(12) **United States Patent**
Bobcik et al.

(10) **Patent No.:** **US 12,387,689 B1**
(45) **Date of Patent:** **Aug. 12, 2025**

(54) **SYSTEMS AND METHODS FOR DYNAMIC DIMMING OF A SET OF DISPLAYS SHARING A SINGLE ENERGY SOURCE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **18/780,185**

(22) Filed: **Jul. 22, 2024**

(51) **Int. Cl.**
G09G 3/34 (2006.01)
G06F 3/01 (2006.01)
G06F 3/14 (2006.01)

(52) **U.S. Cl.**
CPC *G09G 3/3406* (2013.01); *G06F 3/013* (2013.01); *G06F 3/1423* (2013.01); *G09G 2360/144* (2013.01)

(58) **Field of Classification Search**
CPC G06V 10/764; G06V 10/82; G09G 2320/0693; G09G 2340/04
See application file for complete search history.

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(57) **ABSTRACT**

Systems and methods for dynamic dimming of a set of displays sharing a single energy source are provided. Image data is received from an external camera of a vehicle. A light intensity level of an external light source in the image data is determined based on the image data. A light angle of the external light source is determined with respect to the vehicle based on the image data. A desired brightness level is generated based on the light intensity level and the light angle. If a first display of a plurality of displays of the vehicle is in a line of sight of a driver gaze direction, a command is issued to adjust a brightness level of the first display to the desired brightness level and dim the other displays to a dim brightness level. The desired brightness level is greater than the dim brightness level.

20 Claims, 8 Drawing Sheets
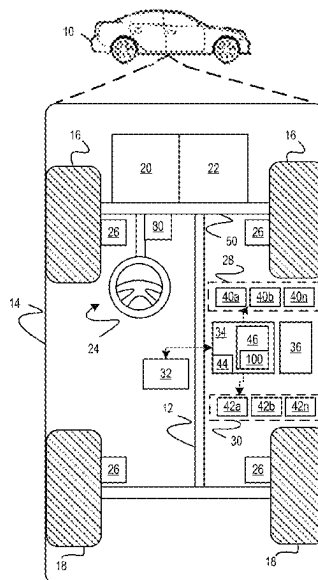
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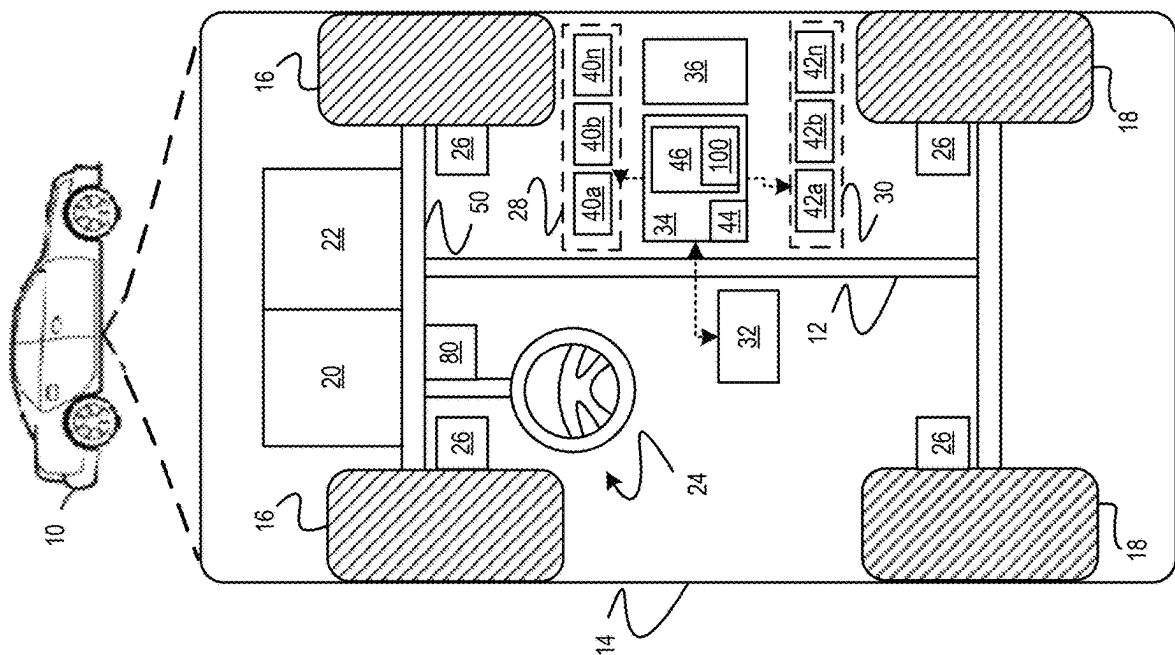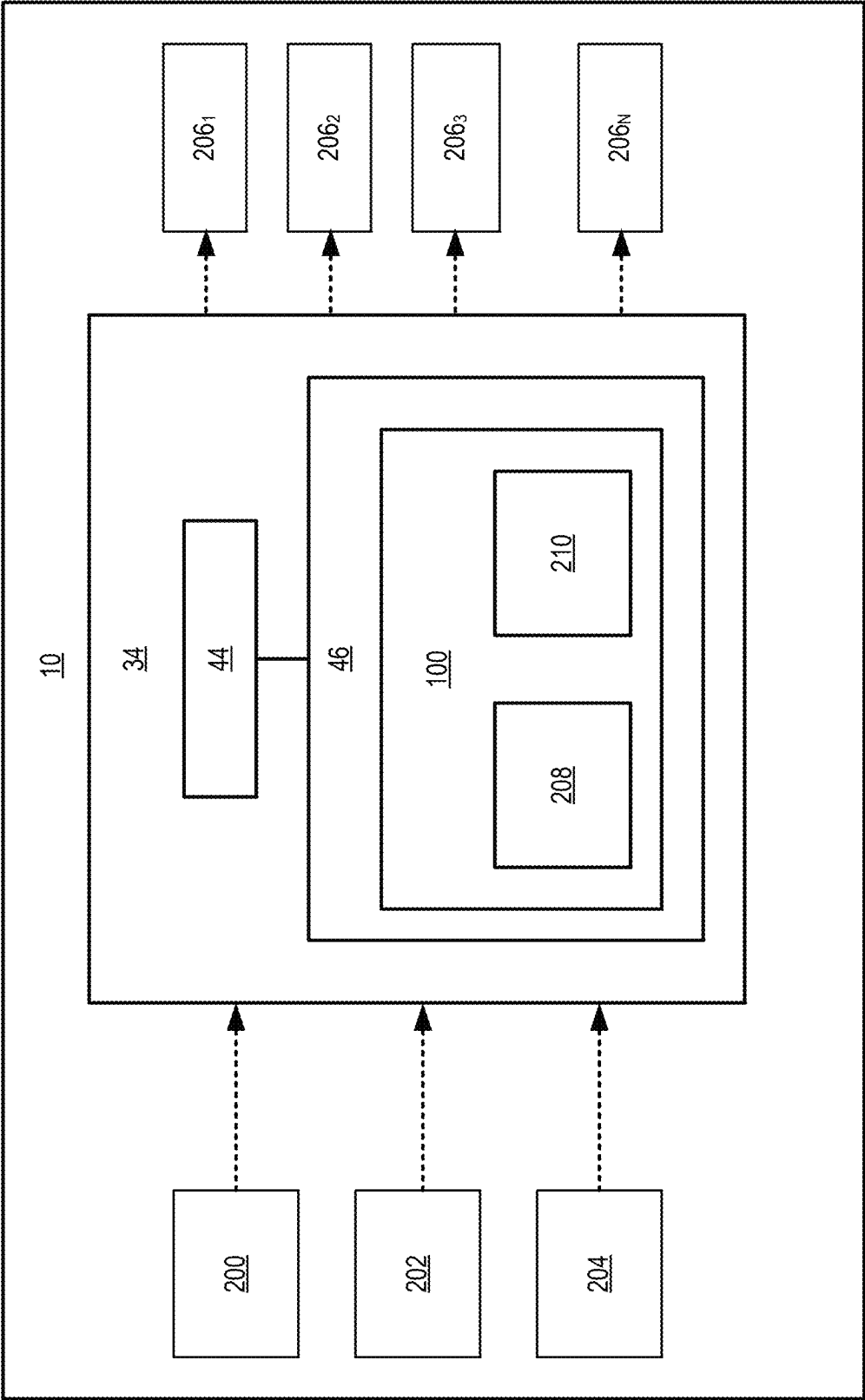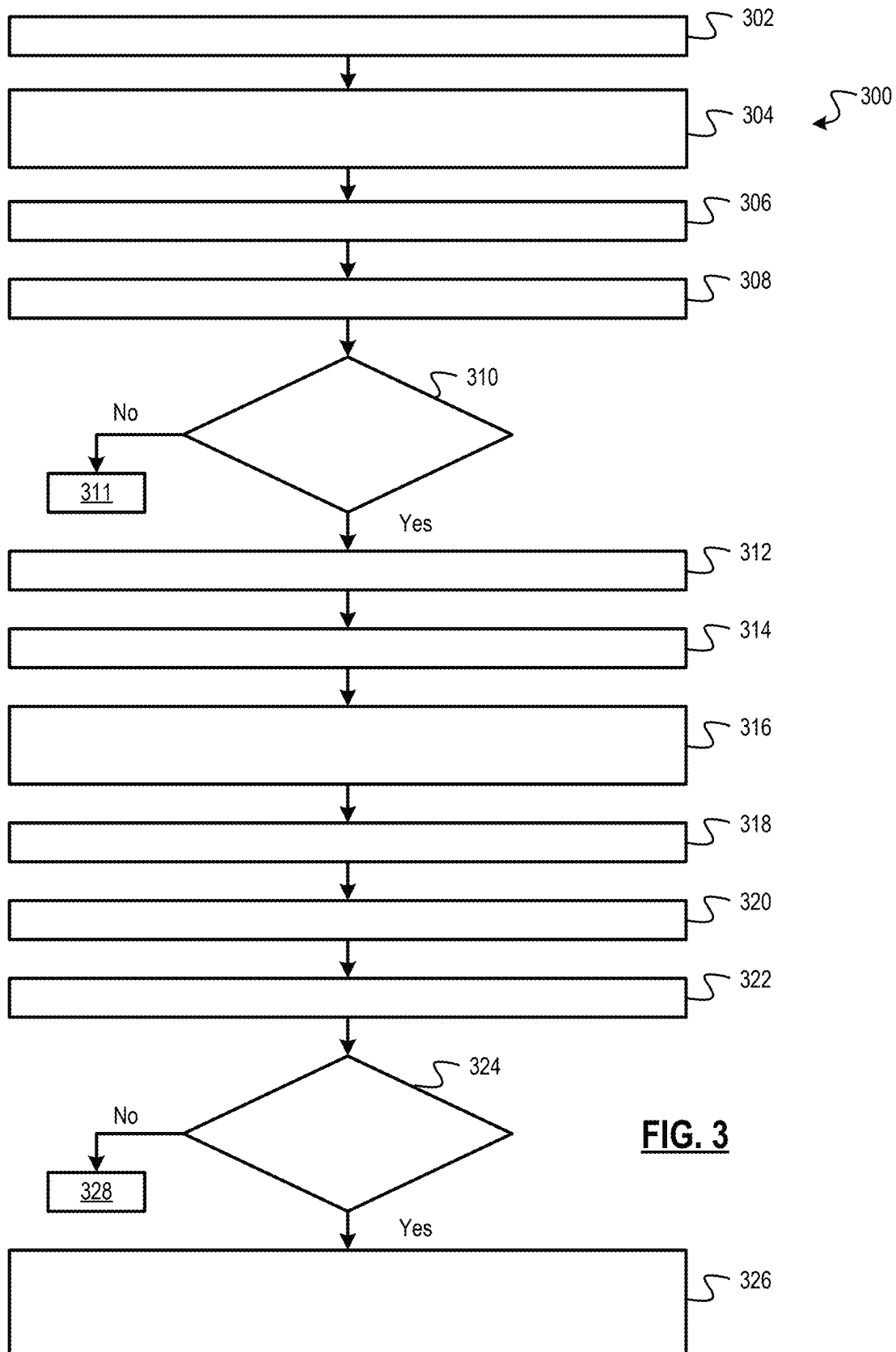|			
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FIG. 1

FIG. 2

302

304

300

306
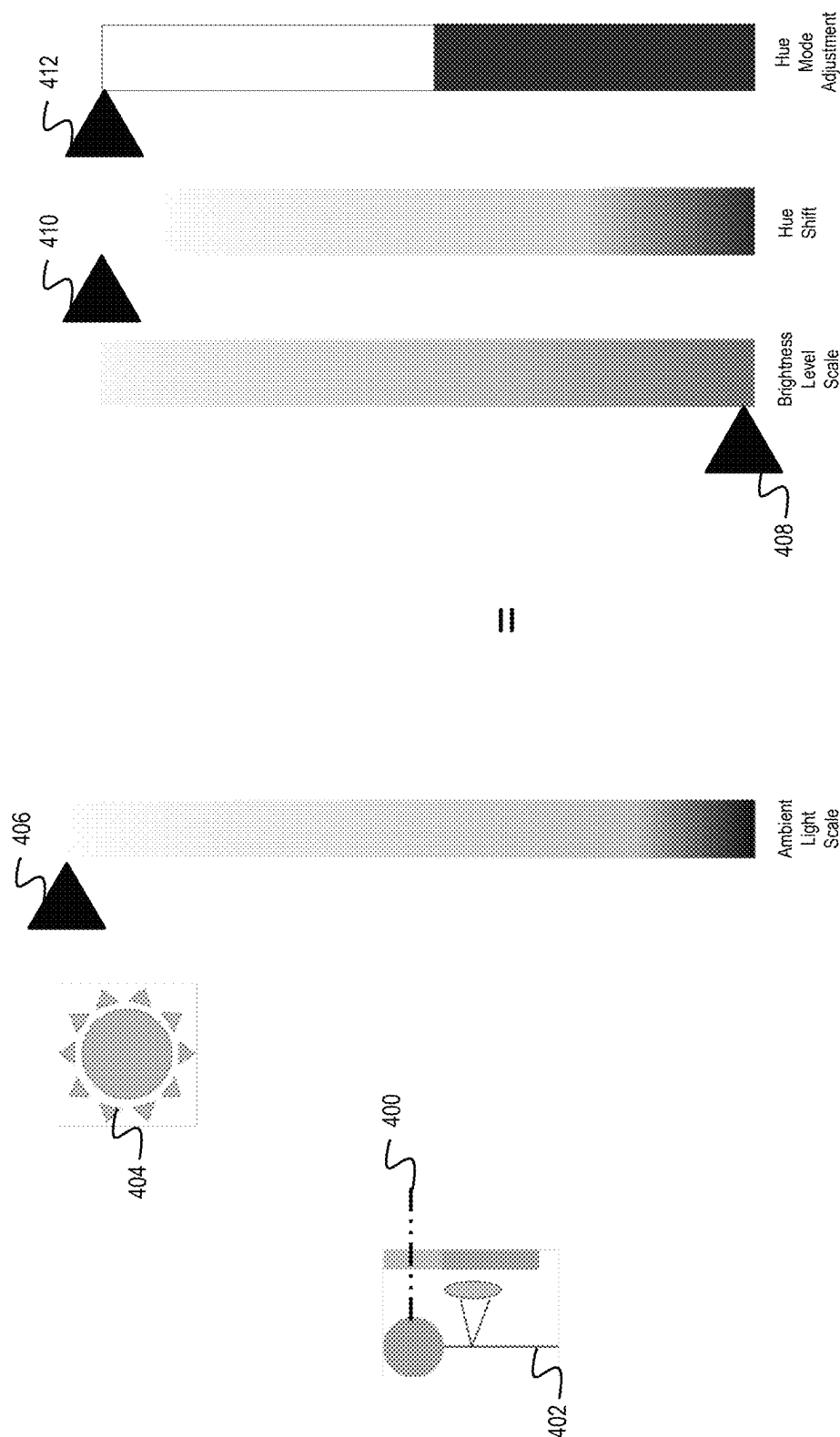
308

310

No

311

Yes

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314

316

318

320

322

324

No

328

Yes

326

FIG. 3

FIG. 4

FIG. 5

FIG. 6

FIG. 7

800

802

804

806

Yes   No

812   808

814   810

Yes

No   818

816
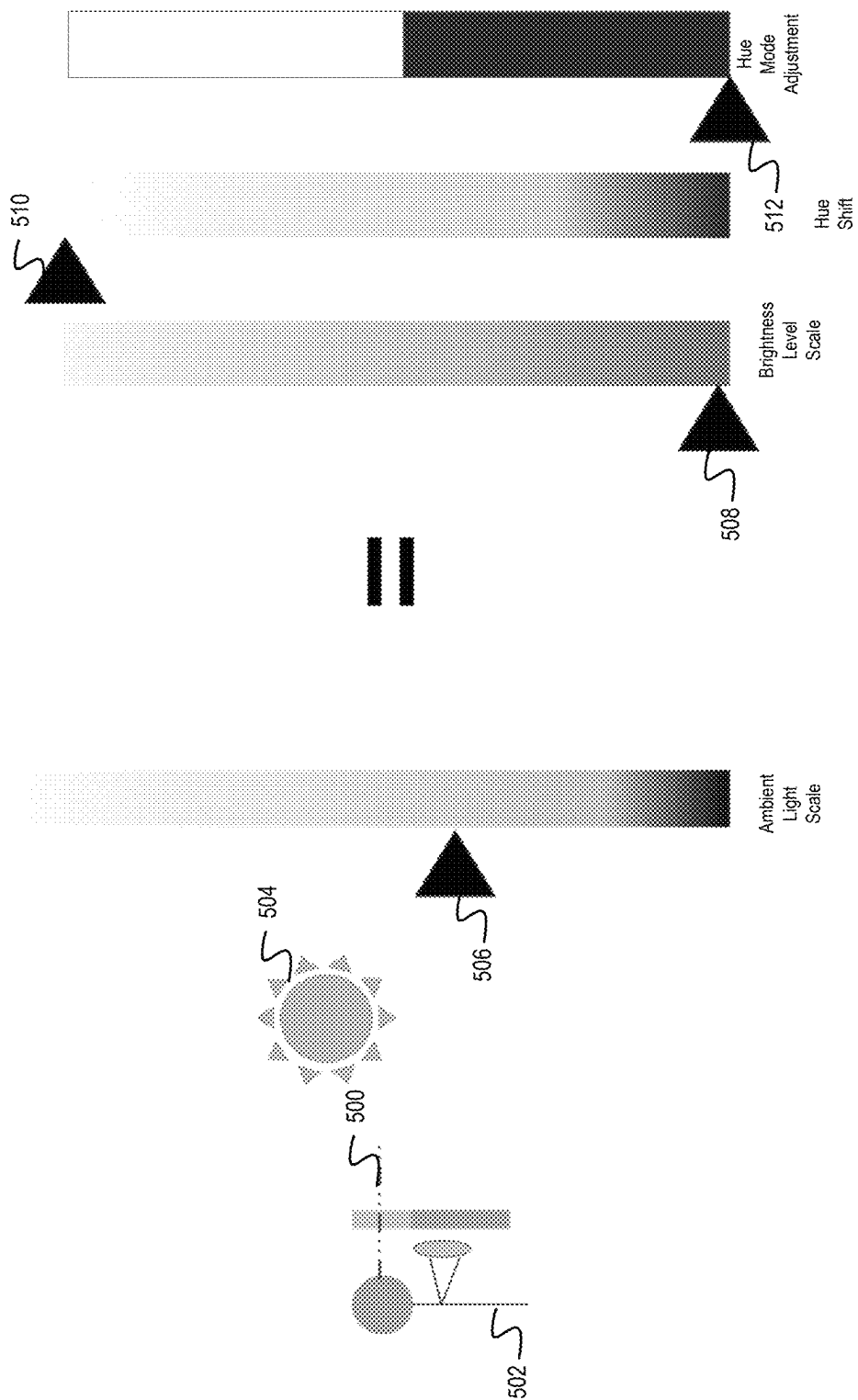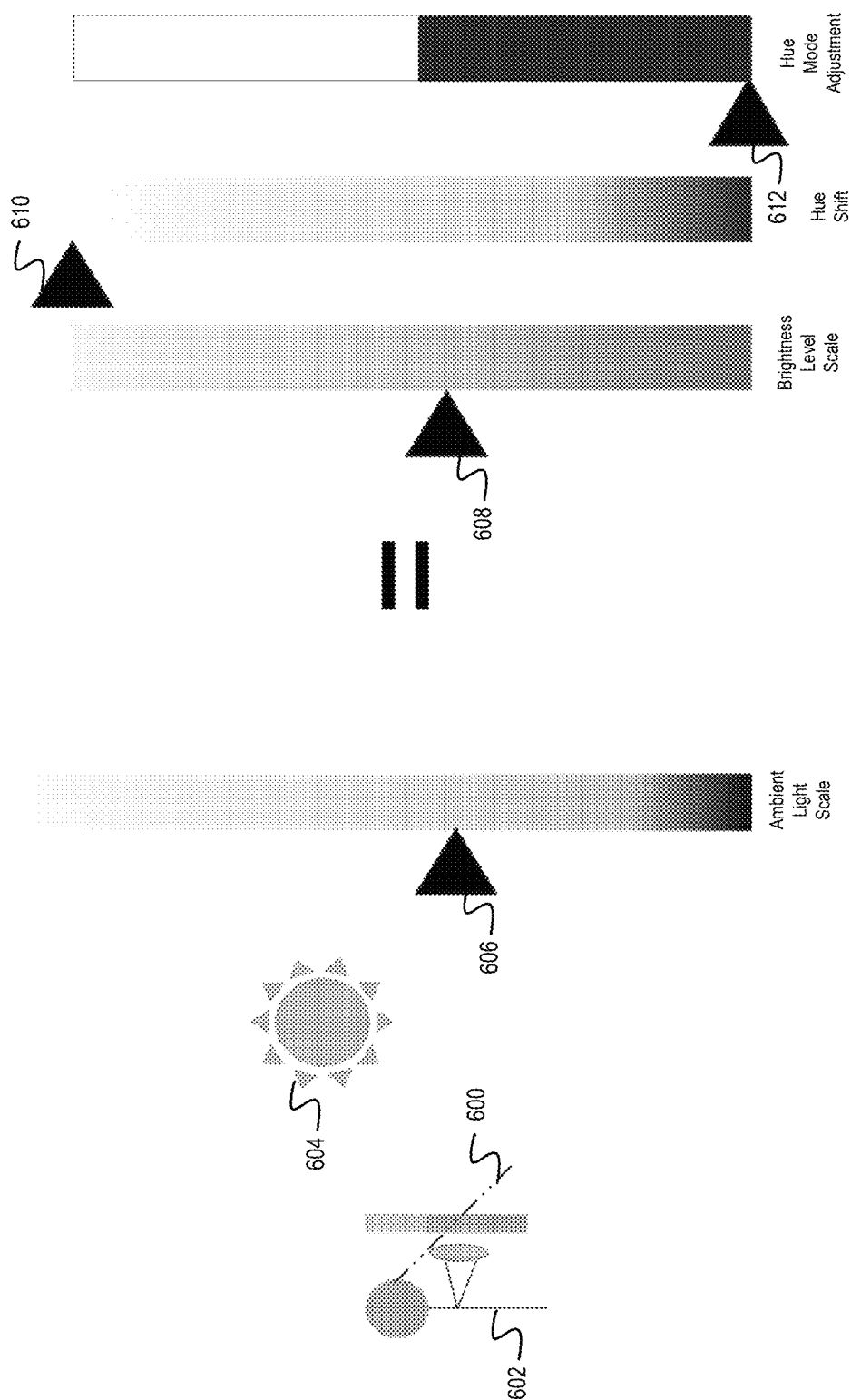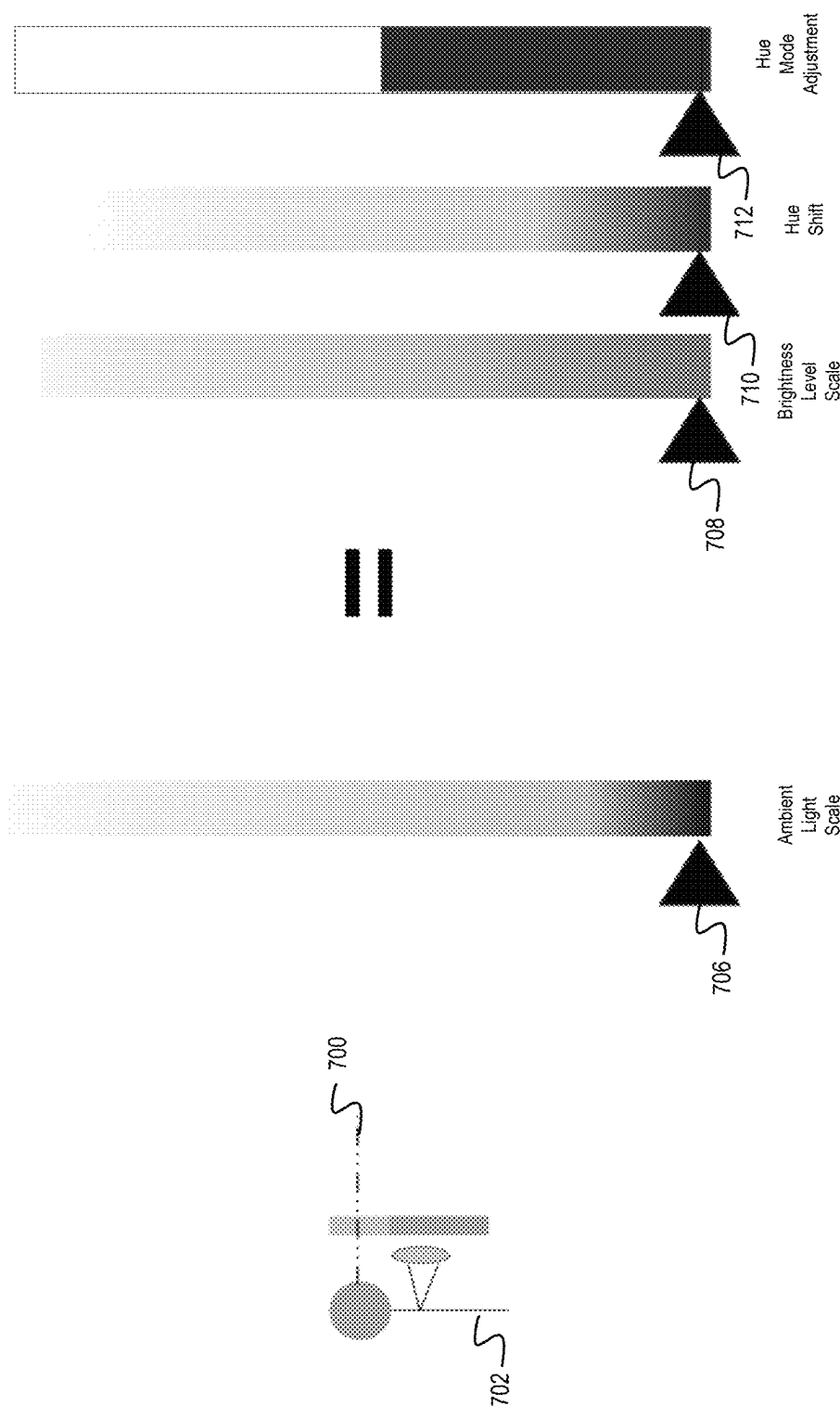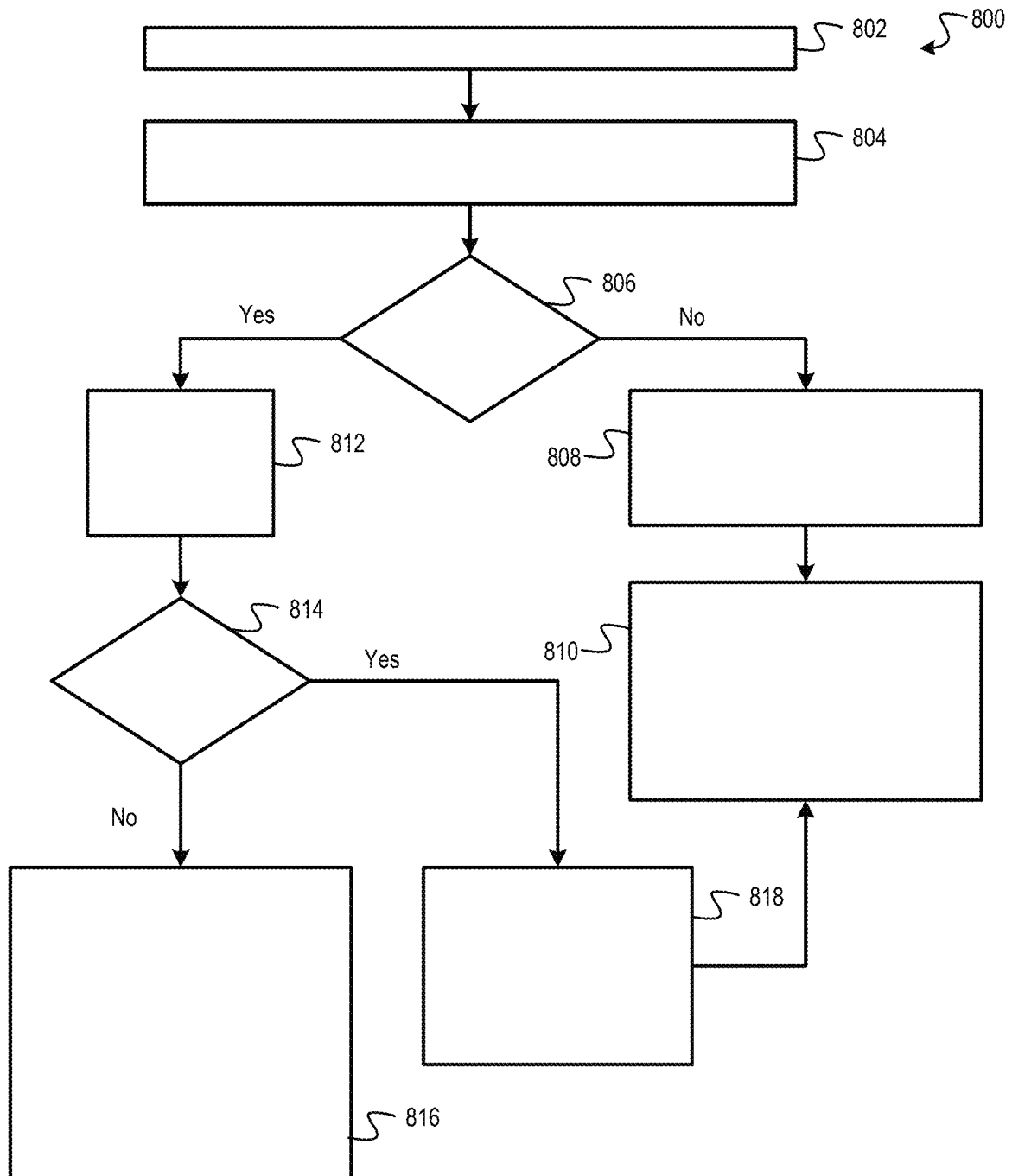
FIG. 8

SYSTEMS AND METHODS FOR DYNAMIC DIMMING OF A SET OF DISPLAYS SHARING A SINGLE ENERGY SOURCE

INTRODUCTION

The technical field generally relates to vehicles, and more particularly relates to systems and methods for dynamic dimming of a set of displays sharing a single energy source.

When driving in low light conditions, the eyes of a driver of a vehicle may constantly have to adapt to changing light conditions resulting in eye strain. Factors that may contribute to eye strain include, but are not limited to, a position of the sun, headlights of oncoming vehicles, bright billboards, streetlights, and brightness levels of displays inside the vehicle. Displays inside the vehicle may provide a competing source of blue light that may pose a distraction that impacts an ability of the driver to visually focus on the road. Displays may operate in different resolutions and/or refresh rates. In addition, maintaining all of the displays in the vehicle at a constant increased brightness level may increase consumption of battery energy in electric vehicles.

Accordingly, it is desirable to provide systems and methods for dynamic dimming of a set of displays sharing a single energy source in a vehicle. Dynamically adjusting the rendering pipeline to dynamically adjust the graphics processing unit (GPU) target resolution, refresh rate and apply foveated rendering when available may result in power saving for an electric vehicle (EV) battery. Other desirable features and characteristics will become apparent from the subsequent detailed description and the appended claims, taken in conjunction with the accompanying drawings and the foregoing technical field and background.

SUMMARY

A system for dynamic dimming of a set of displays sharing a single energy source includes at least one processor and at least one memory communicatively coupled to the at least one processor. The at least one memory includes instructions that upon execution by the at least one processor, cause the at least one processor to: receive image data from at least one external camera of a vehicle; and upon a determination that the image data includes an external light source: determine a light intensity level of the external light source based on the image data; determine a light angle of the external light source with respect to the vehicle based on the image data; generate a desired brightness level based on the light intensity level and the light angle; receive driver gaze data from a gaze tracking system of the vehicle; determine a driver gaze direction based on the driver gaze data; determine whether a first display of a plurality of displays of the vehicle is in a line of sight of the driver gaze direction; and issue a first command to adjust a brightness level of the first display to the desired brightness level and dim the other displays of the plurality of displays to a dim brightness level, the desired brightness level being greater than the dim brightness level.

In at least one embodiment, the plurality of displays are associated with a default brightness level; the desired brightness level is greater than the default brightness level; and the dim brightness level is less than the default brightness level.

In at least one embodiment, the at least one memory further includes instructions that upon execution by the at least one processor, cause the at least one processor to: receive ambient light data from at least one ambient light sensor of the vehicle; determine whether the ambient light

data is greater than a first ambient light threshold; upon a determination that the ambient light data is greater than the first ambient light threshold, issue a second command to adjust a hue of the first display to a day mode hue; and upon a determination that the ambient light data is less than the first ambient light threshold, issue the second command to adjust the hue of the first display to a night mode hue.

In at least one embodiment, the at least one memory further includes instructions that upon execution by the at least one processor, cause the at least one processor to: determine whether the ambient light data is less than a second ambient light threshold, the second ambient light threshold being lower than the first ambient light threshold; and issue the second command to adjust the hue of the first display to a shifted night mode hue based on the determination.

In at least one embodiment, the at least one memory further includes instructions that upon execution by the at least one processor, cause the at least one processor to: receive a driver eyesight profile; and modify at least one of the day mode hue and the night mode hue based on the driver eyesight profile.

In at least one embodiment, the at least one memory further includes instructions that upon execution by the at least one processor, cause the at least one processor to: upon a determination that none of the plurality of displays are in the line of sight of the driver gaze direction, issue a third command to adjust a brightness level of each of the plurality of displays to the dim brightness level.

In at least one embodiment, the at least one memory further includes instructions that upon execution by the at least one processor, cause the at least one processor to upon a determination that the driver gaze direction cannot be determined based on the gaze data, issue a fourth command to adjust a brightness level of each of the plurality of displays to the default brightness level.

In at least one embodiment, the at least one memory further includes instructions that upon execution by the at least one processor, cause the at least one processor to: determine whether the vehicle is on; and activate operation of the system for dynamic dimming of a set of displays sharing a single energy source based on the determination.

In at least one embodiment, the at least one memory further includes instructions that upon execution by the at least one processor, cause the at least one processor to: receive a state of charge (SOC) value of a battery system of the vehicle; determine whether the SOC value is below a SOC threshold; and activate operation of the system for dynamic dimming of the set of displays sharing the single energy source based on the determination.

In at least one embodiment, the at least one memory further includes instructions that upon execution by the at least one processor, cause the at least one processor to: identify a light source type of the external light source based on the light intensity level and the light angle; and generate the desired brightness level based on the light source type of the external light source.

In at least one embodiment, the light source type is one of a sun, headlights of a vehicle, a streetlight, and a billboard.

A method of dynamically dimming a set of displays sharing a single energy source includes: receiving image data from at least one external camera of a vehicle; and upon a determination that the image data includes an external light source: determining a light intensity level of the external light source based on the ambient light data; determining a light angle of the external light source with respect to the vehicle based on the image data; generating a desired

brightness level based on the light intensity level and the light angle; receiving driver gaze data from a gaze tracking system of the vehicle; determining a driver gaze direction based on the driver gaze data; determining whether a first display of a plurality of displays of the vehicle is in a line of sight of the driver gaze direction; and issuing a first command to adjust a brightness level of the first display to the desired brightness level and dim the other displays of the plurality of displays to a dim brightness level, the desired brightness level being greater than the dim brightness level.

In at least one embodiment, the plurality of displays are associated with a default brightness level; the desired brightness level is greater than the default brightness level; and the dim brightness level is less than the default brightness level.

In at least one embodiment, the method further includes: receiving ambient light data from at least one ambient light sensor of the vehicle; determining whether the ambient light data is greater than a first ambient light threshold; upon a determination that the ambient light data is greater than the first ambient light threshold, issuing a second command to adjust a hue of the first display to a day mode hue; and upon a determination that the ambient light data is less than the first ambient light threshold, issuing the second command to adjust the hue of the first display to a night mode hue.

In at least one embodiment, the method further includes: determining whether the ambient light data is less than a second ambient light threshold, the second ambient light threshold being lower than the first ambient light threshold; and issuing the second command to adjust the hue of the first display to a shifted night mode hue based on the determination.

In at least one embodiment, the method further includes: upon a determination that none of the plurality of displays are in the line of sight of the driver gaze direction, issuing a third command to adjust a brightness level of each of the plurality of displays to the dim brightness level.

In at least one embodiment, the method further includes: upon a determination that the driver gaze direction cannot be determined based on the gaze data, issuing a fourth command to adjust a brightness level of each of the plurality of displays to the default brightness level.

In at least one embodiment, the method further includes: identifying a light source type of the external light source based on the light intensity level and the light angle; and generating the desired brightness level based on the light source type of the external light source.

In at least one embodiment, the method further includes: locking a driver eye gaze; determining an eye gaze zone, the eye gaze zone being one of a front zone, a left zone, a right zone, and undefined zone, the front zone being associated with road attention; and determining whether the eye gaze is on a road based on the determined eye gaze zone; upon a determination that the eye gaze is on the road; and update a power mode zone; update information to the road attention; and determine whether a passenger is detected; upon a determination that the passenger is detected: update the power mode zone; update the information to interior attention by the passenger and an interface to act as a wakeup event; place passenger displays in a normal operating mode; place passenger door switches in a regular pooling rate; and exit passenger side modules from a pseudo sleep; and upon a determination that the passenger is not detected: passenger displays are able to change power modes, lower refresh rate, and lower resolution; change the pooling rate of the passenger door switches; reduce a network bandwidth of the passenger side modules; and enter the passenger side modules into the pseudo sleep; and upon a determination that the

eye gaze is not on the road: update the power mode zone; and update the information to interior attention; place the passenger displays in the normal operating mode; place the passenger door switches in the regular pooling rate; and exit the passenger side modules from the pseudo sleep.

A vehicle including a system for dynamic dimming of a set of displays sharing a single energy source includes at least one external camera; at least one processor communicatively coupled to the at least one external camera; and at least one memory communicatively coupled to the at least one processor. The at least one memory includes instructions that upon execution by the at least one processor, cause the at least one processor to: receive image data from the at least one external camera; and upon a determination that the image data includes an external light source: determine a light intensity level of the external light source based on the image data; determine a light angle of the external light source with respect to the vehicle based on the image data; generate a desired brightness level based on the light intensity level and the light angle; receive driver gaze data from a gaze tracking system of the vehicle; determine a driver gaze direction based on the driver gaze data; determine whether a first display of a plurality of displays of the vehicle is in a line of sight of the driver gaze direction; and issue a first command to adjust a brightness level of the first display to the desired brightness level and dim the other displays of the plurality of displays to a dim brightness level, the desired brightness level being greater than the dim brightness level.

BRIEF DESCRIPTION OF THE DRAWINGS

The exemplary embodiments will hereinafter be described in conjunction with the following drawing figures, wherein like numerals denote like elements, and wherein:

FIG. 1 is a functional block diagram of a vehicle including a system for dynamic dimming of a set of displays sharing a single energy source in accordance with at least one embodiment;

FIG. 2 is a functional block diagram of a system for dynamic dimming of a set of displays sharing a single energy source in accordance with at least one embodiment;

FIG. 3 is a flowchart representation of an exemplary method of dynamically dimming a set of displays sharing a single energy source in accordance with at least one embodiment;

FIG. 4 is a diagrammatic representation of an exemplary implementation of a system for dynamic dimming of a set of displays sharing a single energy source in broad daylight with none of a plurality of displays of a vehicle in a line of sight of a driver gaze direction of a driver in accordance with at least one embodiment;

FIG. 5 is a diagrammatic representation of an exemplary implementation of a system for dynamic dimming of a set of displays sharing a single energy source in dusk or dawn with none of a plurality of displays of a vehicle in a line of sight of a driver gaze direction of a driver in accordance with at least one embodiment;

FIG. 6 is a diagrammatic representation of an exemplary implementation of a system for dynamic dimming of a set of displays sharing a single energy source in dusk or dawn with one of the plurality of displays of a vehicle in a line of sight of a driver gaze direction of a driver in accordance with at least one embodiment;

FIG. 7 is a diagrammatic representation of an exemplary implementation of a system for dynamic dimming of a set of displays sharing a single energy source in a protected dark

sky area with none of a plurality of displays of a vehicle in a line of sight of a driver gaze direction of a driver in accordance with at least one embodiment; and

FIG. **8** is a flowchart representation of another exemplary method of dynamically dimming a set of displays sharing a single energy source in accordance with at least one embodiment.

DETAILED DESCRIPTION

The following detailed description is merely exemplary in nature and is not intended to limit the application and uses. Furthermore, there is no intention to be bound by any expressed or implied theory presented in the preceding technical field, background, brief summary or the following detailed description. As used herein, the term module refers to an application specific integrated circuit (ASIC), an electronic circuit, a processor (shared, dedicated, or group) and memory that executes one or more software or firmware programs, a combinational logic circuit, and/or other suitable components that provide the described functionality.

Embodiments of the present disclosure may be described herein in terms of functional and/or logical block components and various processing steps. It should be appreciated that such block components may be realized by any number of hardware, software, and/or firmware components configured to perform the specified functions. For example, an embodiment of the present disclosure may employ various integrated circuit components, e.g., memory elements, digital signal processing elements, logic elements, look-up tables, or the like, which may carry out a variety of functions under the control of one or more microprocessors or other control devices. In addition, those skilled in the art will appreciate that embodiments of the present disclosure may be practiced in conjunction with any number of systems, and that the systems described herein is merely exemplary embodiments of the present disclosure.

For the sake of brevity, conventional techniques related to signal processing, data transmission, signaling, control, and other functional aspects of the systems (and the individual operating components of the systems) may not be described in detail herein. Furthermore, the connecting lines shown in the various figures contained herein are intended to represent example functional relationships and/or physical couplings between the various elements. It should be noted that many alternative or additional functional relationships or physical connections may be present in an embodiment of the present disclosure.

Referring to FIG. **1**, a functional block diagram of a vehicle including a system for dynamic dimming of a set of displays sharing a single energy source **100** in accordance with at least one embodiment is shown. In at least one embodiment, the single energy source refers to a collection of battery units or all of the energy sources used to power an electric vehicle (EV) **10**. In at least one embodiment, the set of displays refers to a plurality of displays in the vehicle **10**. In at least one embodiment, the set of displays refers to all of the displays in the vehicle **10**. The vehicle **10** generally includes a chassis **12**, a body **14**, front wheels **16**, and rear wheels **18**. While the vehicle **10** is depicted in the illustrated embodiment as a passenger car, the vehicle **10** may be other types of vehicles including trucks, sport utility vehicles (SUVs), and recreational vehicles (RVs).

In various embodiments, the body **14** is arranged on the chassis **12** and substantially encloses components of the vehicle **10**. The body **14** and the chassis **12** may jointly form

a frame. The wheels **16-18** are each rotationally coupled to the chassis **12** near a respective corner of the body **14**.

In various embodiments, the vehicle **10** is an autonomous or semi-autonomous vehicle that is automatically controlled to carry passengers and/or cargo from one place to another. For example, in an exemplary embodiment, the vehicle **10** is a so-called Level Two, Level Three, Level Four or Level Five automation system. Level two automation means the vehicle assists the driver in various driving tasks with driver supervision. Level three automation means the vehicle can take over all driving functions under certain circumstances. All major functions are automated, including braking, steering, and acceleration. At this level, the driver can fully disengage until the vehicle tells the driver otherwise. A Level Four system indicates "high automation", referring to the driving mode-specific performance by an automated driving system of all aspects of the dynamic driving task, even if a human driver does not respond appropriately to a request to intervene. A Level Five system indicates "full automation", referring to the full-time performance by an automated driving system of all aspects of the dynamic driving task under all roadway and environmental conditions that can be managed by a human driver.

As shown, the vehicle **10** generally includes a propulsion system **20** a transmission system **22**, a steering system **24**, a braking system **26**, a sensor system **28**, an actuator system **30**, at least one data storage device **32**, at least one controller **34**, and a communication system **36**. The controller **34** is configured to implement an automated driving system (ADS). The propulsion system **20** is configured to generate power to propel the vehicle. The propulsion system **20** may, in various embodiments, include an internal combustion engine, an electric machine such as a traction motor, a fuel cell propulsion system, and/or any other type of propulsion configuration. The transmission system **22** is configured to transmit power from the propulsion system **20** to the vehicle wheels **16-18** according to selectable speed ratios. According to various embodiments, the transmission system **22** may include a step-ratio automatic transmission, a continuously-variable transmission, or other appropriate transmission. The braking system **26** is configured to provide braking torque to the vehicle wheels **16-18**. The braking system **26** may, in various embodiments, include friction brakes, brake by wire, a regenerative braking system such as an electric machine, and/or other appropriate braking systems.

The steering system **24** is configured to influence a position of the of the vehicle wheels **16**. While depicted as including a steering wheel and steering column, for illustrative purposes, in some embodiments contemplated within the scope of the present disclosure, the steering system **24** may not include a steering wheel and/or steering column. The steering system **24** includes a steering column coupled to an axle **50** associated with the front wheels **16** through, for example, a rack and pinion or other mechanism (not shown). Alternatively, the steering system **24** may include a steer by wire system that includes actuators associated with each of the front wheels **16**.

The sensor system **28** includes one or more sensing devices **40a-40n** that sense observable conditions of the exterior environment and/or the interior environment of the vehicle **10**. The sensing devices **40a-40n** can include, but are not limited to, radars, lidars, global positioning systems, optical cameras, thermal cameras, ultrasonic sensors, a steering wheel sensor, and/or other sensors.

The vehicle dynamics sensors provide vehicle dynamics data including longitudinal speed, yaw rate, lateral acceleration, longitudinal acceleration, etc. The vehicle dynamics

sensors may include wheel sensors that measure information pertaining to one or more wheels of the vehicle **10**. In one embodiment, the wheel sensors comprise wheel speed sensors that are coupled to each of the wheels **16**-**18** of the vehicle **10**. Further, the vehicle dynamics sensors may include one or more accelerometers (provided as part of an Inertial Measurement Unit (IMU)) that measure information pertaining to an acceleration of the vehicle **10**. In various embodiments, the accelerometers measure one or more acceleration values for the vehicle **10**, including latitudinal and longitudinal acceleration and yaw rate. In at least one embodiment, the vehicle dynamic sensors provide vehicle movement data.

The actuator system **30** includes one or more actuator devices **42a**-**42n** that control one or more vehicle features such as, but not limited to, one or more vehicle wheels **16**-**18** the propulsion system **20**, the transmission system **22**, the steering system **24**, and the braking system **26**. In various embodiments, the vehicle features can further include interior and/or exterior vehicle features such as, but are not limited to, doors, a trunk, and cabin features such as air, music, lighting, etc. (not numbered).

The communication system **36** is configured to wirelessly communicate information to and from other entities **48**, such as but not limited to, other vehicles ("V2V" communication) infrastructure ("V2I" communication), remote systems, and/ or personal devices. In an exemplary embodiment, the communication system **36** is a wireless communication system configured to communicate via a wireless local area network (WLAN) using IEEE 802.11 standards or by using cellular data communication. However, additional, or alternate communication methods, such as a dedicated short-range communications (DSRC) channel, are also considered within the scope of the present disclosure. DSRC channels refer to one-way or two-way short-range to medium-range wireless communication channels specifically designed for automotive use and a corresponding set of protocols and standards.

The data storage device **32** stores data for use in the ADS of the vehicle **10**. In various embodiments, the data storage device **32** stores defined maps of the navigable environment. In various embodiments, the defined maps may be predefined by and obtained from a remote system. For example, the defined maps may be assembled by the remote system and communicated to the vehicle **10** (wirelessly and/or in a wired manner) and stored in the data storage device **32**. As can be appreciated, the data storage device **32** may be part of the controller **34**, separate from the controller **34**, or part of the controller **34** and part of a separate system.

The controller **34** includes at least one processor **44** and a computer readable storage device or media **46**. The processor **44** can be any custom made or commercially available processor, a central processing unit (CPU), a graphics processing unit (GPU), an auxiliary processor among several processors associated with the controller **34**, a semiconductor-based microprocessor (in the form of a microchip or chip set), a macroprocessor, any combination thereof, or generally any device for executing instructions. The computer readable storage device or media **46** may include volatile and nonvolatile storage in read-only memory (ROM), random-access memory (RAM), and keep-alive memory (KAM), for example. KAM is a persistent or non-volatile memory that may be used to store various operating variables while the processor **44** is powered down. The computer-readable storage device or media **46** may be implemented using any of a number of known memory devices such as PROMs (programmable read-only memory),

EPROMs (electrically PROM), EEPROMs (electrically erasable PROM), flash memory, or any other electric, magnetic, optical, or combination memory devices capable of storing data, some of which represent executable instructions, used by the controller **34** in controlling the vehicle **10**.

The instructions may include one or more separate programs, each of which comprises an ordered listing of executable instructions for implementing logical functions. The instructions, when executed by the processor **44**, receive and process signals from the sensor system **28**, perform logic, calculations, methods and/or algorithms for automatically controlling the components of the vehicle **10**, and generate control signals to the actuator system **30** to automatically control the components of the vehicle **10** based on the logic, calculations, methods, and/or algorithms. Although only one controller **34** is shown in FIG. **1**, embodiments of the vehicle **10** can include any number of controllers **34** that communicate over any suitable communication medium or a combination of communication mediums and that cooperate to process the sensor signals, perform logic, calculations, methods, and/or algorithms, and generate control signals to automatically control features of the vehicle **10**. In various embodiments, the controller(s) **34** are configured to implement ADS.

Referring to FIG. **2**, a functional block diagram of a controller **34** including a system for dynamic dimming of a set of displays sharing a single energy source **100** in accordance with at least one embodiment is shown. The controller **34** includes at least one processor **44** and at least one memory **46**. The at least one processor **44** is a programmable device that includes one or more instructions stored in or associated with the at least one memory **46**. The at least one memory **46** includes instructions that the at least one processor **44** is configured to execute. The at least one memory **46** includes an embodiment of the system for dynamic dimming of a set of displays sharing a single energy source **100**. The controller **34** is configured to be communicatively coupled to at least one ambient light sensor **200**, at least one external camera **202**, a gaze tracking system **204**, and a plurality of displays **2061**, **2062**, **2063**, **206N**. The plurality of displays **2061**, **2062**, **2063**, **206N** may operate in different resolutions and/or refresh rates.

The ambient light sensor(s) **200** is configured to generate the ambient light data based on sensed ambient light around the vehicle **10**. The external camera(s) **202** are configured to capture images of an external environment outside of the vehicle **10**. In at least one embodiment, the external camera(s) **202** is mounted on a windshield of the vehicle **10**. In at least one embodiment, the external camera(s) **202** is mounted on a dashboard of the vehicle **10**. In at least one embodiment, the external camera(s) **202** is mounted on a hood of the vehicle **10**. In at least one embodiment, the gaze tracking system **204** includes at least one internal camera. The internal camera(s) is configured to capture images of a driver in an interior of the vehicle **10**. The plurality of displays **2061**, **2062**, **2063**, **206N** may also be referred to as a plurality of display devices **2061**, **2062**, **2063**, **206N**. Each of the plurality of displays **2061**, **2062**, **2063**, **206N** is configured to receive commands from the system for dynamic dimming of a set of displays sharing a single energy source **100** and responsively adjust a brightness level and/or hue of the displays **2061**, **2062**, **2063**, **206N**.

In at least one embodiment, the system for dynamic dimming of a set of displays sharing a single energy source **100** includes a light capture algorithm **208** and a light dimming algorithm **210**. The controller **34** may include additional components that facilitate operation of the system

for dynamic dimming of a set of displays sharing a single energy source **100**. The operation of the system for dynamic dimming of a set of displays sharing a single energy source **100** will be described in greater detail below.

Referring to FIG. **3**, a flowchart representation of an exemplary method **300** method of dynamically dimming a set of displays sharing a single energy source in a vehicle **10** in accordance with at least one embodiment is shown. The method **300** will be described with reference to an exemplary implementation of an embodiment of a system for dynamic dimming of a set of displays sharing a single energy source **100**. As can be appreciated in light of the disclosure, the order of operation within the method **300** is not limited to the sequential execution as illustrated in FIG. **3** but may be performed in one or more varying orders as applicable and in accordance with the present disclosure.

At **302**, the vehicle **10** is turned on. At **304** operation of the system for dynamic dimming of a set of displays sharing a single energy source **100** is activated. In at least one embodiment, the operation of the system for dynamic dimming of a set of displays sharing a single energy source **100** is activated in response to the vehicle **10** being turned on. In at least one embodiment, the operation of the system for dynamic dimming of a set of displays sharing a single energy source **100** receives a state of charge (SOC) value of a battery system of the vehicle **10**. The system for dynamic dimming of a set of displays sharing a single energy source **100** determines whether the SOC value is below a SOC threshold. An SOC value that is below the SOC threshold indicates that the battery system has a low SOC and the system for dynamic dimming of a set of displays sharing a single energy source **100** is responsively activated to conserve battery system power.

At **306**, the system for dynamic dimming of a set of displays sharing a single energy source **100** receives ambient light data from the ambient light sensor(s) **200** of the vehicle **10**. In at least one embodiment, the light capture algorithm **208** receives the ambient light data from the ambient light sensor(s) **200** of the vehicle **10**. The ambient light sensor(s) **200** is configured to generate the ambient light data based on sensed ambient light around the vehicle **10**.

At **308**, the system for dynamic dimming of a set of displays sharing a single energy source **100** receives image data from an external camera(s) **202** of the vehicle **10**. In at least one embodiment, the light capture algorithm **208** receives the image data from the external camera(s) **202** of the vehicle **10**. In at least one embodiment, the external camera(s) **202** is mounted on a windshield of the vehicle **10**. In at least one embodiment, the external camera(s) **202** is mounted on a dashboard of the vehicle **10**. In at least one embodiment, the external camera(s) **202** is mounted on a hood of the vehicle **10**.

At **310**, the system for dynamic dimming of a set of displays sharing a single energy source **100** determines whether the image data includes an external light source. In at least one embodiment, the light capture algorithm **208** determines whether the image data includes an external light source. Examples of external light sources include, but are not limited to, a sun, a billboard, a streetlight, and headlights of a vehicle.

In at least one embodiment, the light capture algorithm **208** is a machine learning model. A remote cloud-based system trains the light capture algorithm **208** to recognize external light sources in image data using datasets. Crowd sourced image data and identified external light sources in the image data are received from the system for dynamic dimming of a set of displays sharing a single energy source

100 of different vehicles **10** at the remote cloud-based system. The remote cloud-based system uses the crowd sourced image data and identified external light sources in the image data to train and refine the light capture algorithm **208**. Updates to the light capture algorithm **208** based on the training and refinement are transmitted from the remote cloud-based system to the light capture algorithm **208** of the vehicle **10**.

If the system for dynamic dimming of a set of displays sharing a single energy source **100** determines that the image data does not include an external light source, the system for dynamic dimming of a set of displays sharing a single energy source **100** issues a command to the plurality of displays **2061**, **2062**, **2063**, **206N** of the vehicle **10** to adjust the brightness level of the plurality of displays **2061**, **2062**, **2063**, **206N** to a default brightness level at **311**.

If the system for dynamic dimming of a set of displays sharing a single energy source **100** determines that the image data includes an external light source, the system for dynamic dimming of a set of displays sharing a single energy source **100** determines a light intensity level of the external light source based on the image data at **312**. In at least one embodiment, the light capture algorithm **208** determines the light intensity level of the external light source based on the image data.

In at least one embodiment, the light capture algorithm **208** is a machine learning model. A remote cloud-based system trains the light capture algorithm **208** to determine light intensities of external light sources using datasets. Crowd sourced external light sources, ambient light levels, and associated light intensity levels are received from the system for dynamic dimming of a set of displays sharing a single energy source **100** of different vehicles **10** at the remote cloud-based system. The remote cloud-based system uses the crowd sourced external light sources, ambient light levels, and associated light intensity levels to train and refine the light capture algorithm **208**. Updates to the light capture algorithm **208** based on the training and refinement are transmitted from the remote cloud-based system to the light capture algorithm **208** of the vehicle **10**.

At **314**, the system for dynamic dimming of a set of displays sharing a single energy source **100** determines a light angle of the external light source with respect to the vehicle **10** based on the image data. In at least one embodiment, the light capture algorithm **208** determines the light angle of the external light source with respect to the vehicle **10** based on the image data.

In at least one embodiment, the light capture algorithm **208** is a machine learning model. A remote cloud-based system trains the light capture algorithm **208** to determine light angles of external light sources with respect to vehicles using datasets based on image data. Crowd sourced image data, external light sources and associated light angles are received from the systems for dynamic dimming of a set of displays sharing a single energy source **100** of different vehicles **10** at the remote cloud-based system. The remote cloud-based system uses the crowd sourced external light sources and associated light intensity levels to train and refine the light capture algorithm **208**. Updates to the light capture algorithm **208** based on the training and refinement are transmitted from the remote cloud-based system to the light capture algorithm **208** of the vehicle **10**.

At **316**, the system for dynamic dimming of a set of displays sharing a single energy source **100** generates a desired brightness level based on the light intensity level and the light angle of the external light source. In at least one embodiment, the light dimming algorithm **210** generates the

desired brightness level based on the light intensity level and the light angle of the external light source. The vehicle **10** includes a plurality of displays **2061**, **2062**, **2063**, **206**N. Each of the displays **2061**, **2062**, **2063**, **206**N is associated with a default brightness level. The desired brightness level is greater than the default brightness level.

At **318**, the system for dynamic dimming of a set of displays sharing a single energy source **100** generates a hue adjustment based on the ambient light data. In at least one embodiment, the light dimming algorithm **210** generates the hue adjustment based on the ambient light data. In at least one embodiment, the light dimming algorithm **210** determines whether the ambient light data is greater than a day mode ambient light threshold. If the light dimming algorithm **210** determines that the ambient light data is greater than the day mode ambient light threshold, the light dimming algorithm **210** generates a day mode hue as the hue adjustment. Specific hues are employed in the presentation of graphics in a display **2061**, **2062**, **2063**, **206**N in a day mode hue. The hues used in the day mode hue are selected to enhance visual perception of the graphics, for example, in broad daylight when ambient light levels are relatively high and there is a lower likelihood of eye strain.

If the light dimming algorithm **210** determines that the ambient light data is less than the day mode ambient light threshold, the light dimming algorithm **210** determines whether the ambient light data is less than a dark sky ambient light threshold. If the light dimming algorithm **210** determines that the ambient light data is greater than the dark sky ambient light threshold, the light dimming algorithm **210** generates a night mode hue as the hue adjustment. Specific hues are employed in the presentation of graphics in a display **2061**, **2062**, **2063**, **206**N in a night mode hue. The hues used in the night mode hue are selected to enhance visual perception of graphics using mesopic vision, for example, during dusk or dawn when ambient light levels are moderately low.

If the light dimming algorithm **210** determines that the ambient light data is less than the dark sky ambient light threshold, the light dimming algorithm **210** generates a shifted night mode hue as the hue adjustment. In very low light situations, such as for example in protected dark sky environments (e.g. the presence of light is minimal), red hues are often employed in the shifted night mode hue presentation of graphics in a display **2061**, **2062**, **2063**, **206**N. The red hues are often used in the shifted night mode hue to enhance visual perception of the graphics when the rods in the human eye are primarily used in vision and may reduce eye strain.

At **320**, the system for dynamic dimming of a set of displays sharing a single energy source **100** receives driver gaze data from a gaze tracking system **204** of the vehicle **10**. In at least one embodiment, the gaze tracking system **204** includes one or more internal cameras configured to capture images of a head of a driver of the vehicle **10**. The gaze data includes the images captured by the internal camera(s). At **322**, the system for dynamic dimming of a set of displays sharing a single energy source **100** determines a driver gaze direction of the driver of the vehicle **10** based on the gaze data.

At **324**, the system for dynamic dimming of a set of displays sharing a single energy source **100** determines whether one of the plurality of displays **2061**, **2062**, **2063**, **206**N of the vehicle **10** is in a line of sight of the driver gaze direction. If the system for dynamic dimming of a set of displays sharing a single energy source **100** determines that one of the plurality of displays **2061** of the vehicle **10** is in

the line of sight of the driver gaze direction, the method **300** proceeds to **326**. At **326**, the system for dynamic dimming of a set of displays sharing a single energy source **100** issues a command to the display **2061** in the line of sight of the driver gaze direction to adjust the brightness level of the display **2061** to the desired brightness level and implement the hue adjustment. The system for dynamic dimming of a set of displays sharing a single energy source **100** issues a command to the other displays **2062**, **2063**, **206**N of the vehicle **10** to adjust the brightness level to a dim brightness level.

As mentioned above each of the displays **2061**, **2062**, **2063**, **206**N is associated with a default brightness level. The desired brightness level is greater than the default brightness level. The dim brightness level is less than the default brightness level. Placing the displays **2062**, **2063**, **206**N of the vehicle **10** that are not in the line of sight of the driver gaze direction in the dim brightness level results in reduced energy usage of the battery system of the vehicle **10**.

If the system for dynamic dimming of a set of displays sharing a single energy source **100** determines that none of the plurality of displays **2061**, **2062**, **2063**, **206**N of the vehicle **10** are in the line of sight of the driver gaze direction, the method **300** proceeds to **328**. At **328**, the system for dynamic dimming of a set of displays sharing a single energy source **100** issues a command to the plurality of displays **2061**, **2062**, **2063**, **206**N to adjust the brightness level of the all of displays **2061**, **2062**, **2063**, **206**N in the vehicle **10** to the dim brightness level. Since none of the displays **2061**, **2062**, **2063**, **206**N of the vehicle **10** are in the line of sight of the driver gaze direction, placing all of the displays **2061**, **2062**, **2063**, **206**N of the vehicle **10** in the dim brightness level results in reduced energy usage of the battery system of the vehicle **10**.

In at least one embodiment, if the system for dynamic dimming of a set of displays sharing a single energy source **100** is unable to determine a driver gaze direction based on the gaze data received from the gaze tracking system **204**, the system for dynamic dimming of a set of displays sharing a single energy source **100** is configured to issue a command to the plurality of displays **2061**, **2062**, **2063**, **206**N to adjust the brightness level of the all of displays **2061**, **2062**, **2063**, **206**N in the vehicle **10** to the default brightness level.

In at least one embodiment, the system for dynamic dimming of a set of displays sharing a single energy source **100** is configured to receive a driver eyesight profile via a user input device of the vehicle **10**. The system for dynamic dimming of a set of displays sharing a single energy source **100** modifies at least one of the day mode hue, the night mode hue, and the shifted night mode hue based on the driver profile. If for example, the driver eyesight profile indicates that a driver of the vehicle **10** is color blind, the system for dynamic dimming of a set of displays sharing a single energy source **100** modifies at least one of the day mode hue, the night mode hue, and the shifted night mode hue to eliminate the use of colors that the driver is unable to see.

In at least one embodiment, the system for dynamic dimming of a set of displays sharing a single energy source **100** identifies a light source type of external light source in the image data received from the external camera(s) **202** based on the light intensity level and the light angle. In at least one embodiment, the light capture algorithm **208** identifies the light source type of external light source in image data received from the external camera(s) **202** based on the light intensity level and the light angle. Examples of light source types include, but are not limited to, a sun, headlights of a vehicle, a streetlight, and a billboard. The

system for dynamic dimming of a set of displays sharing a single energy source **100** determines the desired brightness level based on the light source type of the external light source. In at least one embodiment, the light dimming algorithm **210** determines the desired brightness level based on the light source type of the external light source.

Referring to FIG. **4**, a diagrammatic representation of an exemplary implementation of a system for dynamic dimming of a set of displays sharing a single energy source **100** in broad daylight with none of a plurality of displays **2061**, **2062**, **2063**, **206N** of a vehicle **10** in a line of sight of a driver gaze direction **400** of a driver **402** in accordance with at least one embodiment is shown. The system for dynamic dimming of a set of displays sharing a single energy source **100** received ambient light data and image data. The image data included an external light source. The external light source is the sun **404**.

The system for dynamic dimming of a set of displays sharing a single energy source **100** determined a light intensity level **406** based on the ambient light data. The light intensity level **406** is at the high end of the ambient light scale. The driver gaze direction **400** of the driver **402** is directly ahead. The system for dynamic dimming of a set of displays sharing a single energy source **100** determined that the none of the plurality of displays **2061**, **2062**, **2063**, **206N** in the vehicle **10** were in the light of sight of the driver gaze direction **400**. Accordingly, the system for dynamic dimming of a set of displays sharing a single energy source **100** issued a command to adjust the brightness level of the plurality of displays **2061**, **2062**, **2063**, **206N** in the vehicle **10** to a dim brightness level **408** as indicated in the brightness level scale.

The system for dynamic dimming of a set of displays sharing a single energy source **100** determined that the ambient light data was greater than a day mode ambient light data threshold and generated a day mode hue **412** adjustment to the plurality of displays **2061**, **2062**, **2063**, **206N** in the vehicle **10**. The system for dynamic dimming of a set of displays sharing a single energy source **100** determined that there was no need to implement a hue shift **410** to the day mode hue **412**.

Referring to FIG. **5**, a diagrammatic representation of an exemplary implementation of a system for dynamic dimming of a set of displays sharing a single energy source **100** in dusk or dawn with none of a plurality of displays **2061**, **2062**, **2063**, **206N** of a vehicle **10** in a line of sight of a driver gaze direction **500** of a driver **502** in accordance with at least one embodiment is shown. The system for dynamic dimming of a set of displays sharing a single energy source **100** received ambient light data and image data. The image data included an external light source. The external light source is the sun **504**.

The system for dynamic dimming of a set of displays sharing a single energy source **100** determined a light intensity level **506** based on the ambient light data. The light intensity level **506** is in the middle of the ambient light scale indicating a moderate light intensity level **506**. The driver gaze direction **500** of the driver **502** is directly ahead. The system for dynamic dimming of a set of displays sharing a single energy source **100** determined that the none of the plurality of displays **2061**, **2062**, **2063**, **206N** in the vehicle **10** were in the light of sight of the driver gaze direction **500**. Accordingly, the system for dynamic dimming of a set of displays sharing a single energy source **100** issued a command to adjust the brightness level of the plurality of

displays **2061**, **2062**, **2063**, **206N** in the vehicle **10** to a dim brightness level **508** as indicated in the brightness level scale.

The system for dynamic dimming of a set of displays sharing a single energy source **100** determined that the ambient light data was less than a day mode ambient light data threshold and greater than dark sky ambient light threshold. Accordingly, the system for dynamic dimming of a set of displays sharing a single energy source **100** generated a night mode hue **512** adjustment to the plurality of displays **2061**, **2062**, **2063**, **206N** in the vehicle **10**. The system for dynamic dimming of a set of displays sharing a single energy source **100** determined that there was no need to implement a hue shift **510** to the night mode hue **512** since the ambient light data was greater than the dark sky ambient light threshold.

Referring to FIG. **6**, a diagrammatic representation of an exemplary implementation of a system for dynamic dimming of a set of displays sharing a single energy source **100** in dusk or dawn with one of the plurality of displays of a vehicle **10** in a line of sight of a driver gaze direction **600** of a driver **602** in accordance with at least one embodiment is shown. The system for dynamic dimming of a set of displays sharing a single energy source **100** received ambient light data and image data. The image data included an external light source. The external light source is the sun **604**. The system for dynamic dimming of a set of displays sharing a single energy source **100** determined a light intensity level **606** based on the ambient light data. The light intensity level **606** is in the middle of the ambient light scale indicating a moderate light intensity level **606**.

The driver gaze direction **600** of the driver **602** is toward one of the of the plurality of displays **2061** in the vehicle **10**. The system for dynamic dimming of a set of displays sharing a single energy source **100** determined a light angle of the sun **604** with respect to the vehicle **10** and generated a desired brightness level **608** based on the light intensity level **606** and the light angle.

The system for dynamic dimming of a set of displays sharing a single energy source **100** determined that the ambient light data was less than a day mode ambient light data threshold and greater than dark sky ambient light threshold. Accordingly, the system for dynamic dimming of a set of displays sharing a single energy source **100** generated a night mode hue **612** adjustment to the plurality of displays **2061**, **2062**, **2063**, **206N** in the vehicle **10**. The system for dynamic dimming of a set of displays sharing a single energy source **100** determined that there was no need to implement a hue shift **610** to the night mode hue **612** since the ambient light data was greater than the dark sky ambient light threshold.

The system for dynamic dimming of a set of displays sharing a single energy source **100** issued a command to the display **2061** in the line sight of the gaze direction **600** of the driver **602** to adjust the brightness level of the display **2061** to the desired brightness level **608** and implement the night mode hue adjustment. The system for dynamic dimming of a set of displays sharing a single energy source **100** issued a command to the other displays **2062**, **2063**, **206N** in the vehicle **10** to a dim the brightness level of the displays **2062**, **2063**, **206N** to a dim brightness level and implement the night hue mode adjustment.

Referring to FIG. **7**, a diagrammatic representation of an exemplary implementation of a system for dynamic dimming of a set of displays sharing a single energy source **100** in a protected dark sky area with none of a plurality of displays **2061**, **2062**, **2063**, **206N** of a vehicle **10** in a line of

sight of a driver gaze direction **700** of a driver **702** in accordance with at least one embodiment is shown. The system for dynamic dimming of a set of displays sharing a single energy source **100** received ambient light data and image data.

The system for dynamic dimming of a set of displays sharing a single energy source **100** determined a light intensity level **706** based on the ambient light data. The light intensity level **706** is at the low end of the ambient light scale indicating a very low light intensity level **706**. The driver gaze direction **700** of the driver **702** is directly ahead. The system for dynamic dimming of a set of displays sharing a single energy source **100** determined that the none of the plurality of displays **2061**, **2062**, **2063**, **206N** in the vehicle **10** were in the light of sight of the driver gaze direction **700**. Accordingly, the system for dynamic dimming of a set of displays sharing a single energy source **100** issued a command to adjust the brightness level of the plurality of displays **2061**, **2062**, **2063**, **206N** in the vehicle **10** to a dim brightness level **708** as indicated in the brightness level scale.

The system for dynamic dimming of a set of displays sharing a single energy source **100** determined that the ambient light data was less than a day mode ambient light data threshold and less than dark sky ambient light threshold. Accordingly, the system for dynamic dimming of a set of displays sharing a single energy source **100** generated a night mode hue **712** adjustment to the plurality of displays **2061**, **2062**, **2063**, **206N** in the vehicle **10**. The system for dynamic dimming of a set of displays sharing a single energy source **100** implemented a hue shift **710** to the night mode hue **712** to generate a shifted night mode hue since the ambient light data was less than the dark sky ambient light threshold.

In at least one embodiment, the gaze tracking, light sensors, cameras, and computer vision are incorporated into a system of algorithms to dynamically shift the brightness, hue, resolution (by applying foveating rendering) and/or refresh rate of an in-vehicle display to support the driver's visual focus in low light (mesopic vision) conditions and dim the display when not in use by the driver or scale display refresh rate and resolution when attention is not a the display.

Combining driver gaze with current luminance and camera data, an algorithm can compute how to adjust the display brightness, hue, resolution and/or refresh rate to preserve EV battery life and support the driver's focus in real time, reducing disability and discomfort glare. Machine learning will be used to train the external cameras' computer vision to accurately identify light sources and intensity, which will improve recognition over time.

Software algorithms are used to dynamically shift the brightness, hue, resolution, and/or refresh rate of individual in-vehicle displays to support driver's visual focus and preserve EV battery.

In at least one embodiment, when the vehicle is on, the driver gaze tracking will enable some additional display and system behavior changes. If gaze tracking identifies where the driver is looking, that information will be sent to the dynamic resolution engine, foveated rendering engine, and dynamic refresh rate display engine. The resolution and refresh rate engine will determine the optimal vehicle display resolution, refresh rate and foveated rendering targets, Then the resulting configurations will be sent to the GPU cluster (display module) which will then adjust the aforementioned parameters to all affected displays in the driver's visual range. Modules to dynamically change power modes

by shifting switches pooling rate, CPU power states and network speed shift to lower speeds. Foveated and dynamic resolution rendering will be established by a predetermination of an eye gaze zone, in with when the gaze enters on this zone a part of the display will enter in a reduced resolution or the full display will be allowed to shift to a lower resolution mode depending on system capability and eye gaze zone data. Refresh rate rendering will be established by a pre-determined zone, of when the eye gaze enters it the rendering pipeline will adjust the refresh rate. For modules outside the main eye gaze attention zone, the system will enable a dynamic pooling rate change for input outputs (I/O's), central processing unit (CPU) clock and when available network speed change. In an event that the driver gaze tracking is not available, the system will return it to its optimal state in with full resolution, refresh rate. Or in an event that a passenger is present, and no gaze tracking is available for the passenger, the system shall return to its optimal logic. The outputs of the rendering and refresh rate engines will be stored in an external/cloud-based database to identify patterns over time and improve the accuracy of the algorithms.

Referring to FIG. **8**, a flowchart representation of another exemplary method **800** of dynamically dimming a set of displays sharing a single energy source in accordance with at least one embodiment is shown. The method **800** will be described with reference to an exemplary implementation of an embodiment of a system for dynamic dimming of a set of displays sharing a single energy source **100**. As can be appreciated in light of the disclosure, the order of operation within the method **800** is not limited to the sequential execution as illustrated in FIG. **8** but may be performed in one or more varying orders as applicable and in accordance with the present disclosure.

At **802**, an eye gaze is locked. At **804**, the system for dynamic dimming of a set of displays sharing a single energy source **100** determines an eye gaze zone of the driver based on eye gaze data from the gaze tracking system **204**. The determined eye gaze zone is one of a front zone (on the road), a left zone, a right zone, and an undefined zone.

At **806**, the system for dynamic dimming of a set of displays sharing a single energy source **100** determines whether the eye gaze of the driver is on the road based on the determined eye gaze zone. If the system for dynamic dimming of a set of displays sharing a single energy source **100** determines that the eye gaze of the driver is not on the road, the system for dynamic dimming of a set of displays sharing a single energy source **100** engages in the following actions: update the power mode zone, information: interior attention, and interface to act as a wakeup event at **808**. At **810**, the system for dynamic dimming of a set of displays sharing a single energy source **100** returns passenger display to normal operating mode, passenger door switches to regular pooling rate, and passenger side modules exit from pseudo sleep. If the system for dynamic dimming of a set of displays sharing a single energy source **100** determines that the eye gaze of the driver is on the road, the system for dynamic dimming of a set of displays sharing a single energy source **100** engages in the following actions: updates power mode zone and information: road attention at **812**.

At **814**, the system for dynamic dimming of a set of displays sharing a single energy source **100** determines if a passenger is detected. If the system for dynamic dimming of a set of displays sharing a single energy source **100** determines that a passenger is not detected, the system for dynamic dimming of a set of displays sharing a single energy source **100** engages in the following actions: pas-

senger displays can change its power mode, low refresh rate and lower resolution, passenger door switches change pooling rate, passenger side modules reduce network bandwidth and enter pseudo sleep at **816**.

If the system for dynamic dimming of a set of displays sharing a single energy source **100** determines that a passenger is detected, the system for dynamic dimming of a set of displays sharing a single energy source **100** engages in the following actions: update power mode zone, information: interior attention by passenger, and interface to act as a wakeup event. The method **800** then proceeds to **810**.

In at least one embodiment, the zones may be used for other purposes, such as for example, changing the pooling rate. Such zones would be used to reduce the level of detail or resolution in the peripheral areas that are not in focus in order to optimize the utilization of the CPU and the GPU by prioritizing rendering quality where it matters most. The detection of a front passenger can be used as refining criterial for front passenger infotainment (FPI).

While at least one exemplary embodiment has been presented in the foregoing detailed description, it should be appreciated that a vast number of variations exist. It should also be appreciated that the exemplary embodiment or exemplary embodiments are only examples, and are not intended to limit the scope, applicability, or configuration of the disclosure in any way. Rather, the foregoing detailed description will provide those skilled in the art with a convenient road map for implementing the exemplary embodiment or exemplary embodiments. It should be understood that various changes can be made in the function and arrangement of elements without departing from the scope of the disclosure as set forth in the appended claims and the legal equivalents thereof.

What is claimed is:

1. A system for dynamic dimming of a set of displays sharing a single energy source comprises:
   at least one processor; and
   at least one memory communicatively coupled to the at least one processor, the at least one memory comprising instructions that upon execution by the at least one processor, cause the at least one processor to:
      receive image data from at least one external camera of a vehicle;
      upon a determination that the image data includes an external light source:
      determine a light intensity level of the external light source based on the image data; and
      determine a light angle of the external light source with respect to the vehicle based on the image data;
      generate a desired brightness level based on the light intensity level and the light angle;
      receive driver gaze data from a gaze tracking system of the vehicle;
      determine a driver gaze direction based on the driver gaze data;
      determine whether a first display of a plurality of displays of the vehicle is in a line of sight of the driver gaze direction; and
      issue a first command to adjust a brightness level of the first display to the desired brightness level and dim the other displays of the plurality of displays to a dim brightness level, the desired brightness level being greater than the dim brightness level.

2. The system of claim **1**, wherein:
   the plurality of displays are associated with a default brightness level;
   the desired brightness level is greater than the default brightness level; and
   the dim brightness level is less than the default brightness level.

3. The system of claim **1**, wherein the at least one memory further comprises instructions that upon execution by the at least one processor, cause the at least one processor to:
   receive ambient light data from at least one ambient light sensor of the vehicle;
   determine whether the ambient light data is greater than a first ambient light threshold;
   upon a determination that the ambient light data is greater than the first ambient light threshold, issue a second command to adjust a hue of the first display to a day mode hue; and
   upon a determination that the ambient light data is less than the first ambient light threshold, issue the second command to adjust the hue of the first display to a night mode hue.

4. The system of claim **3**, wherein the at least one memory further comprises instructions that upon execution by the at least one processor, cause the at least one processor to:
   determine whether the ambient light data is less than a second ambient light threshold, the second ambient light threshold being lower than the first ambient light threshold; and
   issue the second command to adjust the hue of the first display to a shifted night mode hue based on the determination.

5. The system of claim **3**, wherein the at least one memory further comprises instructions that upon execution by the at least one processor, cause the at least one processor to:
   receive a driver eyesight profile; and
   modify at least one of the day mode hue and the night mode hue based on the driver eyesight profile.

6. The system of claim **1**, wherein the at least one memory further comprises instructions that upon execution by the at least one processor, cause the at least one processor to upon a determination that none of the plurality of displays are in the line of sight of the driver gaze direction, issue a third command to adjust a brightness level of each of the plurality of displays to the dim brightness level.

7. The system of claim **1**, wherein the at least one memory further comprises instructions that upon execution by the at least one processor, cause the at least one processor to upon a determination that the driver gaze direction cannot be determined based on the gaze data, issue a fourth command to adjust a brightness level of each of the plurality of displays to a default brightness level.

8. The system of claim **1**, wherein the at least one memory further comprises instructions that upon execution by the at least one processor, cause the at least one processor to:
   determine whether the vehicle is on; and
   activate operation of the system for dynamic dimming of the set of displays sharing the single energy source based on the determination.

9. The system of claim **1**, wherein the at least one memory further comprises instructions that upon execution by the at least one processor, cause the at least one processor to:
   receive a state of charge (SOC) value of a battery system of the vehicle;
   determine whether the SOC value is below a SOC threshold; and

activate operation of the system for dynamic dimming of the set of displays sharing the single energy source based on the determination.

10. The system of claim **1**, wherein the at least one memory further comprises instructions that upon execution by the at least one processor, cause the at least one processor to:

identify a light source type of the external light source based on the light intensity level and the light angle; and

generate the desired brightness level based on the light source type of the external light source.

11. The system of claim **1**, wherein the external light source is one of a sun, headlights of a vehicle, a streetlight, and a billboard.

12. A method of dynamically dimming a set of displays sharing a single energy source comprising:

receiving image data from at least one external camera of a vehicle; and

upon a determination that the image data includes an external light source:

determining a light intensity level of the external light source based on the image data;

determining a light angle of the external light source with respect to the vehicle based on the image data;

generating a desired brightness level based on the light intensity level and the light angle;

receiving driver gaze data from a gaze tracking system of the vehicle;

determining a driver gaze direction based on the driver gaze data;

determining whether a first display of a plurality of displays of the vehicle is in a line of sight of the driver gaze direction; and

issuing a first command to adjust a brightness level of the first display to the desired brightness level and dim the other displays of the plurality of displays to a dim brightness level, the desired brightness level being greater than the dim brightness level.

13. The method of claim **12**, wherein:

the plurality of displays are associated with a default brightness level;

the desired brightness level is greater than the default brightness level; and

the dim brightness level is less than the default brightness level.

14. The method of claim **12** further comprising:

receiving ambient light data from at least one ambient light sensor of the vehicle;

determining whether the ambient light data is greater than a first ambient light threshold;

upon a determination that the ambient light data is greater than the first ambient light threshold, issuing a second command to adjust a hue of the first display to a day mode hue; and

upon a determination that the ambient light data is less than the first ambient light threshold, issuing the second command to adjust the hue of the first display to a night mode hue.

15. The method of claim **14**, further comprising:

determining whether the ambient light data is less than a second ambient light threshold, the second ambient light threshold being lower than the first ambient light threshold; and

issuing the second command to adjust the hue of the first display to a shifted night mode hue based on the determination.

16. The method of claim **12**, further comprising upon a determination that none of the plurality of displays are in the line of sight of the driver gaze direction, issuing a third command to adjust a brightness level of each of the plurality of displays to the dim brightness level.

17. The method of claim **12**, further comprising upon a determination that the driver gaze direction cannot be determined based on the gaze data, issuing a fourth command to adjust a brightness level of each of the plurality of displays to the default brightness level.

18. The method of claim **12**, further comprising:

identifying a light source type of the external light source based on the light intensity level and the light angle; and

generating the desired brightness level based on the light source type of the external light source.

19. The method of claim **12**, further comprising:

locking a driver eye gaze;

determining an eye gaze zone, the eye gaze zone being one of a front zone, a left zone, a right zone, and undefined zone, the front zone being associated with road attention; and

determining whether the eye gaze is on a road based on the determined eye gaze zone;

upon a determination that the eye gaze is on the road; and

update a power mode zone;

update information to the road attention; and

determine whether a passenger is detected;

upon a determination that the passenger is detected:

update the power mode zone;

update the information to interior attention by the passenger and an interface to act as a wakeup event;

place passenger displays in a normal operating mode;

place passenger door switches in a regular pooling rate; and

exit passenger side modules from a pseudo sleep; and

upon a determination that the passenger is not detected:

passenger displays are able to change power modes, lower refresh rate, and lower resolution;

change the pooling rate of the passenger door switches;

reduce a network bandwidth of the passenger side modules; and

enter the passenger side modules into the pseudo sleep; and

upon a determination that the eye gaze is not on the road:

update the power mode zone; and

update the information to interior attention;

place the passenger displays in the normal operating mode;

place the passenger door switches in the regular pooling rate; and

exit the passenger side modules from the pseudo sleep.

20. A vehicle including a system for dynamic dimming of a set of displays sharing a single energy source comprises:

at least one external camera;

at least one processor communicatively coupled to the at least one external camera; and

at least one memory communicatively coupled to the at least one processor, the at least one memory comprising instructions that upon execution by the at least one processor, cause the at least one processor to:

receive image data from the at least one external camera;

upon a determination that the image data includes an external light source:

determine a light intensity level of the external light source based on the image data; and

determine a light angle of the external light source with respect to the vehicle based on the image data;

generate a desired brightness level based on the light intensity level and the light angle;

receive driver gaze data from a gaze tracking system of the vehicle;

determine a driver gaze direction based on the driver gaze data;

determine whether a first display of a plurality of displays of the vehicle is in a line of sight of the driver gaze direction; and

issue a first command to adjust a brightness level of the first display to the desired brightness level and dim the other displays of the plurality of displays to a dim brightness level, the desired brightness level being greater than the dim brightness level.

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