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DRIVER EXHAUSTION DETECTION BASED ON FACIAL NODAL POINTS

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Abstract:

Improvement of public safety and the reduction of accidents are of the important goals of the Intelligent Transportation Systems (ITS). One of the most important factors in accidents, especially on rural roads, is the driver fatigue and monotony. Fatigue reduces driver perceptions and decision making capability to control the vehicle. Researches show that usually the driver is fatigued after 1 hour of driving. Drowsiness and fatigue of automobile drivers reduce the drivers' abilities of vehicle control, natural reflex, recognition and perception. Therefore it is very much necessary in this recent trend in automobile industry to incorporate driver assistance system that can detect drowsiness and fatigue of the drivers. This project presents a nonintrusive prototype computer vision system for monitoring a driver's vigilance in real time. Eye tracking is one of the key technologies for future driver assistance systems since human eyes contain much information about the driver's condition such as gaze, attention level, and fatigue level. Once the monitor detects the driver is drowsy, it will send a warning immediately to the driver. The aim is to reduce as many as accidents & let every driver can able to drive safely. With the help of renowned company care drive's driver fatigue monitoring system, we can able to provide safety & can able to gain the trust and support from various clients. We are an exclusive distributor of Care drive Fatigue Monitoring System. Fatigue driving means a phenomenon where in long hours continuous driving, the drivers' mental and physiological functions get disturbed, and drivers become eyes fuzzy and slow in reaction. Fatigue driving has negative affects to drivers' attention, feeling, consciousness, thinking, judgment, decision and movement. Driving fatigue is not a disease, but a physical self-protective reaction. This always insists independent development and customer-oriented management system, through which we can able to maintain our quality standards. Real-time detection and tracking of the eye is an active area of research in computer vision community. Localization and tracking of the eye can be useful in face alignment. This project describes real time eye detection and tracking method that works under variable and realistic lighting conditions. It is based on a hardware system for the real-time acquisition of a driver's images using camera and the software implementation for monitoring eye that can avoid the accidents. We can implement this project in real time using C#.NET as front end and SQL SERVER as back end.

Keywords — **Intelligent Transportation Systems (ITS), Nonintrusive, Eye tracking, Eyes Fuzzy, Driver's Images, and Monitoring Eye** .

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I. INTRODUCTION

IoT software addresses its key areas of networking and action through platforms, embedded systems, partner systems, and middleware. These individual and master applications are responsible for data collection, device integration, real-time analytics, and application and process extension within the IoT network. They exploit integration with critical business systems (e.g., ordering systems, robotics, scheduling, and more) in the execution of related tasks.

Data Collection

This software manages sensing, measurements, light data filtering, light data security, and aggregation of data. It uses certain protocols to aid sensors in connecting with real-time, machine-to-machine networks. Then it collects data from multiple devices and distributes it in accordance with settings. It also works in reverse by distributing data over devices. The system eventually transmits all collected data to a central server.

Device Integration

Software supporting integration binds (dependent relationships) all system devices to create the body of the IoT system. It ensures the necessary cooperation and stable networking between devices. These applications are the defining software technology of the IoT network because without them, it is not an IoT system. They manage the various applications, protocols, and limitations of each device to allow communication.

Real-Time Analytics

These applications take data or input from various devices and convert it into viable actions or clear patterns for human analysis. They analyze information based on various settings and designs in order to perform automation-related tasks or provide the data required by industry.

Application and Process Extension

These applications extend the reach of existing systems and software to allow a wider, more effective system. They integrate predefined devices for specific purposes such as allowing certain mobile devices or engineering instruments access. It supports improved productivity and more accurate data collection. IoT primarily exploits standard protocols and networking technologies. However, the major enabling technologies and protocols of IoT are RFID, NFC, low-energy Bluetooth, low-energy wireless, low-energy radio protocols, LTE-A, and WiFi-Direct. These technologies support the specific networking functionality needed in an IoT system in contrast to a standard uniform network of common systems.

NFC and RFID

RFID (radio-frequency identification) and NFC (near-field communication) provide simple, lowenergy, and versatile options for identity and access tokens, connection bootstrapping, and payments.

- RFID technology employs 2-way radio transmitter-receivers to identify and track tags associated with objects.
- NFC consists of communication protocols for electronic devices, typically a mobile device and a standard device.

Low-Energy Bluetooth

This technology supports the low-power, long-use need of IoT function while exploiting a standard technology with native support across systems.

Low-Energy Wireless

This technology replaces the most power hungry aspect of an IoT system. Though sensors and other elements can power down over long

periods, communication links (i.e., wireless) must remain in listening mode. Low-energy wireless not only reduces consumption, but also extends the life of the device through less use.

Radio Protocols

ZigBee, Z-Wave, and Thread are radio protocols for creating low-rate private area networks. These technologies are low-power, but offer high throughput unlike many similar options. This increases the power of small local device networks without the typical costs.

LTE-A

LTE-A, or LTE Advanced, delivers an important upgrade to LTE technology by increasing not only its coverage, but also reducing its latency and raising its throughput. It gives IoT a tremendous power through expanding its range, with its most significant applications being vehicle, UAV, and similar communication.

WiFi-Direct

WiFi-Direct eliminates the need for an access point. It allows P2P (peer-to-peer) connections with the speed of WiFi, but with lower latency. WiFi-Direct eliminates an element of a network that often bogs it down, and it does not compromise on speed or throughput.

IoT has applications across all industries and markets. It spans user groups from those who want to reduce energy use in their home to large organizations who want to streamline their operations. It proves not just useful, but nearly critical in many industries as technology advances and we move towards the advanced automation imagined in the distant future.

Engineering, Industry, and Infrastructure

Applications of IoT in these areas include improving production, marketing, service delivery, and safety. IoT provides a strong means of monitoring various processes; and real transparency creates greater visibility for improvement opportunities.

The deep level of control afforded by IoT allows rapid and more action on those opportunities, which include events like obvious customer needs, nonconforming product, malfunctions in equipment, problems in the distribution network, and more.

Government and Safety

IoT applied to government and safety allows improved law enforcement, defense, city planning, and economic management. The technology fills in the current gaps, corrects many current flaws, and expands the reach of these efforts. For example, IoT can help city planners have a clearer view of the impact of their design, and governments have a better idea of the local economy.

Home and Office

In our daily lives, IoT provides a personalized experience from the home to the office to the organizations we frequently do business with. This improves our overall satisfaction, enhances productivity, and improves our health and safety. For example, IoT can help us customize our office space to optimize our work.

Health and Medicine

IoT pushes us towards our imagined future of medicine which exploits a highly integrated network of sophisticated medical devices. Today, IoT can dramatically enhance medical research, devices, care, and emergency care. The integration of all elements provides more accuracy, more attention to detail, faster reactions to events, and constant improvement while reducing the typical overhead of medical research and organizations.

The applications of IoT in media and advertising involve a customized experience in which the system analyzes and responds to the needs and interests of each customer. This includes their general behavior patterns, buying habits, preferences, culture, and other characteristics.

Marketing and Content Delivery

IoT functions in a similar and deeper way to current technology, analytics, and big data. Existing technology collects specific data to produce related metrics and patterns over time, however, that data often lacks depth and accuracy. IoT improves this by observing more behaviors and analyzing them differently.

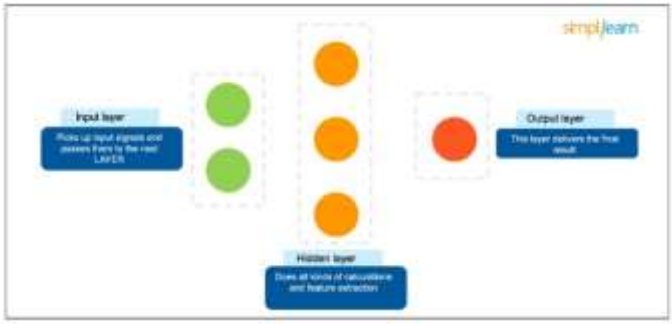
- This leads to more information and detail, which delivers more reliable metrics and patterns.
- It allows organizations to better analyze and respond to customer needs or preferences.
- It improves business productivity and strategy, and improves the consumer experience by only delivering relevant content and solutions.

Improved Advertising

Current advertising suffers from excess and poor targeting. Even with today's analytics, modern advertising fails. IoT promises different and personalized advertising rather than one-size-fits all strategies. It transforms advertising from noise to a practical part of life because consumers interact with advertising through IoT rather than simply receiving it. This makes advertising more functional and useful to people searching the marketplace for solutions or wondering if those solutions exist.

Neural Networks

The structure of the human brain inspires a Neural Network. It is essentially a Machine Learning model (more precisely, Deep Learning) that is used in unsupervised learning. A Neural Network is a web of interconnected entities known as nodes wherein each node is responsible for a simple computation. In this way, a Neural Network functions similarly to the neurons in the human brain. Neural networks can be applied to a broad range of problems and can assess many different types of input, including images, videos, files, databases, and more. They also do not require explicit programming to interpret the content of those inputs. Because of the generalized approach to problem solving that neural networks offer, there is virtually no limit to the areas that this technique can be applied. Some common applications of neural networks today, include image/pattern recognition, self driving vehicle trajectory prediction, facial recognition, data mining, email spam filtering, medical diagnosis, and cancer research. There are many more ways that neural nets are used today, and adoption is increasing rapidly. A neural network is usually described as having different layers. The first layer is the input layer, it picks up the input signals and passes them to the next layer. The next layer does all kinds of calculations and feature extractions—it's called the hidden layer. Often, there will be more than one hidden layer. And finally, there's an output layer, which delivers the final result.



Machine Learning Model

TYPES OF MACHINE LEARNING

Machine learning uses two types of techniques: supervised learning, which trains a model on known input and output data so that it can predict future outputs, and unsupervised learning, which finds hidden patterns or intrinsic structures in input data.

1) Supervised Learning

Supervised machine learning builds a model that makes predictions based on evidence in the presence of uncertainty. A supervised learning algorithm takes a known set of input data and known responses to the data (output) and trains a model to generate reasonable predictions for the response to new data. Use supervised learning if you have known data for the output you are trying to predict.

Classification techniques predict discrete responses—for example, whether an email is genuine or spam, or whether a tumor is cancerous

or benign. Classification models classify input data into categories. Typical applications include medical imaging, speech recognition, and credit scoring. Use classification if your data can be tagged, categorized, or separated into specific groups or classes. For example, applications for hand-writing recognition use classification to recognize letters and numbers. In image processing and computer vision, unsupervised pattern recognition techniques are used for object detection and image segmentation.

Common algorithms for performing classification include support vector machine (SVM), boosted and bagged decision trees, k-Nearest Neighbor, Naïve Bayes, discriminant analysis, logistic regression, and neural networks.

Regression techniques predict continuous responses—for example, changes in temperature or fluctuations in power demand. Typical applications include electricity load forecasting and algorithmic trading. Use regression techniques if you are working with a data range or if the nature of your response is a real number, such as temperature or the time until failure for a piece of equipment.

2) Unsupervised Learning

Unsupervised learning finds hidden patterns or intrinsic structures in data. It is used to draw inferences from datasets consisting of input data without labeled responses.

Clustering is the most common unsupervised learning technique. It is used for exploratory data analysis to find hidden patterns or groupings in data. Applications for cluster analysis include gene sequence analysis, market research, and object recognition.

Common algorithms for performing clustering include k-means and k-medoids, hierarchical clustering, Gaussian mixture models, hidden Markov models, self-organizing maps, fuzzy c-means clustering, and subtractive clustering.

II. EXISTING SYSTEM:

Real-time abnormal driving behaviors monitoring is a corner stone to improving driving safety. Existing works on driving behaviors monitoring using smartphones only provide a coarse grained result, i.e. distinguishing abnormal driving behaviors from normal ones.

Detection using sensors:

To eliminate the need of pre-deployed infrastructures and additional hardwares, recent studies concentrate on using smartphones to detect abnormal driving behaviors. In particular, uses accelerometers, magnetometers and GPS sensors to determine whether high-risk motorcycle maneuvers or accidents occur and uses of accelerometers, gyroscopes and magnetometers to estimate a driver's driving style as Safe or Unsafe and usage of accelerometers to detect drunk driving and sudden driving maneuver, respectively. Therefore, none of existing works can realize fine-grained identification.

Detection using pre-deployed infrastructure:

Existing system uses an EGG equipment which samples the driver's EGG signals to detect drowsiness during car driving. This system uses infrared sensors monitoring the driver's head movement to detect drowsy driving and also GPS, cameras, alcohol sensor and accelerometer sensor are used to detect driver's status of drunk, fatigued, or reckless. However, the solutions all rely on pre-deployed infrastructures and additional hardwares that incur installation cost.

DISADVANTAGES

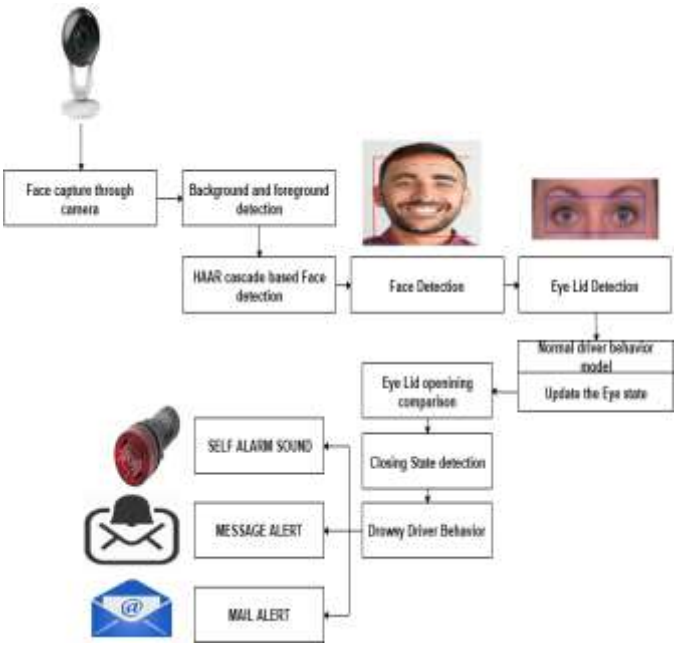
- Need additional sensor for analyze the abnormal driver.
- High Resolution Kinect Cameras can be used .
- Large number of irrelevant facial features are extracted.
- Accuracy is less.
- Complexity is high in detection of text.

III. PROPOSED SYSTEM:

Driving at night has become a tricky situation with a lot of accidents and concerns for the transport authorities and common man especially because of the increasing heavy vehicle movement. The drivers are forced to drive with minimal rest which takes a toll on their driving capability after a few days of continuous driving leading to reduction in their reflexes and thus causing accidents. In most of the cases of accidents, fatigue is found to be the reason for nodding off. The term fatigue refers to a combination of symptoms such as impaired performance and a subjective feeling of drowsiness. Even with the intensive research that has been performed, the term fatigue still does not have a universally accepted definition. From the viewpoint of individual organ functionality, there are different kinds of fatigue, such as the following cases: 1) local physical fatigue (e.g., in a skeletal or ocular muscle); 2) general physical fatigue (following heavy manual labor); 3) central nervous fatigue (sleepiness); 4) mental fatigue (not having the energy to do anything). In this proposed system, we can implement the system for detecting the faces using Linear discriminate analysis and also track the eyes states with improved accuracy. In case of abnormal behavior that is drivers eyes found to be closed as a corrective action alarm signal will be raised. The system enters into analysis stage after locating the driver's head and eyes properly in image captured through camera. This image is then preprocessed using various Image Processing techniques for drowsiness detection. Finally provide alert system in the form of voice, SMS and Email alert admin with face recognition.

ADVANTAGES

- Real time implementation.
- Exact facial features are extracted.
- Accuracy is high.
- SMS and Mail Sent to appropriate persons.
- Computational complexity is less.



System Architecture

IV. CONCLUSIONS

Drowsiness and fatigue of automobile drivers reduce the drivers' abilities of vehicle control, natural reflex, recognition and perception. Such diminished vigilance level of drivers is observed at night driving or overdriving, causing accident and pose severe threat to mankind and society. The proposed system can be used for driver's safety and its consequences. The system detects drowsiness of driver through eye conditions. It based on face detection using well known Linear Discriminative algorithm, eyes are detected through proposed crop Eye algorithm which segments the face in different segments in order to get left and right eye. Conditions of open and close eye are determined by intensity values, distance between eye brow and eye lash is calculated. If calculated distance is greater than threshold value, eyes are closed otherwise open. An alarm is triggered if eyes are found to be closed for consecutive frames. The proposed method was tested in video sequence recorded in vehicle as well as in lab environment. The proposed system works in real time with minimal computational complexity. Therefore it is also suitable for implementing in surveillance environment. The system produces 90% accurate results for different faces.

FUTURE ENHANCEMENT

However, its limitation is detecting the eyes of person wearing glasses. Also it does not produce accurate results if any reflective object is found behind the driver. In future, we can consider the limitations and implemented with embedded system also contains the original verifying methods which were inputting owner's password which is send by the controller. The security features were enhanced largely for the stability and reliability of owner recognition. The whole system was built on the technology of embedded system which makes the system more safe, reliable and easy to use.

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