The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An image sensing system for a vehicle, said image sensing system comprising:

an imaging sensor comprising a two-dimensional array of light sensing pixels;

said imaging sensor having a forward field of view through the windshield of a vehicle equipped with said image sensing system to the exterior of the equipped vehicle;

wherein said imaging sensor is operable to capture image data;

a control comprising an image processor;

wherein said image sensing system determines an object of interest present in said forward field of view of said imaging sensor via processing of said captured image data by said image processor; and

wherein said image processing comprises spatial filtering.

2. The image sensing system of claim 1, wherein said spatial filtering enhances determination of an object of interest present in said forward field of view of said imaging sensor by comparison of data from at least one of (a) adjacent pixels of said imaging sensor and (b) adjacent pixel groups of said imaging sensor.

3. The image sensing system of claim 2, wherein said spatial filtering enhances determination of at least one light source present in said forward field of view of said imaging sensor.

4. The image sensing system of claim 1, wherein said spatial filtering enhances determination of at least one of a headlamp of an approaching vehicle ahead of the equipped vehicle and a taillight of a leading vehicle ahead of the equipped vehicle.

5. The image sensing system of claim 1, wherein said spatial filtering comprises analysis of a spectral signature representative of at least one detected light source present in said forward field of view of said imaging sensor.

6. The image sensing system of claim 1, wherein said spatial filtering evaluates adjacent pixel groups to distinguish more closely proximate detected light sources from more spaced apart detected light sources.

7. The image sensing system of claim 6, wherein said spatial filtering enhances determination of a streetlight by determining the proximity of detected red light and detected white light present in said forward field of view of said imaging sensor.

8. The image sensing system of claim 1, wherein said spatial filtering, at least in part, identifies atmospheric conditions.

9. The image sensing system of claim 8, wherein said spatial filtering, at least in part, identifies at least one of (i) fog, (ii) rain and (iii) snow.

10. The image sensing system of claim 8, wherein said spatial filtering, at least in part, identifies atmospheric conditions by detecting at least one effect on a light source present in said forward field of view of said imaging sensor caused by different types of atmospheric conditions.

11. The image sensing system of claim 8, wherein said spatial filtering, at least in part, identifies fog by detecting a series of transition regions that extend from a detected light source.

12. The image sensing system of claim 8, wherein at least one forward facing light of the equipped vehicle is adjusted at least in part responsive to said identification of atmospheric conditions.

13. The image sensing system of claim 1, wherein said spatial filtering is enhanced by comparing image data over successive frames of said captured image data.

14. The image sensing system of claim 1, wherein said image processing comprises pattern recognition and wherein said pattern recognition comprises detection of at least one of (a) a

headlight, (b) a taillight and (c) an object, and wherein said pattern recognition is based at least in part on at least one of (i) shape, (ii) reflectivity, (iii) luminance and (iv) spectral characteristic.

15. The image sensing system of claim 1, wherein at least one of (a) said imaging sensor is at or proximate to an interior rearview mirror assembly of the equipped vehicle, and (b) said imaging sensor is at or proximate to the in-cabin surface of the windshield of the equipped vehicle.

16. The image sensing system of claim 1, wherein said image sensing system determines objects of interest based, at least in part, on at least one of (i) spatial differentiation, (ii) spectral signature recognition, and (iii) pattern recognition.

17. The image sensing system of claim 1, wherein detected objects are qualified as objects of interest based, at least in part, on object motion in said field of view of said imaging sensor.

18. The image sensing system of claim 17, wherein detected objects are disqualified based, at least in part, on object motion in said field of view of said imaging sensor.

19. The image sensing system of claim 1, wherein said image sensing system determines an environment in which the equipped vehicle is being driven, and wherein said image sensing system controls a headlamp of the equipped vehicle at least in part responsive to said determination of the environment in which the equipped vehicle is driven.

20. The image sensing system of claim 1, wherein said image sensing system, at least in part, detects lane markers on a road being traveled by the equipped vehicle and present in the field of view of said imaging sensor in order to at least one of (a) assist the driver in steering the equipped vehicle and (b) provide a warning to the driver of the equipped vehicle.

21. The image sensing system of claim 20, wherein said detection of lane markers comprises identification of lane markers by spectral signature.

22. The image sensing system of claim 1, wherein said image sensing system, at least in part, identifies traffic signs.

23. The image sensing system of claim 22, wherein said image sensing system, at least in part, identifies traffic signs by at least one of (a) a spectral signature of the traffic signs and (b) a geometric organization of the traffic signs.

24. The image sensing system of claim 1, wherein said array of light sensing photosensor elements is formed on a semiconductor substrate, and wherein said array of light sensing photosensor elements and associated circuitry are formed on said semiconductor substrate and wherein said associated circuitry comprises at least one of (i) an analog-to-digital converter, (ii) a logic circuit, (iii) a clock, (iv) random access memory, and (v) a digital-to-analog converter, and wherein said array of light sensing photosensor elements and said associated circuitry are formed on said semiconductor substrate as a CMOS device.

25. The image sensing system of claim 1, wherein at least one of (a) at least a portion of said control is commonly formed with said array of light sensing photosensor elements on a semiconductor substrate as an integrated circuit, (b) said control comprises a logic circuit and at least a portion of said logic circuit comprises a configuration of digital logic elements formed on a semiconductor substrate, and (c) said control comprises a logic circuit comprising at least one of (i) a central processing unit and (ii) a read-only-memory.

26. The image sensing system of claim 1, wherein said control at least one of (a) controls a headlamp of the equipped vehicle as a function of a speed of the equipped vehicle, (b) controls a headlamp of the equipped vehicle in response to said image processing, (c) controls a speed of the equipped vehicle in response to said image processing, and (d) generates an alert to the driver of the equipped vehicle in response to said image processing.

27. The image sensing system of claim 1, wherein said image sensing system determines headlamps of approaching vehicles and taillights of leading vehicles.

28. An image sensing system for a vehicle, said image sensing system comprising:

an imaging sensor comprising a two-dimensional array of light sensing pixels;

wherein said array of light sensing photosensor elements and associated circuitry are formed on a semiconductor substrate and wherein said associated circuitry comprises at least one of (i) an analog-to-digital converter, (ii) a logic circuit, (iii) a clock, (iv) random access memory, and (v) a digital-to-analog converter, and wherein said array of light sensing photosensor elements and said associated circuitry are formed on said semiconductor substrate as a CMOS device;

said imaging sensor having a forward field of view through the windshield of a vehicle equipped with said image sensing system to the exterior of the equipped vehicle;

wherein said imaging sensor is operable to capture image data;

a control comprising an image processor;

wherein said image sensing system determines an object of interest present in said forward field of view of said imaging sensor via processing of said captured image data by said image processor;

wherein said image processing comprises spatial filtering; and

wherein said spatial filtering, at least in part, identifies atmospheric conditions.

29. The image sensing system of claim 28, wherein said spatial filtering, at least in part, identifies at least one of (i) fog, (ii) rain and (iii) snow.

30. The image sensing system of claim 28, wherein said spatial filtering, at least in part, identifies atmospheric conditions by detecting at least one effect on a light source present in said forward field of view of said imaging sensor caused by different types of atmospheric conditions.

31. The image sensing system of claim 28, wherein at least one forward facing light of the equipped vehicle is adjusted at least in part responsive to said identification of atmospheric conditions.

32. The image sensing system of claim 28, wherein said spatial filtering enhances determination of an object of interest present in said forward field of view of said imaging sensor

DOCKET ALARM

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips

Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS
Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS
Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS
Sync your system to PACER to automate legal marketing.