedicated logic, or even manually, the particular technique being selectable by the entity implementing this invention. Those of ordinary skill in the art further understand that the exemplary hardware, software, processes, methods, and/or operating systems described herein are for illustrative purposes and, thus, are not intended to be limited to any particular named.

[0068] While embodiments of the present invention have been illustrated and described, it will be clear that the invention is not limited to these embodiments only. Numerous modifications, changes, variations, substitutions, and equivalents will be apparent to those skilled in the art, without departing from the spirit and scope of the invention, as described in the claim.

[0069] In the foregoing description, numerous details are set forth. It will be apparent, however, to one of ordinary skill in the art having the benefit of this disclosure, that the present disclosure can be practiced without these specific details. In some instances, well-known structures and devices are shown in block diagram form, rather than in detail, to avoid obscuring the present invention.

[0070] While the foregoing describes various embodiments of the disclosure, other and further embodiments of the disclosure may be devised without departing from the basic scope thereof. The disclosure is not limited to the described embodiments, versions or examples, which are included to enable a person having ordinary skill in the art to make and use the disclosure when combined with information and knowledge available to the person having ordinary skill in the art.

ADVANTAGES OF THE INVENTION

[0071] The present disclosure provides an efficient and cost-effective solution to prevent vehicle collision during night and in foggy weather.

[0072] The present disclosure provides a system for vehicles to provide cryptographic thermal visualization of a field of view of the vehicle to prevent vehicle collision/road accidents during night and in dense foggy weather.

[0073] The present disclosure provides a system for vehicles to alert a driver during driving on detection of any object in proximity of the vehicle in night as well as in dense foggy weather.

[0074] The present disclosure provides a simple and cost-effective driver-assistance system and method for vehicles to provide cryptographic thermal visualization of a field of view of the vehicle to prevent vehicle collision/road accidents during night and in dense foggy weather.

We Claim:

1. A driver-assistance system (100) for a vehicle for assisting a driver of the vehicle, the system (100) comprising:

one or more camera sensors (118) mounted on the vehicle to capture a field of view of the vehicle;

a monitoring screen (120) embedded on a windshield of the vehicle, and operatively coupled to the one or more camera sensors (118), the monitoring screen (120) being configured to operate in a normal mode during a day when weather is clear to provide normal visibility of the field of view of the vehicle, and in a thermal mode to provide, in real-time,a thermal visualization of the field of view of the vehicleon the monitoring screen based on the captured field of view during night and in foggy weather;

a control unit (108) operatively coupled to the one or more camera sensors (118) and the monitoring screen (120), the control unit (108) comprising a processor (102) coupled with a memory (104), the memory (104) storing a set of instructions executable by the processor (102) to:

receive, a set of input signals from the one or more camera sensors (118) based on the captured field of view of the vehicle;

in response to the received set of input signals, determine one or more parameters associated with at least one of position, size and velocity of one or more objects in the field of view of the vehicle;

estimate, a time duration for collision of the vehicle with the one or more objects based on the determined one or more parameters and one or more attributes of the vehicle comprising position,velocity and size of the vehicle;

generate, an alert signal if the determined time duration of collision is between a range of predefined threshold time duration to alert the driver for immediate speed reduction of the vehicle.

2. The system (100) as claimed in claim 1, wherein the one or more parameters comprise any or a combination of lateral distance, longitudinal distance, velocity vectors and orientation, and status of the one or more objects.

3. The system (100) as claimed in claim 1, wherein the one or more objects are any or combination of a vehicle, animal, pedestrian, and an article.

4. The system (100) as claimed in claim 1, wherein the one or more camera sensors (118) are thermal cryptographic cameras comprising an infrared light lens (202), a thermal camera lens (204), and a front view camera lens (206).

5. The system (100) as claimed in claim 1, wherein the one or more camera sensors (118) are actuated by any or combination of the driver of the vehicle and the control unit (108).

6. The system (100) as claimed in claim 1, wherein the monitoring screen (120) is a transparent electric mirror, and wherein the monitoring screen (120) is actuated by the control unit (108).

7. The system (100) as claimed in claim 1, wherein the monitoring screen (120) is configured to adjust an intensity of incoming light rays into the vehicle based on control signals from the control unit (108).

8. The system (100) as claimed in claim 1, wherein determination of the one or more parameters associated with the at least one of position, size and velocity of the one or more objects is based on execution of a first set of instructions being performed at the one or more processors (102).

9. The system (100) as claimed in claim 1, wherein the thermal visualization of the field of view of the vehicle on the monitoring screen (120) is based on execution of a second set of instructions being performed at the one or more processors (102) to facilitate clear visualization of the field of view of the vehicle on the monitor screen (120).

10. A method (300) for assisting a driver of the vehicle, the method (300) comprising:

capturing (302), at one or more camera sensors mounted on the vehicle, a field of view of the vehicle;

operating (304), at a monitoring screen embedded on a windshield of the vehicle, in a normal mode during day when weather is clear to provide normal visibility of the field of view of the vehicle, and in a thermal mode to provide, in real-time, a thermal visualization of the field of view of the vehicle on the monitoring screen based on the captured field of view during night and in foggy weather;

receiving (306), at a control unit, a set of input signals from the one or more camera sensors based on the captured field of view of the vehicle;

determining (308),at the control unit, one or more parameters associated with at least one of position, size and velocity of one or more objects in the field of view of the vehicle in response to the received set of input signal;

estimating (310), at the control unit, a time duration for collision of the vehicle with the one or more objects based on the determined one or more parameters and one or more attributes of the vehicle comprising position, velocity and size of the vehicle;

generating (312), at the control unit, an alert signal if the determined time duration of collision is between a range of predefined threshold time duration to alert the driver for immediate speed reduction of the vehicle.

Dated this 15/05/2020

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A DRIVER-ASSISTANCE SYSTEM AND METHOD FOR ASSISTING A DRIVER DURING NIGHT AND FOGGY WEATHER

ABSTRACT

System and method for assisting a driver of a vehicle are based on cameras (118) to capture a field of view (FOV) of the vehicle; and a monitoring screen (120) embedded on a windshield to operate in a normal mode during a day to provide normal visibility of the FOV, and in a thermal mode to provide a thermal visualization of the FOV on the monitoring screen (120) based on the captured FOV during night and in foggy weather. A control unit (108) is provided to receive a set of input signals from the cameras based on the captured FOV, determine parameters associated with position, size and velocity of objects in the FOV; and estimate a time duration for collision of the vehicle with the objects, and generate alert signals based on the determined time duration to alert the driver for immediate vehicle speed reduction.