inventionevaluator ®

objective idea analysis

Assess the Commercial Potential of your IP

Invention Name:	Smart Vision System
Submitted By:	Lucyd
Invention ID:	IES104281
Date of Report:	January 2021

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Very Limited
Limited
Limited - Moderate
Moderate
Moderate - Strong
Strong

EXECUTIVE SUMMARY

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- ■ Useful
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Market

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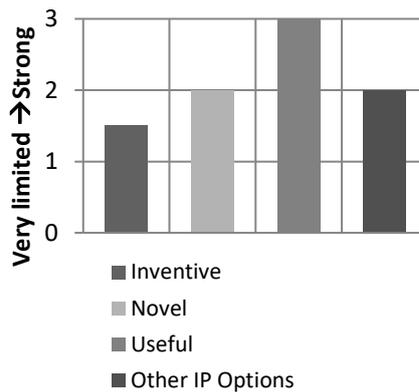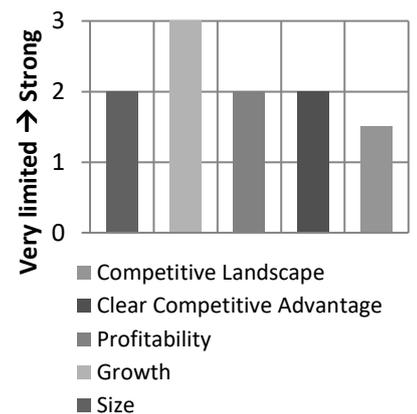

Commercialization Summary

Despite a few documents found in the literature mentioning systems with similar features, no documents were found describing the exact algorithm and this invention may have the advantage of additional IP options. The growing market for drowsiness monitors may benefit the invention but it may face a moderate level of indirect competitors.

- Google Scholar searches returned a number of relevant results. Most of the relevant results have a feature or two in common with the invention. Other systems were found which incorporate the ability to detect drowsiness with a system which warns the driver or which can switch to autonomous control of the vehicle. Additionally, some other systems were found which also appear to …   more

- Espacenet searches returned a few relevant results. Some of these results mentioned the use of a camera for monitoring face and or eye movement for determining if a driver is drowsy. Some of the documents also included a system for warning or alerting the drive like in the invention. However, none of the algorithms described in these documents appear to have steps similar to th… more

TECHNOLOGY ANALYSIS

Idea Description

This invention is an algorithm which is used for detecting the alertness of a driver using a single camera placed in the front of the vehicle facing the driver. The algorithm uses facial recognition to detect the blinking, the direction of the gaze, and yawning. This algorithm has the ability to select the face of the driver and does not need additional lighting or IR sensors.

Material → Sub-component → Component → Device → **System** → Service

Features & Benefits

Features	Benefits
Single camera	• Cost effective • Space efficient
Multiple modes of recognition	• High accuracy
Multiple alerts	• Safer
Integrated into driving systems	• Used in automatic/self-driving cars
No additional lighting necessary	• Space efficient and cost advantage

What may be some innovative aspects of the technology?

Some innovative aspects of this invention could be but are not limited to:

- An algorithm that can use facial recognition from a single driver facing camera for detecting driver alertness and can signal multiple alarms or take control of the vehicle if drowsiness is detected.

Are there regulatory hurdles?

The specific regulatory requirements will depend on the specific jurisdictions that products and services based on your invention are sold into. For this technology, there may be a moderate amount of regulatory hurdles to overcome in the commercialisation process.

The following links provide information and services available to assist in understanding the specific regulatory requirements in different jurisdictions:

RESOURCES

Institution	Website
Business Consultation	https://consultation.business.gov.au/consultation/
US Consumer Product Safety Commission	http://www.cpsc.gov/businfo/regsbyproduct.html
European Commission: Enterprise and Industry	http://ec.europa.eu/enterprise/policies/single-market-goods/cemarking/faq/index_en.htm

What is the development status?

The current status of the invention is at the prototype and testing stage.

This is a mature stage in product development, and therefore some work needs to be done to transfer the technology from this stage into a product that can be sold commercially. The typical developmental steps are:

Concept ⟷ Prototype ⟷ Testing ⟷ Manufacturing ⟷ Sales

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LANDSCAPE

Semantic Mapping

The semantic map below illustrates the divisional breakdown of 'Smart Vision System'. To show a simplified landscape setting we have provided the following schematic, however the divisions and subfields shown may have further interconnectedness.[1]

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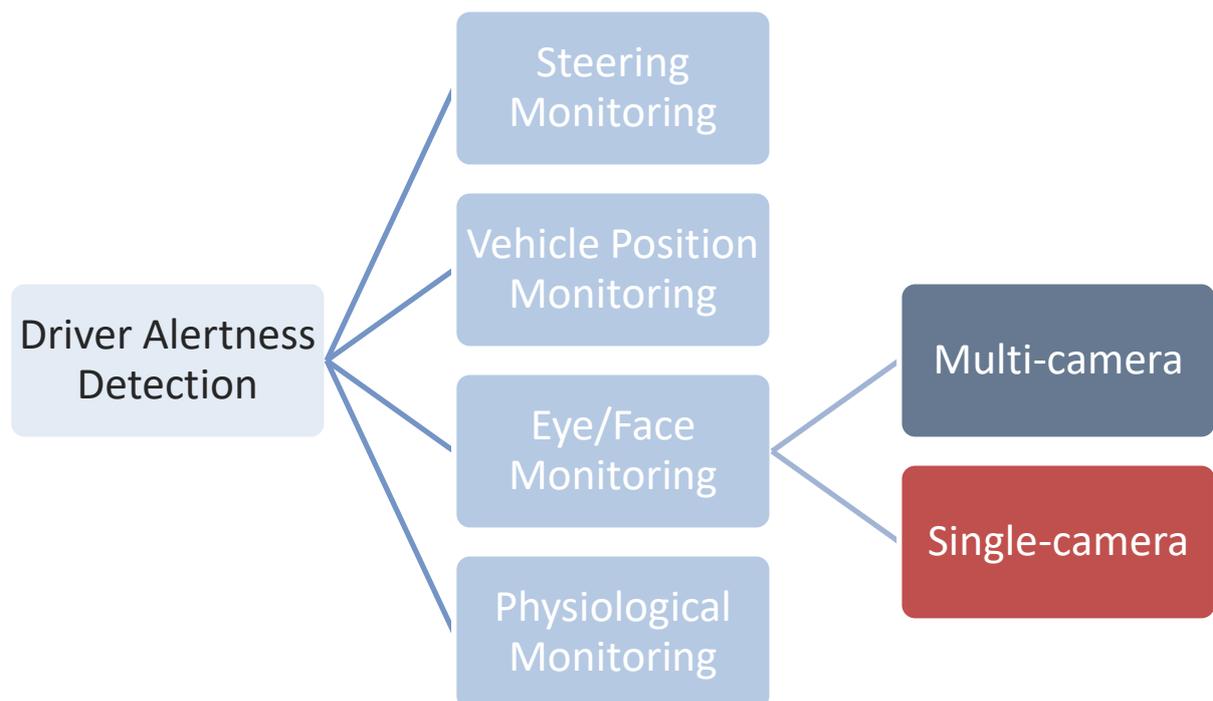
[1] https://en.wikipedia.org/wiki/Driver_drowsiness_detection

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![invention evaluator® objective idea analysis]

PatentScope Landscape

The following landscape analysis was conducted using patent applications on WIPO PatentScope as an indicator of patenting activity, and thus as a proxy for innovation in the field.

Search query keywords:

(algorithm OR software)(driving)(monitor* OR safety) yielded 755 patents.

SUMMARY

The majority of the patent applications in this area are filed in China. It is not surprising then that many of the most prolific applicants may be Chinese entities. These most prolific applicants account for only a small fraction of the total patent applications indicating a highly fractured field. Patent activity in this area increased dramatically in 2014 and may indicate an increasing innovation trend.

Patent Applications by Region

Patent Applications by Main Applicants

Patent Activity in the Last Decade
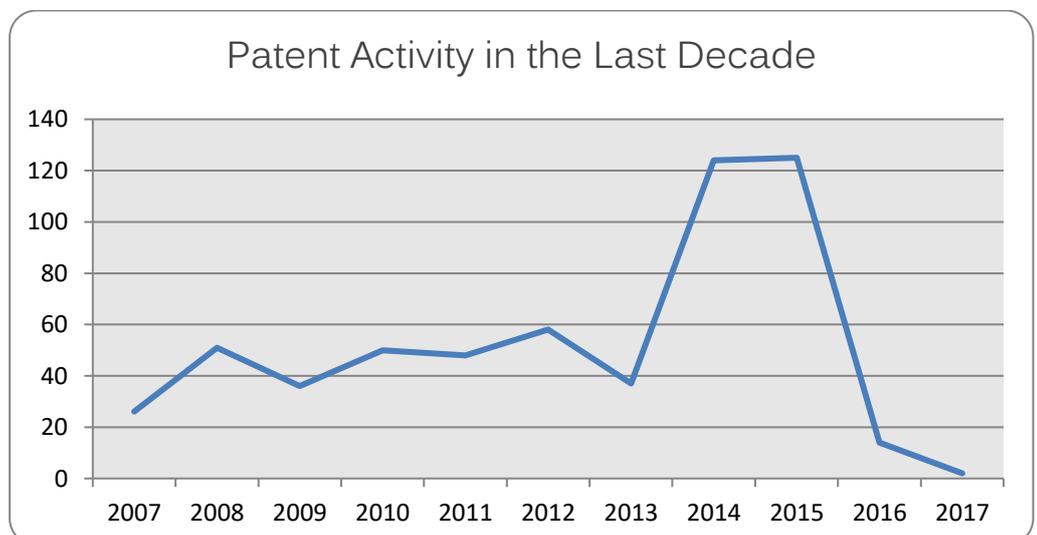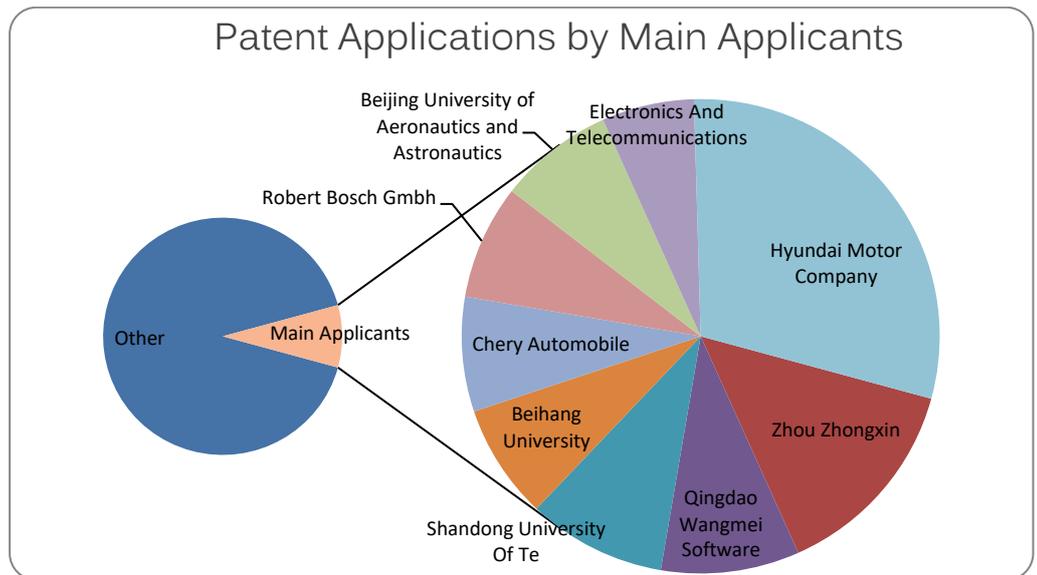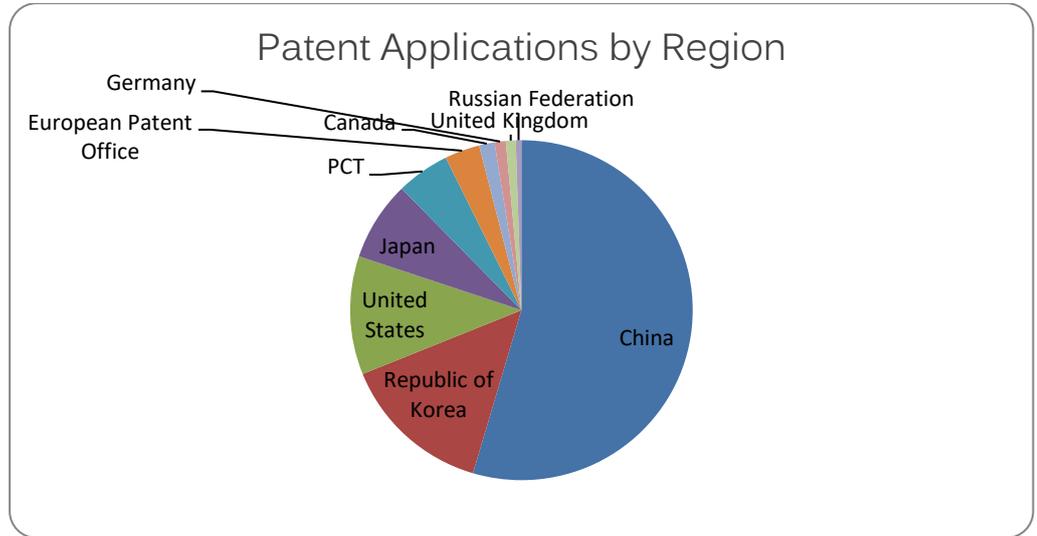
INTELLECTUAL PROPERTY ANALYSIS

- [Online Technology Overview – Google Scholar Search](#)

- [Patent Searches on Espacenet](#)

Depending on the type of patent, the jurisdictions you pursue, and other advice, your patent application will follow a different (and complex) pathway in order to be granted. However, at this stage of analysis it is important to understand whether your invention may be patentable. This will depend on whether it is **patentable subject matter**, **useful**, **inventive** and **novel**. These criteria may change over different regions. For more information on patentability, see [Appendix A](#).

SUMMARY OF ESPACENET & GOOGLE FINDINGS

Criteria	Smart Vision System
Useful: Does the invention have a practical utility?	Highly. This invention may be useful for providing an economical and effective solution to preventing traffic accidents due to drivers falling asleep at the wheel.
Inventive: Is the invention different from what would be obvious to those skilled in the art?	Limited to Moderate. Other researchers have also looked at strategies using one camera and integrating these strategies into systems for automated driving or for providing warning signals.
Novel: Is the invention different and new from what is known in the prior art?	Moderate. While other algorithms were found which may perform similar tasks, no documents were found describing the exact steps used in the invention for identifying drowsiness. See Google and Espacenet novelty searches.

Online Technology Overview – Google Scholar Search

The following online searches were conducted using Google Scholar, but sometimes we also supplement with general web searching. Images and search terms are hyperlinked for your convenience.

Our methodology for online search is to conduct searches online using keywords from our understanding of the invention through the above analysis. The aim of the search is not a conclusive novelty determination, but rather to ascertain if there is relevant literature. See Appendix B for more information on our Google Scholar Search.

SUMMARY OF GOOGLE SEARCH FINDINGS

Google Scholar searches returned a number of relevant results. Most of the relevant results have a feature or two in common with the invention. Other systems were found which incorporate the ability to detect drowsiness with a system which warns the driver or which can switch to autonomous control of the vehicle. Additionally, some other systems were found which also appear to include only one camera. The most relevant result was found in Search #4 which describes a system incorporating monitoring of both the eyes and mouth of the driver in addition to switching to an autonomous driving mode.

TAXONOMY

Level	Keywords	Broader	Narrower	Alternate
I	algorithm			software
II	video		one camera, single camera	camera
III	drowsiness			alertness, sleepy
IV	facial recognition			
V	car			automobile
VI	alarm		autonomous, self driving	warning

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SEARCH 1

64 results. Click here for search query.

	Title	Publication Date	Comment
VII	**Patent US20080158357 - Apparatus for driver analysis using rearview mirror**	July 2008	This slightly relevant document describes a system that also uses a single camera but it is mounted behind the driver and monitors the rearview mirror.
VIII	**Real-time nonintrusive monitoring and detection of eye blinking in view of accident prevention due to drowsiness**	March 2016	This document describes a system which monitors eye movement and also provides an audio signal as well as a vibration.

a. Click here for full reference.

A driver analysis system for a vehicle includes a video camera producing a video
signal mounted in or on a body of the vehicle, the video camera having a field of view that includes a rearview mirror, and the video camera being positioned such that it sees a face of a driver of the vehicle reflected by the rearview mirror when the mirror is aligned to allow the driver to see behind the vehicle, a processing unit receiving a video signal from the video camera, where the processing unit includes a video grabber/digitizer, which receives the video signal from the camera and produces a sequence of digitized images, a central processing unit, a memory, and an output control line, and a control program, that runs on the processing unit, comprising image recognition algorithms that are capable of detecting the face of the driver in the image sequence.

Inventors	Jonathan H. Connell, Vit Libal
Original Assignee	International Business Machines Corporation
Export Citation	BiBTeX, EndNote, RefMan
Patent Citations (9), Referenced by (9), Classifications (5), Legal Events (1)	
External Links: USPTO, USPTO Assignment, Espacenet	

b. Click here for full reference.

Driver fatigue is the major cause of accidents in the world. Detecting the drowsiness of the driver is the surest ways of measuring the driver fatigue. The purpose of this paper is to develop a drowsiness detection system. This system works by analyzing the eye movement of the driver and alerting the
driver by activating the buzzer when he/she is drowsy. The system so implemented is a nonintrusive real-time monitoring system for eye detection. During monitoring, the system is able to decide whether the eyes were opened or closed. When the eyes were detected closed for too long, a signal was issued to warn the driver. In addition, the system also have an option for making vibration when drowsiness was detected. The aim is on improving the safety of the driver without being obtrusive. Visual cues were obtained through eye blink rate by using a camera, which typically characterize the level of alertness of a person. These were extracted in real-time and systematically joined to check the fatigue level of the driver. The system can monitor the driver's eyes to detect short periods of sleep lasting 3 to 4 seconds. The system implemented in this approach runs at 8-15 frames per second. The application was implemented using Open CV in Raspberry Pi environment with a single camera view. This system was used to detect the drowsiness of the driver and thereby reducing the road accidents.

SEARCH 2

Google Scholar search query: (algorithm OR software) ("one camera" OR "single camera") (drowsiness OR alertness) (alarm OR warning)

823 results. Click here for search query. A conference abstract from a presentation by the inventors in 2000 was found in this search as well as their patent document.

Title	Publication Date	Comment
a **Monitoring mouth movement for driver fatigue or distraction with one camera**	6 Oct. 2004	This document describes a system that also uses a single camera but is mostly focused on detecting mouth movements and yawning.

a. Click here for full reference.

This paper proposed to locate and track a driver's mouth movement using a dashboard-mounted CCD camera. Study on monitoring and recognizing a driver's yawning fatigue state and distraction state due to talking or conversation. Firstly determining the interest of area for mouth by detecting face using color analysis, then segmenting skin and lip pixels by fisher classifier, and detecting driver's mouth and extracting lip features by connected component analysis, tracking driver's mouth via Kalman filtering in real time. Taking the mouth region's geometric features to make up an eigenvector as the input of a BP ANN, then we acquire the BP ANN output of three different mouth states that represent normal, yawning or talking state respectively. The experiment results show that this new method can inspect the driver's mouth region accurately and quickly, and gives a warning sign when it find driver's yawning fatigue state and distraction state due to talking or conversation.

SEARCH 3

Google search query: (algorithm OR software) ("one camera" OR "single camera") (drowsiness OR alertness) (alarm OR warning)

21500 results. Click here for search query. Most of the documents found in this Google search are scholarly or patent documents which also appear in Google Scholar.

SEARCH 4

Google Scholar search query: (algorithm OR software) (video OR camera) (drowsiness OR alertness) ("facial recognition") (car OR automobile) (alarm OR warning)	
260 results. Click here for search query.	

	Title	Publication Date	Comment
a	**FEER: Non-intrusive facial expression and emotional recognition for driver's vigilance monitoring**	November 2015	This document describes a similar system with the ability to detect both yawning and closure of eyes and can also take actions which include a warning or automatic takeover of the car.

a. Click here for full reference.

Each year, drivers' loss of vigilance is chasing human lives in almost 25% of road accidents. In this paper, we present a non-intrusive approach that relies on facial expression detection. Face features, such as eyes and mouth, are extracted and quickly analyzed, using an integrated camera with an onboard processor. The closure rate and frequency of the eyes is then combined with the rate and frequency of yawning in a weighted combination to compute a decision map. Based on that decision, actions can range from a simple warning, to a severe warning, and sometimes taking control of the vehicle, such as automatic braking or deceleration. The proposed approach proved to be fast and accurate in terms of sleepiness detection with a very low rate of false positives.

SEARCH 5

Google Scholar search query: (algorithm OR software) (video OR camera) (drowsiness OR alertness) (car OR automobile) (autonomous OR "self driving")

2930 results. Click here for search query.

Title	Publication Date	Comment
a **A driver assistance framework based on driver drowsiness detection**	June 2016	In this example a system for detecting driver alertness using both facial data and steering wheel data is used to trigger switching between manual and autonomous driving.

a. Click here for full reference.

This paper proposes the development of a driver assistance framework that allows switching between manual and autonomous driving on a simulated testbed. This testbed is a driving simulator which can create realistic environments and driving experience while enabling both autonomous and manual driving capabilities. The switching between manual and autonomous driving is triggered by the driver drowsiness analysis which is performed with two inputs: driver's facial data (from a camera mounted in front of the driver) and steering wheel data (from a car controller system). In this paper, the driver status is always monitored. When he is not drowsy, he can manually drive the simulated car. Otherwise, the simulator lets the car switch to autonomous driving to run in a pre-defined trajectory. Experiments were performed on the simulated testbed to demonstrate the effectiveness of the proposed framework.

SEARCH 6

Google search query: (algorithm OR software) (video OR camera) (drowsiness OR alertness) (car OR automobile) (autonomous OR "self driving")

244000 results. Click here for search query.

Title	Publication Date	Comment
a **Seeing Machines Driver Monitoring Systems Watch the Driver**	March 2015	This article mentions an Australian company making a system using video cameras to monitor drowsiness.

a. Click here for full reference.

Seeing Machines is an Australian company that has developed a camera system and accompanying software to monitor drivers. The system watches the vehicle's operator to determine if and when that person is getting drowsy, distracted or just plain not watching the road.

This is a common problem. The Anti-Snoozer app won AT&T's Developer Summit Hackathon earlier this year. Using Intel Edison and Intel RealSense technology, the app uses facial recognition to determine if a driver is getting drowsy.

In collaboration with Intel and Jaguar Land Rover, Seeing Machines implemented one of their driver monitoring systems into a Jaguar F-type for display at the Consumer Electronics Show in Las Vegas earlier this year.

SEARCH 7

Google Scholar search query: (algorithm OR software) ("one camera" OR "single camera") (sleepy) (car OR automobile) (alarm OR warning)

1170 results. Click here for search query. Most of the documents found in this search were also found in previous searches.

Patent Searches on Espacenet

NOVELTY SEARCH

This is not a full Patentability search. The preliminary searches in [Espacenet](#) are an attempt to find relevant literature in available public databases based on our understanding of the invention through your submission and the above technology analysis. For more on the specifics of our Espacenet searches refer to [Appendix C](#).

The results below are hyperlinked so you can replicate the searches with one click, then easily modify, expand, and explore them. The tables include hyperlinks to the patent applications from these searches which may be relevant, or of interest, to the current invention.

SUMMARY OF ESPACENET SEARCHES

Espacenet searches returned a few relevant results. Some of these results mentioned the use of a camera for monitoring face and or eye movement for determining if a driver is drowsy. Some of the documents also included a system for warning or alerting the drive like in the invention. However, none of the algorithms described in these documents appear to have steps similar to that of the invention, even though they also use one camera. Many of the unrelated documents described systems for theft monitoring and determining the identity of the driver.

TAXONOMY

Level	Keywords	Broader	Narrower	Alternate
I	algorithm			software
II	video		one camera, single camera	camera
III	drows*	monitor*		alert*, sleep*
IV		eye?, face, facial		
V	car	vehicle?		automobile?

SEARCH 1

Espacenet search query: (algorithm OR software) ("one camera" OR "single camera") ("drows*" OR "alert*")

6 results. Click here for search query. The patent document by the inventors was found in this search, but other documents found are not relevant to monitoring of drivers for drowsiness or alertness.

SEARCH 2

Espacenet search query: (algorithm OR software) ("one camera" OR "single camera") ("monitor*") ("car?" OR "vehicle?" OR "automobile?")

8 results. Click here for search query. Most of the documents found in this search were also found in the previous search.

SEARCH 3

Espacenet search query: (algorithm OR software) (video OR camera) ("drows*" OR "alert*") (car OR "vehicle?" OR "automobile?")

24 results. Click here for search query.

Title	Publication Number	Publication Date	Comment
VI **METHOD AND SYSTEM FOR CHECKING DOZE AT THE VEHICLE**	KR20140107880 (A)	September 2014	This document describes a method using a camera which triggers an alert system, but the algorithm in this disclosure monitors the size of the pupil.

a. [Click here](#) for full reference.

> The present invention relates to a system for preventing drowsy driving by photographing a face of a driver driving a vehicle and operating a drowsy driving prevention alarm unit, including a camera photographing the face of the driver; a control unit outputting an image of the face photographed by the camera and executing an algorithm for determining the drowsy driving based on the image data outputted; and an alarm unit for warning the driver of the drowsy driving under to control of the control unit. The drowsy driving algorithm extracts an image of a pupil in a normal state, and calculates an area of the pupil. If the pupil image having an area smaller than a given ratio relative to that of the pupil in the normal state is extracted, the control unit operates the drowsy driving prevention alarm unit.; The drowsy driving of the driver is automatically detected in real time by use of the image data while driving, without special manipulation of the driver or attaching a specific equipment to a body of the driver, and if the drowsy driving is verified by the algorithm, an warning signal is outputted to the driver, thereby preventing a traffic accident in advance.

SEARCH 4

Espacenet search query: (algorithm OR software) (video OR camera) ("sleep*") (car OR "vehicle?" OR "automobile?")
7 results. [Click here](#) for search query.

Title	Publication Number	Publication Date	Comment
a **Method and system for detecting fatigue driving based on head and neck movement feature recognition of driver**	CN103198616 (A)	July 2013	This slightly relevant document also appears to describe a system using one camera to monitor the drive but the camera is monitoring the profile of the driver.

a. [Click here](#) for full reference.

> The invention discloses a method and a system for detecting fatigue driving based on head and neck movement feature recognition of a driver. The method comprises the following steps: (1) arranging a camera on the side face of a driving position in a car, and collecting images of the head and neck part of the driver from the side face; (2) storing a group of images collected by the camera in the step (1) through an image processing unit at intervals of time T, and abstracting contour lines of head and neck side images of the driver; and (3) forming head and neck movement features of the driver according to a plurality of groups of continuous contour lines of the head and neck side images of the driver, wherein the continuous contour lines of the head and neck side images of the driver are obtained from the step(2), comparing the head and neck movement features of the driver with the head and neck movement features when a human body is in a sleepy state, carrying out judgment, if the head and neck movement features of the driver conform to sleepy state requirements, considering the driver to be fatigue driving and sending an alarm prompt, or else, repeating the step (2),; and keeping operation continuously and circularly. The method and the system for detecting fatigue driving based on head and neck movement feature recognition of the driver have the advantages that detecting recognition accuracy is high, the requirements for an image processing algorithm and corresponding hardware are low, and implementation is easy.

SEARCH 5

Espacenet search query: (algorithm OR software) (video OR camera) ("monitor*") (face OR facial) (car OR "vehicle?" OR "automobile?")

12 results. Click here for search query.

Title	Publication Number	Publication Date	Comment
a **Driving state monitoring system and method for automobile driver**	CN105354986 (A)	February 2016	This document describes a system using a camera to analyze the face of a driver including the eyes and mouth but application to drowsiness detection is not mentioned.

a. Click here for full reference.

The invention provides a driving state monitoring system and method for an automobile driver. The method comprises the following steps that the face is detected, whether the driver is placed in a detectable range at present is detected and if the face cannot be detected, the driver is prompted to adjust the position of a device till the device can detect the face; once the face is detected, a loudspeaker plays a prompt that the system starts working; image information is obtained continuously, face and mouth detection are carried out, a mouth tracking module is initialized, an eye contour positioning algorithm is called to carry out positioning, and the distance between the upper eyelid and the lower eyelid of the driver is analyzed till the analysis frame number exceeds certain number; the threshold of a blinking determination algorithm is initialized according to the distance between the upper and lower eyelids of the driver; and image information is continuously obtained from a camera, images are analyzed, and the driving state of the driver is analyzed comprehensively. According to the system and method, the driving state of the common drivers can be monitored by a machine vision technology, and behaviors of the drivers are prompted and standardized.

SEARCH 6

Espacenet search query: (algorithm OR software) (video OR camera) ("monitor*") ("eye?") (car OR "vehicle?" OR "automobile?")

6 results. Click here for search query. Most of the documents found in this search were also found in previous searches.

Other Intellectual Property Rights

Listed below are other ways you may be able to protect your intellectual property. We recommend you seek an attorney or intellectual property rights specialist to further address the IP protection of 'Smart Vision System'. See Appendix D for more information.

TYPE	COMMENTS
Copyright	The software code used to implement the algorithm could be protected by copyright
Trademark	The name of the software could be protected by trademark

For a more comprehensive list of types of intellectual property, refer to Wikipedia's "List of intellectual property-related topics".
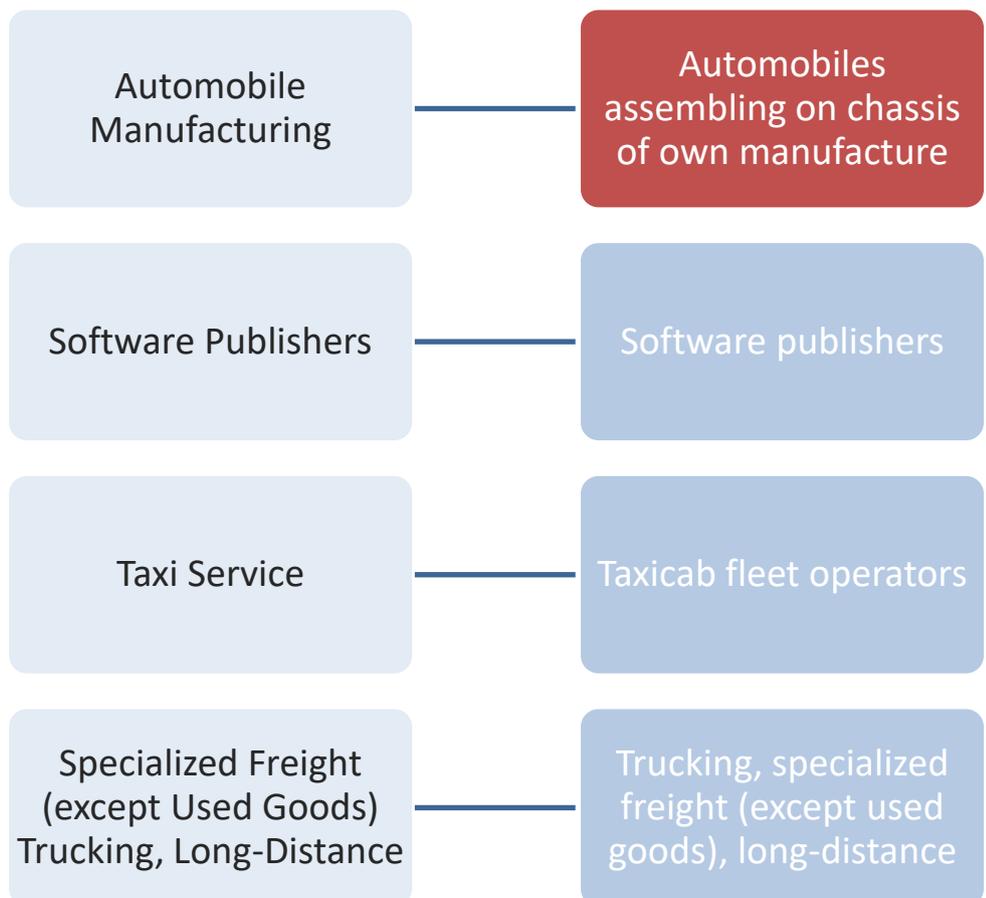
SUMMARY OF MARKET ANALYSIS

This invention may take advantage of the growing market around drowsiness monitors which are expected to become a billion dollar industry by 2020 with Europe representing both the largest and fastest growing market for this technology. Looking more broadly at advanced driver assistance systems, the market is expected to skyrocket over the next four years with a CAGR predicted by some to be as high as 28% although more modest estimates place it at a still healthy 10%. Overall concern for driver safety is expected to drive this market. Although drowsiness detection is not currently a large segment of this market, the invention may have an advantage in its ability to address the concerns over system complexity and high initial investment which are restraining this market. Additionally, the current surge in demand for mid-priced vehicles are also driving manufacturers to look for lower price options for the de… [more](#)

MARKET ANALYSIS

OPPORTUNITY ASSESSMENT

The following shows potential commercial applications of the invention, **assuming it were successfully commercialised**.

Automobile Manufacturing	Automobiles assembling on chassis of own manufacture
Software Publishers	Software publishers
Taxi Service	Taxicab fleet operators
Specialized Freight (except Used Goods) Trucking, Long-Distance	Trucking, specialized freight (except used goods), long-distance

Different products and services can have different purchasers and users depending on where they exist in the value chain. The following table is an assessment of the industry for the primary opportunity.

| Sector	NAICS 31-33 Manufacturing
Sub-sector	NAICS 336 Transportation equipment manufacturing
Industry Group	NAICS 3361 Motor Vehicle Manufacturing
Industry	NAICS 33611 Automobile & light duty motor vehicle manufacturing
National Specific Industry	**NAICS 336111 Automobile Manufacturing** This U.S. industry comprises establishments primarily engaged in (1) manufacturing complete automobiles (i.e., body and chassis or unibody) or (2) manufacturing automobile chassis only.
Industry Segment	Automobiles assembling on chassis of own manufacture
Products and/or Services	A system for monitoring a driver and performing an action (alerting or stopping the car) if drowsiness is detected
Market Need	There is a need for systems capable of preventing accidents caused by sleepy drivers
Purchaser	Automobile manufacturers, vehicle monitoring system manufacturers
Consumer	Long haul trucking companies, vehicle fleet managers, car owning consumers
Distribution Channels	Licensing, business to business, online, retail
Estimated Unit Price	$50 - $500
Estimated Frequency of Purchase by End Consumer	Every 5 - 10 years depending on durability of equipment or rate of obsolescence
Comments	This invention may be incorporated directly into an automobile system as an on-board feature. Current NAICS codes do not include a category for facial recognition software or vehicle monitoring equipment so automobile manufacturing was chosen as the closest primary opportunity.

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INDUSTRY TRENDS FOR AUTOMOBILE MANUFACTURING

Number US Employees (thousands)

Number of US Establishments

US Total Value of Shipments ($millions)

US Operating Profits ($millions)
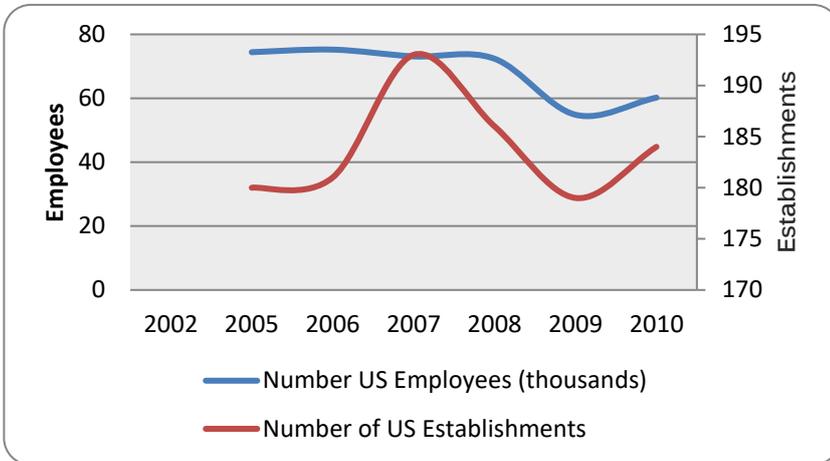
Despite an obvious downturn around 2008, the automobile manufacturing industry in the US appears to have quickly started their recovery as of 2009 with all four metrics shown here indicating increasing trends heading into 2011. This industry is dominated by the largest manufacturers which see about 100 times the value of shipments than the next smallest sized companies. This is an indication of economies of scale in this industry.


Bubble size is Value of shipments in US$ thousands in 2007

- 5-9
- 10-19
- 20-99
- 500+
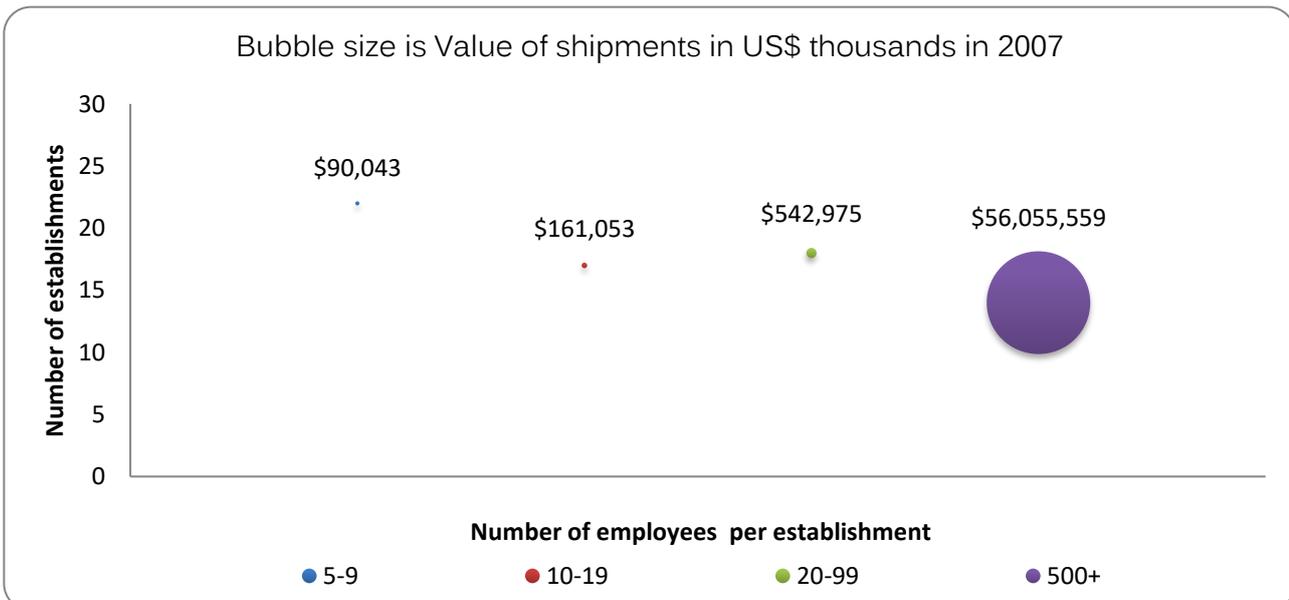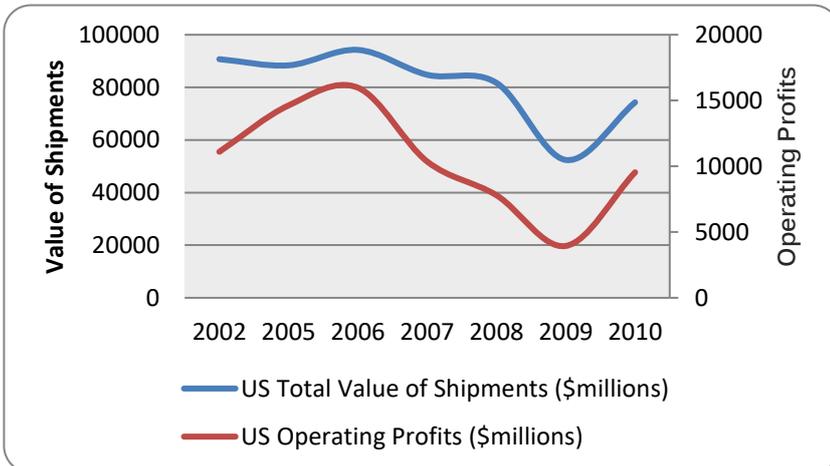
Sources: US Census Bureau 2002, 2007 Economic Census, 2009 County Business patterns. Some data may be estimated. See www.census.gov

NEW INVESTMENTS

Around the year 2000 there was a surge in investment activity in the software industry associated with the dot-com bubble. Since that time, investment has been steady and growing. Venture investment has recently been focused on mobile and social commerce, conscious capitalism, collaborative consumption and the resurgence of enterprise-focused technologies. Largely due to Silicon Valley, California attracts around 48% of all the venture investment in software. The top three venture capital trends for 2012 are predicted to be software-as-a-service, "big data" and social mobile technology.

US Venture Capital Investment & Average Investment Deal

Total US Venture Capital Investment per Quarter in Software

Average Investment per Deal in Software
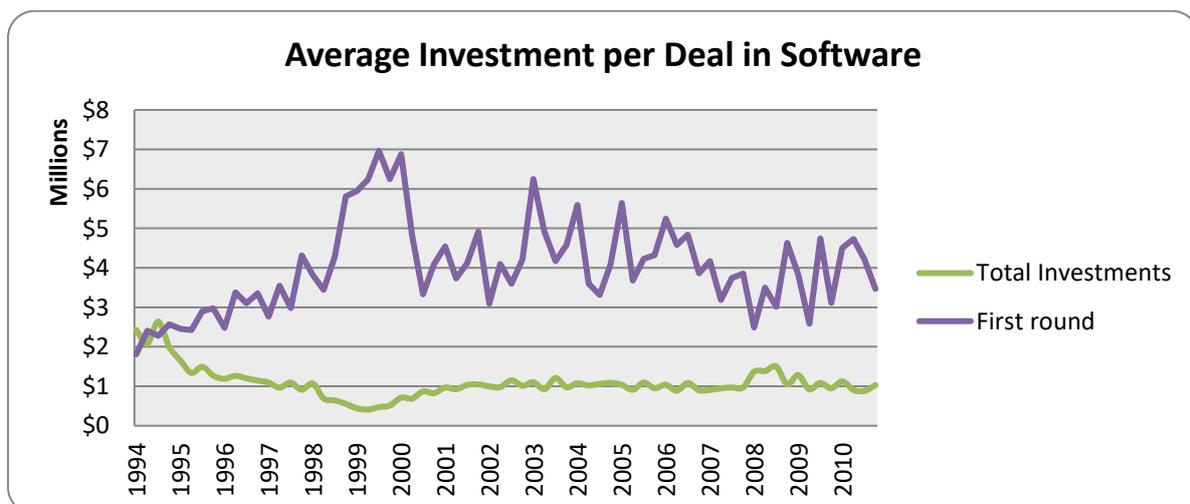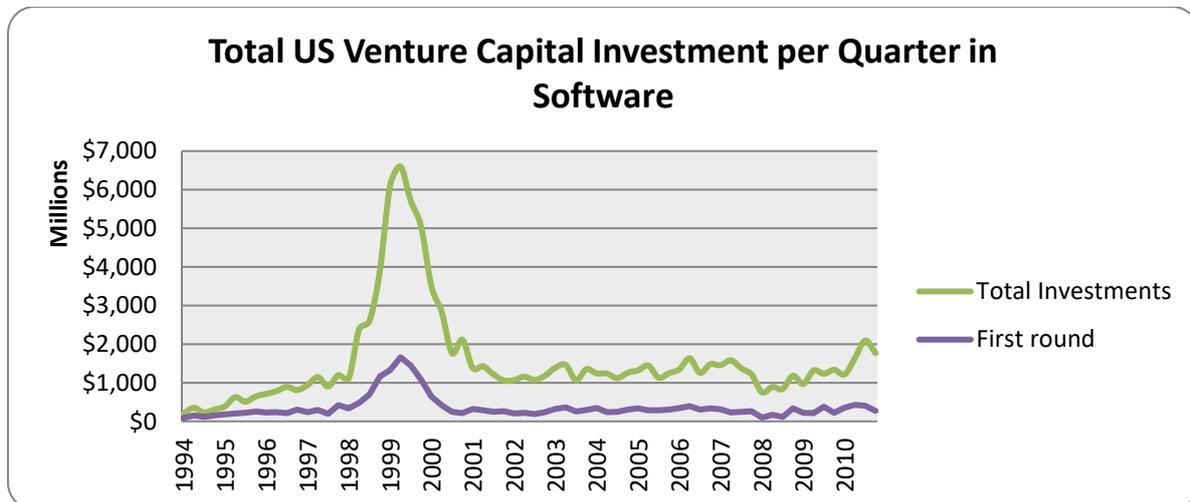
Source data: National Venture Capital Association www.nvca.org

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INDUSTRY REPORTS

Industry reports covering drowsiness monitors specifically as well as advanced driver assistance systems are included in this section. Since the algorithm is based on recognition and monitoring of facial features, a report covering the facial recognition software market is also included.

Drowsiness Monitors Market Trends Global Industry Analysts January 2015. [Click here](#).
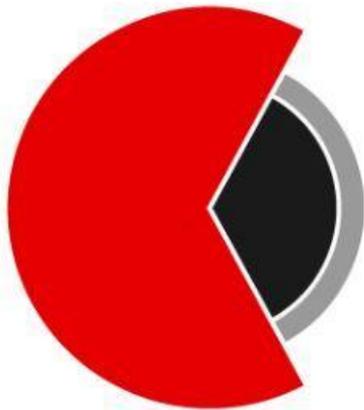
Advanced Driver Assistance System (ADAS) Market by Type, Sensor Technology, Region - 2021 MarketsandMarkets May 2014. Click here.

The advanced driver assistance system (ADAS) market is projected to grow at a CAGR of 10.44% during the forecast period, to reach USD 42.40 Billion by 2021. Growing concerns pertaining to vehicle, driver, passenger, and pedestrian safety have fueled the growth of the global ADAS market.

The global market for adaptive cruise control is estimated to grow at the highest CAGR from 2016 to 2021, owing to the proven benefits of the system in terms of vehicle safety. The National Transport Safety Board, U.S. included adaptive cruise control in its list of ten most-wanted safety improvements in 2013. The European parliament is also planning to make adaptive cruise control a mandate in the next few years. These regulations are estimated to drive the growth of the adaptive cruise control market during the forecast period.

The radar sensor segment is estimated to lead the ADAS market, by sensor technology, from 2016 to 2021. The high demand for radar sensors can be attributed to the advantages offered by these sensors in various vehicle applications. Radar sensors are used in adaptive cruise control, emergency braking, and collision avoidance systems, among others. The market for these technologies is set to witness considerable growth, and regulatory bodies in Europe and North America are planning to mandate some of the technologies. This will likely drive the demand for radar sensors.

North America is estimated to be the largest market for ADAS during the forecast period. This is mainly credited to the presence of the U.S., which is the second-largest vehicle manufacturer in the world. Furthermore, the technology adoption rate in the region is relatively high. North America has some of the most stringent vehicle safety regulations in the world; these are expected boost the market for ADAS technologies.

Projected Market Size of Major Countries by 2021 (USD Billion)
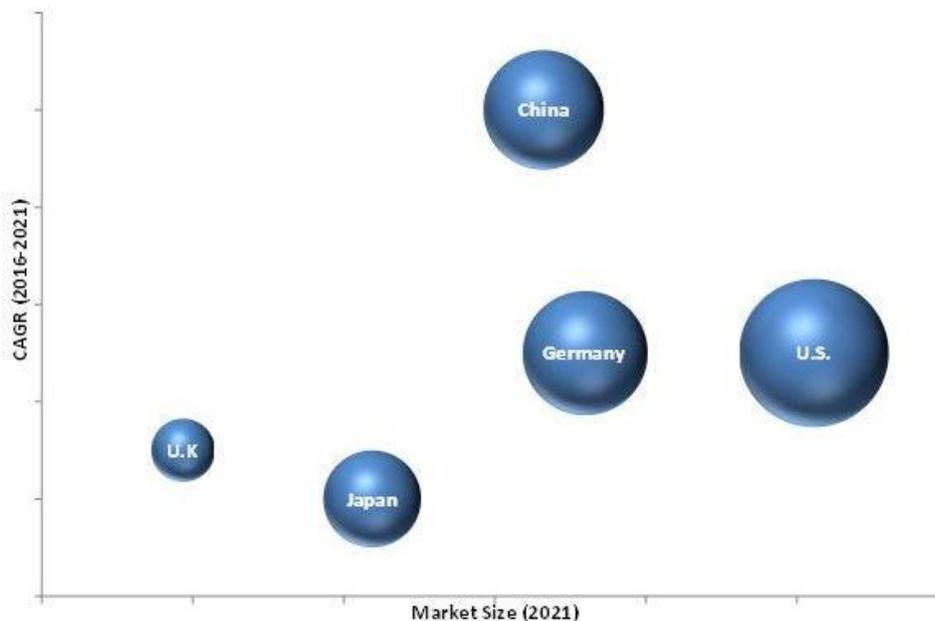
Key factors restraining the growth of the ADAS market include the high cost of these systems and their complex nature. The systems incorporate several electronic components that bring about architectural changes in the vehicle, which eventually increases the complexity and cost of the system.

Global Advanced Driver Assistance Systems Market | Trends I Forecasts I Analysis I Night Vision Market I Blind Spot Detection Market I Electronic Horizon Market I Parking Assistance Control Market I Traffic Sign Recognition Market I Automatic Energy Brake Support Market I Collision Warning Market I Adaptive Cruise Control Market I Traction Control Mordor Intelligence January 2017. [Click here](#).

TOP TRENDING AREAS

- Object Detection and Differentiation
- 360 degree View
- Intelligent Speed Assistance
- Crosswind Stabilization
- Gesture Detection Cameras

The global advanced driver assistance systems market was valued at USD 22.69 billion in 2015 and is projected to reach USD 78.19 billion by 2020, at a CAGR of over 28% during the forecast period from 2017 to 2022. The demand for fuel-efficient vehicles along with an accelerating need for road safety systems will help to boost the global demand for ADAS significantly.

Over the last few years, growing concern about automotive safety among consumers has resulted in high demand for advanced safety features, especially for inexpensive and mid-price segment vehicles. The dynamics of the global automotive industry are also changing rapidly. Automobile manufacturers expect that the demand for mid-price segment cars is expected to increase by 20% by 2020. These vehicles are equipped with basic components that have been designed and manufactured as per consumer preferences. ADAS manufacturers such as Autoliv and Continental are collaborating with OEMs to develop and manufacture low-cost driver assistance systems. This will help manufacturers to attain economies of scale and reduce the price of ADAS, and thereby, increase implementation of ADAS in low-cost cars in the coming years. A consistent increase in the demand for compact and mid-size automobiles equipped with the advanced safety features is also expected to propel the growth of this market.

Advanced Driver Assistance Systems (ADAS) Market - Global Industry Analysis, Size and Forecast, 2014 to 2020 Future Market Insights March 2017. [Click here](#).

The global advanced driver assistance systems market is increasing rapidly due to various factors such as stringent government norms related to safety and consumer preferences shifting to new technology advancement and active safety features. The global advanced driver assistance systems market is expected to register 16% to 18% CAGR for the forecast period. The global advanced driver assistance systems market is geographically segmented into seven key regions which are North America, South America, Eastern Europe, Western Europe, Asia Pacific, Japan and Middle East & Africa. As of 2013, North America registered the largest share in global advanced driver assistance systems market followed by Europe and Asia Pacific region respectively. In terms of growth rate Asia Pacific segment is projected to register highest growth in global advanced driver assistance systems market with double digit CAGR, closely followed by Japan and South Korea. The growth in Asia Pacific segment of the global advanced driver assistance systems market is fueled by increasing penetration rate of active safety systems especially in region like China and India due to supporting macroeconomic factors such as rising income and purchasing power, changing lifestyle to due growing urbanization and increasing awareness about active safety systems. Additionally, countries like Japan and South Korea is also forecast to register significant growth of demand inadvanced driver assistance systems and is expected to account for double digit growth in terms of revenue in the global advanced driver assistance systems market due to stringent government legislations and safety norms.

The global advanced driver assistance systems market is further segmented into channel which include original equipment manufacturers (OEMs) and aftermarket. OEMs accounts majority of share in terms of revenue in the global advanced driver assistance systems market, and is forecast to maintain its dominance for the forecast period in global advanced driver assistance systems market. On the basis of vehicle type the global advanced driver assistance systems market is further segmented into passenger vehicle and commercial vehicle sub-segments. As of 2013, the passenger vehicle segment dominates the overall global advanced driver assistance system, and it

Facial Recognition Market by Component & Technology - 2021 MarketsandMarkets November 2016. Click here.

The facial recognition market size is estimated to grow from USD 3.35 Billion in 2016 to USD 6.84 Billion by 2021, at a CAGR (Compound Annual Growth Rate) of 15.3% from 2016 to 2021. The main driving factors for the growth of the market include growing surveillance market and increasing applications in numerous industry sectors. These factors are boosting the adoption of market.

The facial recognition market is segmented by component, technology, use cases application area, enterprise, and geographical region. Among the software tools, the 3D facial recognition technology is the fastest growing market. The reason for the wide adoption of this technology is the quality of image captured. Among facial recognition services, the cloud-based facial recognition services are the fastest growing market, due to rapid adoption of cloud technologies.

In the technology segment, the analytics solution is expected to be the largest contributor during the forecast period. As video analytics is gaining traction across industries, there has been an increase in demand for analytic solutions. Among the use case segment, the law enforcement, surveillance, and monitoring market is expected to hold the largest market share, as there is increase in demand for software due to increasing data breaches and unauthorized access.

Among the application area segment, the government segment holds the largest market share, the reason being increasing investments by government organizations in the facial recognition market. The opportunity to extract intelligence from real-time videos via surveillance cameras is driving the facial recognition analytics market.

Asia-Pacific (APAC) is expected to be the fastest growing region during the forecast period; therefore, the facial recognition market in APAC is expected to grow significantly due to huge governmental investments in security and surveillance infrastructure. Moreover, the growth is anticipated with technological advancements along with the mandatory regulations imposed by government regulatory entities to adopt the best-in-class technologies and standards.
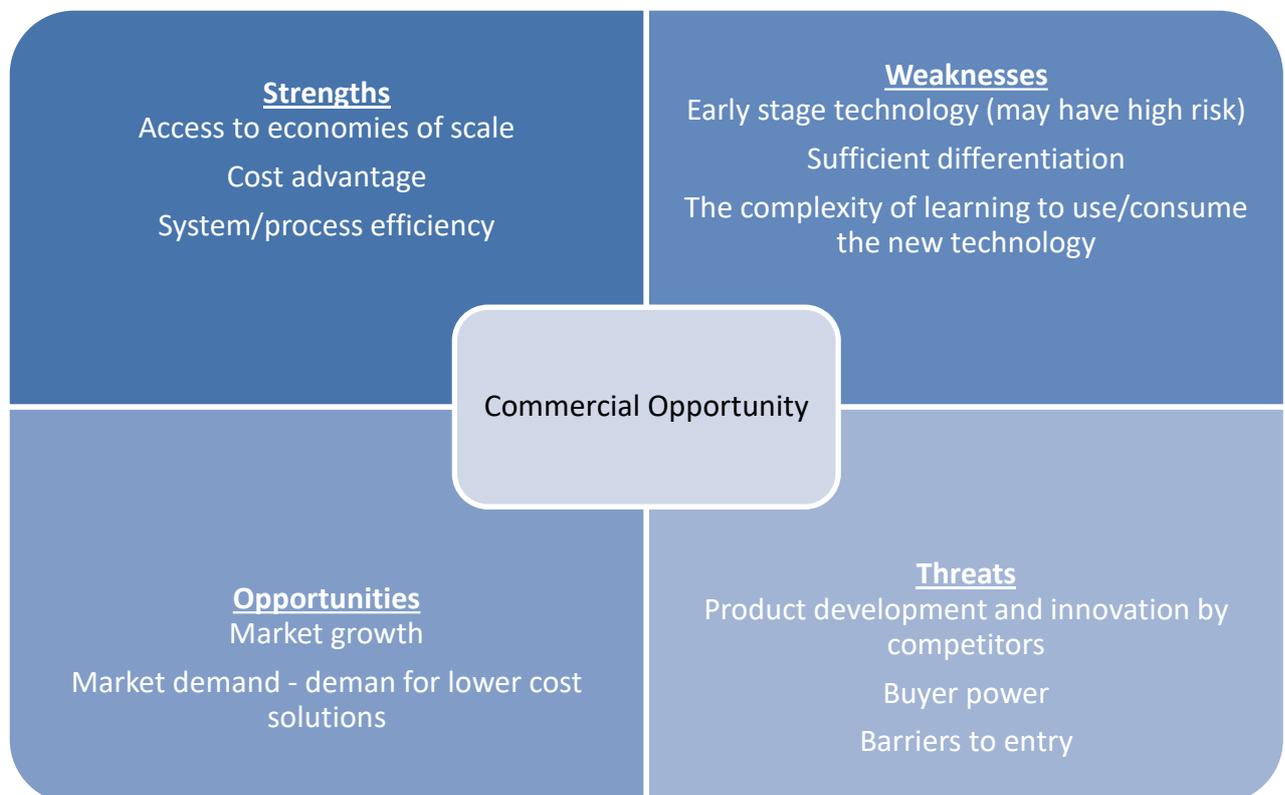
COMPETITIVE LANDSCAPE

There appears to be a moderately competitive landscape around products for preventing sleeping at the wheel. The most direct competitors are other types of cameras mounted on dashboards, but these seem to exclusively use IR light and detection unlike the invention. Other indirect competitors which include other methods of sensing drowsiness are also currently on the market. This competitive landscape focuses mostly on OEM competitors that can be purchased directly by the consumer but car manufacturers working to implement their own anti-sleeping technologies may also be competitors.

Company	Website	Methods and examples of products	Comment
Optalert	http://www.optalert.com/portable-drowsiness-detection	Eagle Portable	System consists of smartphone sized touch screen and wireless glasses worn by the user. Device is portable and can be easily transferred between vehicles or other use cases.
Care Drive	http://www.care-drive.com/product/driver-fatigue-monitor-mr688/standard/	Driver Fatigue Warning System MR688 Civil Standard Version	Camera device which sits on dashboard and powered by plugging into cigarette lighter. Detects when gaze moves to a side window or when drowsiness occurs. Two sensitivity settings are available.
StopSleep	http://www.stopsleep.com.au/how-driver-fatigue-detection-system-stopsleep-works/	Driver Fatigue Detection System	A device worn on a finger like a ring. Includes sensors measuring skin conductivity which falls as an indication of pending sleepiness. The device vibrates and produces an auditory alarm to alert the driver.
Seeing Machines	https://www.seeingmachines.com/industry-applications/mining/	Driver Safety System	An in-cab solution for heavy equipment operators in the mining sector. Developed in cooperation with Caterpillar brand. Event data from system is transmitted to a monitoring facility.
Exeros	http://www.exeros-technologies.com/products/driver-fatigue-management	Sleep Watcher XR	This system is based on an algorithm for detecting signs of sleepiness in the eyelids and retina from images obtained using an IR camera.
Rear View Safety	https://www.rearviewsafety.com/safety-solutions/driver-fatigue-systems/vuemate-driver-fatigue-system-rvs-330.html	RVS-330 | Vuemate Driver Fatigue System	A dash mounted camera using IR LEDs and CMOS detection. When sleepiness is detected there is both a visual and aural alarm.

SWOT ANALYSIS

The SWOT analysis for the potential to commercialise the invention within the market identified above. **This analysis assumes that the technical hurdles can be met, and that an IP strategy devised to protect rights are effective.**

Strengths Access to economies of scale Cost advantage System/process efficiency	**Weaknesses** Early stage technology (may have high risk) Sufficient differentiation The complexity of learning to use/consume the new technology
Opportunities Market growth Market demand - deman for lower cost solutions	**Threats** Product development and innovation by competitors Buyer power Barriers to entry

Commercial Opportunity

SUMMARY OF MARKET ANALYSIS

This invention may take advantage of the growing market around drowsiness monitors which are expected to become a billion dollar industry by 2020 with Europe representing both the largest and fastest growing market for this technology. Looking more broadly at advanced driver assistance systems, the market is expected to skyrocket over the next four years with a CAGR predicted by some to be as high as 28% although more modest estimates place it at a still healthy 10%. Overall concern for driver safety is expected to drive this market. Although drowsiness detection is not currently a large segment of this market, the invention may have an advantage in its ability to address the concerns over system complexity and high initial investment which are restraining this market. Additionally, the current surge in demand for mid-priced vehicles are also driving manufacturers to look for lower price options for the desired driver assistance features. As opposed to drowsiness monitors specifically, North America is the largest market for advanced driver assistance technologies. Reports indicate that this market is dominated by OEMs and indeed many competitors were found which would fall under this category. However, these competitors do not use the same technology as the invention which may still be differentiated based on a cost advantage or sensitivity advantage.

POTENTIAL PARTNERS

Once you have secured your IP, you may choose a licensing or joint venture pathway. We have a listed some organisations below that may be of interest for establishing a partner relationship.

Ford Motor Company - Corporate Headquarters - US
http://corporate.ford.com/
Raj Nair - VP - Global Product Development
One American Road
Dearborn, MI, 48126
United States
Phone: +1 313-322-3000
Fax: +1 302-655-5049
Description: Ford Motor Company (Ford) is a producer of cars and trucks. The Company and its subsidiaries also engage in other businesses, including financing vehicles. The Company operates in two sectors: Automotive and Financial Services. Its Automotive Sector includes Ford North America, Ford South America, Ford Europe and Ford Asia Pacific Africa. Financial Services includes Ford Motor Credit Company and Other Financial Services. Ford North America includes the sale of Ford- and Lincoln-brand vehicles and related service parts in North America (the United States, Canada and Mexico), together with the associated costs to develop, manufacture, distribute and service these vehicles and parts. Ford Motor Credit Company includes vehicle-related financing, leasing, and insurance. Other Financial Services Includes a variety of businesses including holding companies and real estate. On January 15, 2011, the Company completed the acquisition of Cologne Precision Forge GmbH (CPF).

Ford New Ideas/Consumer Innovation Office
http://corporate.ford.com/innovation/innovation-detail/ford-new-ideas
Description: In order to review the thousands of ideas we receive each year, we have a strict process for reviewing your ideas. Our process reflects a balance of your interests and rights and those of Ford Motor Company. In return for your acceptance of the Idea Submission Terms & Conditions, Ford Motor Company offers a non-confidential, preliminary evaluation of your submitted materials.

Toyota Motor Corporation (ADR)
http://www.toyota-global.com/
1, Toyota-cho
TOYOTA-SHI, ACH, 471-8571
Japan
Phone: +81-565-282121
Fax: +81-565-235800
Description: TOYOTA MOTOR CORPORATION is a Japan-based company mainly engaged in the automobile business and financial business. The Company operates through three business segments. The Automobile segment is engaged in the design, manufacture and sale of car products,

including sedans, minivans, 2BOX cars, sport-utility vehicles and trucks, as well as the related parts and accessories. The Finance segment is involved in the provision of financial services related to the sale of the Company's products, as well as the leasing of vehicles and equipment. The Others segment is involved in the design, manufacture and sale of housings, as well as the information and communication business. As of March 31, 2012, the Company had 507 subsidiaries and 212 associated companies.

Honda Motor Co Ltd (ADR)
http://world.honda.com/
2-1-1, Minami-Aoyama, Minato-ku
Tokyo, TKY, 107-8556
Japan
Phone: +81-3-34231111
Description: Honda Motor Co., Ltd. (Honda) develops, produces and manufactures a variety of motor products, ranging from small general-purpose engines and scooters to specialty sports cars. The Company's business segments are the motorcycle business, automobile business, financial services business, and power product and other businesses. Honda conducts its operations in Japan and worldwide, including North America, Europe and Asia. On March 22, 2011, the Company completed the selling of all its stake in Hero Honda Motors Limited to Bahadur Chand Investments Pvt.Ltd. and Hero Investments Pvt. Ltd. In August 2012, the Company acquired Usha International Ltd.

Honda Research & Development
http://world.honda.com/RandD/system/
Description: The Honda R&D story began in 1960 with the separation of the research and development division from Honda Motor Co. With the goal of bringing the Honda magic to ever greater numbers of satisfied customers, Honda R&D was born as an independent entity. Our corporate culture is imbued with respect for the individual, emphasizing a research and development system that enables the talents of each engineer to flourish in the pursuit of our ultimate objective: bringing originality and innovation to the technologies and products that we develop.

FaceFirst
http://www.facefirst.com/
31416 Agoura Road, #250
Westlake Village, CA, 91361
Phone: (805) 482-8428
Description: FaceFirst® services several different markets including Retail, Law Enforcement, Airports & Transportation, Commercial Security and Gaming. The FaceFirst® infinitely scalable face recognition platform, was built with the ambition of achieving global scalability. For every security or customer-identification goal, FaceFirst® gives you accurate alerts in seconds. FaceFirst® is military-grade facial identification that communicates instantly with a vast central database, configured according to your requirements.

Orbotech Ltd.
http://www.orbotech.com/
Hananel Kvatinsky-Director of Intellectual Property
hkvatinsky@yahoo.com
Shderot Hasanhedrin
Yavne, 8110101
Israel
Phone: +972 (8) 942-3533
Phone: +972 (8) 942 3148
Fax: +972 (8) 943-8769
Description: The world of high-tech is a demanding one. The speed of change is rapid - the uncertainty substantial. Its players face relentless pressure in delivering innovative technological solutions, while ensuring the highest quality and providing the fastest turnaround at the most competitive price. Against this backdrop – Orbotech excels and is the sure choice for those aspiring to minimize risk and achieve stability, while moving forward. Orbotech's proven track record and our passion for technology enable manufacturers to meet their most demanding goals – time after time. What We Do For over 30 years, Orbotech designs, develops, manufactures, markets and services automated optical inspection (AOI) systems for bare PCBs, FPDs, and imaging solutions for PCB production. Our innovative AOI, imaging and computer-aided manufacturing (CAM and Engineering) technologies enable electronic manufacturers to achieve the increased yields and throughput essential for retaining their leading positions at the forefront of electronics production. Our subsidiary, Orbograph Ltd., develops and markets automatic check reading software to banks and other financial institutions.

Google Inc.
www.google.com
David C. Drummond - SVP - Corporate Development & Chief Legal Officer
david.drummond@google.com
1600 Amphitheatre Parkway
MOUNTAIN VIEW, CA, 94043
United States
Phone: +1 650-253-0000
Fax: +1 650-253-0001
Description: Google Inc. (Google) is a global technology company focused on improving the ways people connect with information. The Company generates revenue primarily by delivering online advertising. As of December 31, 2011, the Company's business was focused on areas, such as search, advertising, operating systems and platforms, and enterprise. Businesses use its AdWords program to promote their products and services with targeted advertising. In addition, the third parties that comprise the Google Network use its AdSense program to deliver relevant advertisements that generate revenue. In June 2011, the Company launched Google+, a way to share online. As of January 2012, over 90 million people had joined Google+. In April 2011, the Company acquired PushLife. In September 2011, the Company acquired Zagat. In May 2012, Google acquired Motorola Mobility Holdings, Inc.(MMI).

Google Developers Platform
https://developers.google.com/
Description: GDL is a place for developers around the world to connect face to face with Google employees, peers, and other industry luminaries.

Delta Air Lines, Inc.
www.delta.com
Holden Shannon - SVP - Corporate Strategy & Real Estate
holden.shannon@delta.com
1030 Delta Boulevard
Atlanta, GA, 30320-6001
United States
Phone: +1 404-715-2600
Phone: +1 302-636-5454
Fax: +1 404-773-0182
Description: Delta Air Lines, Inc. (Delta) provides scheduled air transportation for passengers and cargo throughout the United States and around the world. The Company's route network gives it a presence in every domestic and international market. Delta's route network is centered around the hub system it operates at airports in Amsterdam, Atlanta, Cincinnati, Detroit, Memphis, Minneapolis-St. Paul, New York-JFK, Paris-Charles de Gaulle, Salt Lake City and Tokyo-Narita. Each of these hub operations includes flights that gather and distribute traffic from markets in the geographic region surrounding the hub to domestic and international cities and to other hubs. The Company's network is supported by a fleet of aircraft that is varied in terms of size and capabilities.

Partnership Program
https://public.conxport.com/home.aspx
Description: Thank you for your interest in submitting a partnership proposal to Delta Air Lines. Delta continually strives to be a respected community partner in the neighborhoods where we do business and live. Through the Delta Air Lines Sponsorship & Promotional Marketing areas, Delta seeks partnership opportunities that will increase brand awareness and loyalty, generate revenue, communicate customer benefits and new Delta products/services, and support positive community involvement.

Omnitracs
http://www.omnitracs.com/company
717 N. Harwood Street
Suite 1300
Dallas, TX, 75201
United States
Phone: +1 (800) 348-7227
Description: Omnitracs LLC is the global pioneer of innovative software and SaaS fleet management solutions serving the transportation sector. Leveraging unmatched industry knowledge and resources, we help companies of all sizes improve the productivity, reliability, routing, safety, and compliance of their transportation assets. Today, Omnitracs continues to grow its comprehensive portfolio of proven applications and services to provide customers a competitive advantage through lowered costs, increased driver satisfaction, streamlined processes, improved customer service, and the unparalleled power of big data.

Volkswagen AG
www.volkswagenag.com
Martin Hofmann - Chief Information Officer
MHofmann@volkswagenag.com
Berliner Ring 2
Wolfsburg, 38440
Germany
Phone: +49-5361-90
Fax: +49-5361-928282

Description: Volkswagen AG is a Germany-based automobile manufacturer. The Company consists of four business segments namely: the Passenger Cars and Light Commercial Vehicles segment, engaged in the development of vehicles and engines, the production and sale of passenger cars and light commercial vehicles, and the genuine parts business; the Trucks and Buses segment, engaged in the development, production and sale of trucks and buses from the Scania and MAN brands, the corresponding genuine parts business and related services; the Power Engineering segment, that combines the large-bore diesel engines, turbo machinery, special gear units, propulsion components and testing systems businesses, and the Financial Services segment, that comprises dealer and customer financing, leasing, banking and insurance activities, as well as fleet management.

INDUSTRY INFORMATION

Associations/Advocacy

Association for Unmanned Vehicle Systems International
http://www.auvsi.org/
2700 S Quincy St, Ste. 400
Arlington, VA
Description: The Association for Unmanned Vehicle Systems International is the world's largest non-profit organization devoted exclusively to advancing the unmanned systems and robotics community. Serving more than 7,500 members from government organizations, industry and academia, AUVSI is committed to fostering, developing, and promoting unmanned systems and robotic technologies. AUVSI members support defense, civil and commercial sectors.

Automotive Aftermarket Industry Association
www.aftermarket.org
aaia@aftermarket.org
7101 Wisconsin Ave., Suite 1300
Bethesda, MD, 20814
United States
Phone: 301-654-6664
Description: Motor Vehicle Aftermarket Overview   The motor vehicle aftermarket is a significant sector of the U.S. economy employing nearly 4.1 million people in 2012. This industry encompasses all products and services purchased for light, medium and heavy duty vehicles after the original sale including replacement parts, accessories, lubricants, appearance products, tires, collision repairs as well as the tools and equipment necessary to make the repair. Overall aftermarket sales totaled $307.7 billion in 2012, representing a 3.5% increase over the previous year. Sales in the automotive aftermarket (cars and light trucks) totaled $231.2 billion while sales in the medium and heavy duty vehicle aftermarket totaled $76.5 billion.

Digital Imaging Association
http://www.digitalimagingassoc.ca/
Boulevard Club
Lakeshore Blvd. West in Toronto,
Toronto
Canada
Description: The DIA's mission is to keep member companies up to date with the latest information in our fast changing industry, and provide a forum for information dissemination to help each member grow their business in a planned and profitable manner.

NAFA Fleet Management Association
http://www.nafa.org/
Description: NAFA is the world's premier not-for-profit association for professionals who manage fleets of sedans, public safety vehicles, trucks, and buses of all types and sizes, and a wide range of

military and off-road equipment for organizations across the globe. NAFA is the association for the diverse vehicle fleet management profession regardless of organizational type, geographic location, or fleet composition.

Consultants

CogNova Technologies
http://cognovatech.com/
cognovat@cognovatech.com
Annapolis Valley, Nova Scotia
Canada
Description: The company's mission is to provide education, consultation, and services in the areas of machine learning, knowledge discovery, and data mining. We have developed specific talent in the area of Transfer Learning applied to data mining. Transfer Learning is the use of data or models from one or more related source tasks when learning a new target task. Transfer learning is consider a major advance in mahine learning and its applications in data mining.

FiveFocal LLC
www.fivefocal.com
1600 Range Street
Suite 202
Boulder, CO, 80301
United States
Phone: 303 900 2317
Description: In 2009, FiveFocal brought together a group of key individuals with rich backgrounds in bringing innovative technologies to both the commercial and defense markets with the goal of creating novel design methodologies, test tools, algorithms and imaging systems.

IDTechEx
IDTechEx
http://www.idtechex.com
info@IDTechEx.com
222 Third Street
Suite 0222
Cambridge, MA, 02142
United States
Phone: + 44 (0)1223 813703
Phone: + 1 617 577 7890
Description: IDTechEx offers independent market research and advice in selected emerging technologies to companies across the value chain, to support them in making essential strategic business decisions. Content expertise and IP in our chosen specialisms is available through provision of regularly-updated reports, advisory services, bespoke consulting services and events. Our technology experts are respected, high profile and well-connected in their fields.   IDTechEx covers the following emerging technologies: Printed, organic and flexible electronics Game changing new electronic materials and components RFID, RTLS and wireless sensors Electric vehicles Energy Harvesting and Storage Photovoltaics Smart Packaging   Our work includes technology and market benchmarking, analysis of companies, due diligence, in-company master classes and global research.

IDTechEx consultants travel extensively, visiting many conferences, universities and companies to learn and interpret the latest information for you.   In addition, we provide syndicated research reports and host the world's leading events on these topics.

Paladin Consultants, LLC.
www.paladn.com
11 Beech Ct.
Chatham, NJ, 07928
United States
Phone: (973) 635 0080
Fax: (973) 701 8151
Description: Paladin Consultants is an information technology and business systems consulting firm located in the NY metropolitan area with particular expertise in custom programming, client-server database design and implementation, and web development. We specialize in designing and implementing cost-effective, creative information solutions to complex business problems. Paladin has provided mission critical applications for the financial industry, healthcare, Fortune 500 finance and manufacturing environments, as well as cost-effective core systems for smaller enterprises.

Directories/Mailing Lists

Federation of Automotive Products Manufacturers - Members Directory
http://fapm.com.au/aboutfapm/membersDirectory.aspx
Description: Federation of Automotive Products Manufacturers - Members Directory

NAFA Fleet Management Association Buyer's Guide
http://nafa.officialbuyersguide.net/
Description: The NAFA Fleet Management Association (NAFA) Buyer's Guide is the fastest way to locate the products and services you need! Find GPS/Vehicle Navigation Systems, Shop Equipment, Legal Services, Paint Protection, and much more!

The Open Directory Project: Image Processing Software
http://www.dmoz.org/Science/Technology/Electrical_Engineering/Image_Processing/Software/
Description: The Open Directory Project's Image Processing Software listing.

The Software Network
http://www.thesoftwarenetwork.com/
Description: The Software Network: A Business Software Directory

Yahoo! Directories Automotive Accessories > Manufacturers
http://dir.yahoo.com/business_and_economy/business_to_business/automotive/accessories/manufacturers/

Trade Magazines

AutoInc.
http://www.autoinc.org/
Description: AutoInc. magazine, published monthly, is the informational authority for ASA members and the automotive industry nationwide. Its purpose is to enhance the professionalism of these members through management, technical and legislative articles, researched and written with the highest regard for accuracy, quality and integrity.

Automobile
http://www.automobilemag.com/
1995 Highland Drive
Ann Arbor, MI, 48108
United States
Description: Automobile offers a rich and varied examination of the automotive universe in all its forms – delivered by our stable of first-class editors and freelance contributors and illustrated with vibrant photography. Our aim is to drive new cars in new and interesting ways and celebrate the automotive lifestyle and its personalities, past and present. We also deliver the latest automotive news and offer insights into emerging trends in the automotive industry, whatever the medium – be it magazine, digital, social, video, mobile, and whatever comes next.

Automotive Business Review
http://www.automotive-business-review.com/
Description: Automotive Business Review provides latest Automotive industry news, analysis and market research reports. It also offers a comprehensive breakdown of Design & Production, Auto Components, Technology, Leasing & Insurance, Supply Chain and Green Technology.

IEEE Software
IEEE
http://www.computer.org/portal/web/computingnow/software
Description: This bimonthly magazine delivers reliable, useful, leading-edge software development information to keep engineers and managers abreast of rapid technology change. The authority on translating software theory into practice, the magazine positions itself between pure research and pure practice, transferring ideas, methods, and experiences among researchers and engineers. Peer-reviewed articles and columns by real-world experts illuminate all aspects of the industry, including process improvement, project management, development tools, software maintenance, Web applications and opportunities, testing, usability, and much more.

Software Magazine
www.softwaremag.com
jdesmond@softwaremag.com
King Content Co.
P.O. Box 135
E. Walpole, MA, 02032
United States
Phone: (508) 668-9928

Description: Software Magazine, the Software Decision Journal, has been a brand name in the industry for more than 30 years. Software Magazine and its related website, Softwaremag.com, comprise the online catalog to enterprise software and the home of the Software 500 ranking of the world's largest software and services companies.

Trade Expositions

Australian Auto Aftermarket Expo
www.aftermarketexpo.com.au
Melbourne Exhibition Centre
Description: Hosted every two years by the Australian Automotive Aftermarket Association (AAAA), the Expo is a trade only show run by the industry for the industry.

IEEE International Conference on Consumer Electronics
http://www.icce.org/
Las Vegas, Nevada, USA
Description: ICCE is the flagship conference of the IEEE Consumer Electronics Society, and held annually in conjunction with the International CES, one of the biggest international consumer electronics shows in the world. ICCE 2016 is intended to provide an international forum that brings together those actively involved in areas of interest to consumer electronics, and to report on up-to-the-minute innovations and developments.

NAFA Institute & Expo
http://www.nafainstitute.org/
Tampa, Florida
United States
Description: NAFA's annual Institute & Expo is the largest event of the fleet management industry! The perfect opportunity to increase your networking power, I&E is the largest community of fleet professionals who attend year after year because they experience I&E's hands-on value. Attend I&E to get real money-saving, time-saving value!

SEMA Show
http://www.semashow.com/
Las Vegas, Nevada, USA
Description: The SEMA Show is the premier automotive specialty products trade event in the world. It draws the industry's brightest minds and hottest products to one place, the Las Vegas Convention Center. As part of the AAIW, the SEMA Show attracts more than 100,000 industry leaders from more than 100 countries for unlimited profit opportunities in the automotive, truck and SUV, powersports, and RV markets. The 2015 SEMA Show drew more than 60,000 domestic and international buyers.

ORIGINAL SUBMISSION

What is the name of your invention?
Smart Vision System

Give a short description of your invention.
Algorithm for monitoring head/eye motion for driver alertness with one camera.

Give a detailed description of your invention.
Smart vision systems are important for autonomous vehicles and safety. The patent US6,927,694 (attached below) embodies an image processing algorithm solution for driver alertness with advanced eye & face tracking and feature analysis - include head orientation, gaze directions, blinking, yawning, etc. This technology can also be implemented in adjacent applications such as security (face recognition) and social media (facial gestures).

Have you done background research on your invention? If so, when and how was it done? Upload information you have collected.
Refer to uploaded patent.

What is new and innovative about your invention?
Algorithm for driver alertness using one camera

Can you demonstrate that your invention works? Do you have any proof of concept, or data from tests? Have you made a prototype? If not, do you have any plans to do so?
Yes, included in patent below.

Have you sought any protection for your intellectual property, such as filing a patent application, registered design, trademark, placed a copyright mark on your work, or done something else? Have you sought legal advice?
Issued patent attached.

If it's not already clear above, what types of products and/or services do you think could be made based on your invention?
Autonomous driver safety (aero, automotive, heavy equipment); entertainment/infotainment; virtual reality VR/AR; wearable optics.

What countries do you think these products/services would be sold in, and in what industries?
Worldwide; aero, automotive, manufacturing; virtual reality. Looking to identify other promising adjacent industries this technology might be useful.

Do you know of any products and/or services that are similar to those described above, or that would be competitors?
Components already present in autonomous driving systems?

Have you told anyone about your idea? Published any papers? Put it on a website? Put it on a social media site? Presented a seminar?
Published.

APPENDICES

Appendix A.

A **patent** is an exclusive right granted for an invention, which is a product or a process that provides, in general, a new way of doing something, or offers a new technical solution to a problem. In order to be patentable, the invention must fulfil certain conditions. An invention must, in general, fulfil the following conditions to be protected by a patent:

- It must be of practical use.
- It must show an element of novelty, that is, some new characteristic which is not known in the body of existing knowledge in its technical field. This body of existing knowledge is called "prior art".
- It must show an inventive step which could not be deduced by a person with average knowledge of the technical field.
- The subject matter must be accepted as "patentable" under law. In many countries, scientific theories, mathematical methods, plant or animal varieties, discoveries of natural substances, commercial methods, or methods for medical treatment (as opposed to medical products) are generally not patentable.

For an excellent overview of Patents and the Patent system, see:

→ World Intellectual Property Organisation
→ United States Patent & Trademark Office

Appendix B.

About the Google Scholar Search. Our methodology for online search is to conduct searches online using keywords from our understanding of the invention through the above analysis. We typically use Google Scholar, but sometimes we supplement with general web searching as well.

We aim to do both broad searching of the field, as well as specific searching focused on the innovative aspects of the invention to determine if we can find any relevant literature. We do not read the entire articles, only the abstracts. This is due to the large amounts of data we find and time constraints.

The aim of the search is not a conclusive novelty determination, but rather to ascertain if there is relevant literature.

We hyperlink our searches so that if relevant literature is found, you can easily replicate the search. This allows you to expand on the search, and follow up on literature which may be relevant. Some commentary may be provided as to why the analyst thinks the particular piece of literature may be relevant to the current invention.

Appendix C.

We use **Espacenet** for our searching, using the Worldwide database of documents from 80+ patent offices, including USPTO and WIPO.   These preliminary searches attempt to find relevant literature in available public databases. We have attempted to understand the essence of your invention through your submission and the above technology analysis. This is then used to generate keyword searches, reading only the abstracts (not the entire patent document). We search for relevant terms and/or phrases in Titles and Abstracts, and occasionally in other fields. This is not an exhaustive search, and there may be other terms which are relevant but not included, or in fields such as the specification, which we have not searched here.

Espacenet offers free access to more than 60 million patent documents worldwide, containing information about inventions from 1836 to today.   We use the Advanced Search and SmartSearch options to query. SmartSearch queries utilise Contextual Query Language (CQL). Click here for a booklet that introduces Espacenet and includes more information about SmartSearch, which may be useful to further understand our searches.

Appendix D.

Other Intellectual Property Rights

Trademark

A trademark (or **trade mark**) is a form of intellectual property protection characterized by a brand name that may include any word, name, symbol, logo, device, sound, smell or any combination, used, or intended to be used in business to distinguish and identify the products or services of one manufacturer or seller from those sold by another. It is a valuable marketing tool that enables the public to identify the quality and image associated with your goods.

Not all trademarks must be registered however including a mark of ownership can give you exclusive right to use the trademark nationwide. A trademark cannot be registered if it is unable to distinguish your goods or services from similar goods or services of other providers in your competing marketplace. If there is an earlier trademark within your marketplace, it will not be registrable as to prevent the public from being mislead about the nature of your services or products.

You should search trademark database records before using a new trademark and before filing application to register it. Trademarks that may cause confusion to the consumer may be rejected if found to be too similar to existing trademarks. Simple searches can save you time and money.

If you are satisfied you found a trademark that is registrable, we recommend you seek professional services and traders to finalise your trademark application. There are trademark attorneys and legal practitioners who can help you further to avoid legal actions down the road.

Copyright

Copyright is a form of intellectual property that prevents unauthorised use or reproduction by others of original work. In general, these rights include "the right to copy", but more broadly include the right to copy, print, publish, film, communicate and perform copyright material, and to authorize others to do the same.   A creator need not "register" or "apply for" a copyright in most countries, as it is automatically protected once the work has been written or recorded on some physical medium.

Depending on the jurisdiction, a copyright must generally meet minimal standards of originality in order to qualify for copyright. A copyright typically expires after a period of time, however this too may be contingent upon the specific jurisdiction.   Copyrights have largely been internationally standardised, enduring fifty to hundred years from the creator's death.

Copyright protection is dependent upon the nature of the work. Due to the advent of computer network technologies and digital media, some exceptions are made to the creator's "exclusive" right, allowing some amount of permissible copying based on the doctrine of Fair Use or Fair Dealing. Further, these technological advances are currently reshaping copyright protection, one example being **software copyright**. The specifics of a software technology determine whether or not it is subject to software copyright. Refer to Wikipedia's article on software copyright for more information.

IEA104281: Lucyd – Smart Vision System. Report 8th January 2021.

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