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Driver Exhaustion Reduction 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.

I. INTRODUCTION

1.1 INTERNET OF THINGS (SOFTWARE)

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.

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

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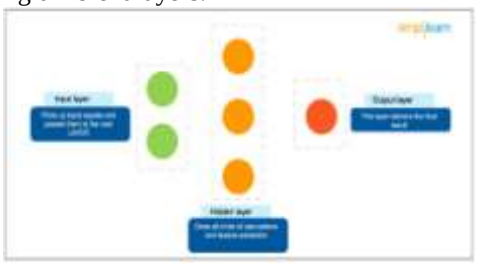
functions similarly to the neurons in the human brain. Neural networks can be applied to a broad range of problems and can assess many different types of input, including images, videos, files, databases, and more. They also do not require explicit programming to interpret the content of those inputs. 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.



II. LITERATURE SURVEY

2.1 TITLE: VIGILANCE DECREMENT AND PASSIVE FATIGUE CAUSED BY MONOTONY IN AUTOMATED DRIVING AUTHOR: MORITZ KÖRBER

Besides resource depletion caused by being actively engaged in a task, there are several signs that passive monitoring, monotony and passive fatigue can also induce vigilance decrement. Partially automated driving represents such a passive situation as the driver's only task is to monitor the system. In this work, we investigate the decrement of vigilance during a partially automated highway drive in a driving simulator. Indicators used to assess the vigilance state was a reaction time task, passive fatigue was measured by eye tracking and a mind wandering questionnaire. Active fatigue represents fatigue caused by being actively engaged in a task which leads to a depletion of mental resources. Relevant situations comprise driving with high traffic density, with low visibility conditions or driving for a long time. To empirically investigate the effects of passive fatigue in a naturalistic setting, Schmidt and colleagues studied the effect of a 3 h monotonous highway drive on driver's vigilance and drowsiness. Besides an increase in subjective (Karolinska Sleepiness Scale) and objective (EEG) indicators of drowsiness, they reported an increment of reaction times, i.e. a decrement in vigilance, during thecourse of the drive. The authors claim the monotonous environment of a highway drive and the long time-on-task as causes for the decrement.

DISADVANATAGE

- Only predict the partial eye estimations

2.2 Title: An Elaborate Algorithm For Automatic Processing Of Eye Movement Data And Identifying Fixations In Eye-Tracking Experiments Author: Bo Liu , Qi-Chao Zhao

As an evolutionary species, humans acquire external information by different ways. Visual, auditory, olfactory, and tactile senses are most commonly used. Researchers had studied the ratio of information obtained by different types of sensation. It was found that vision obtains about 80% of environmental information, which makes it the most important way for information searching and receiving. Thereafter, eye tracking had been gaining in popularity for decades as a window to understand and study observer's visual characteristics, as well as the cognitive ability. High sampling frequency of eye-trackers introduces noise in raw eye movement data. Furthermore, the unstable sampling frequency of devices generates fluctuating time interval between samples, which has negative influence on the quality of raw eye movement data. Therefore, the article aims to propose a valid and universal procedure on raw eye movement data processing. The procedure will be suitable for eye movement data collected by most types of eye-trackers. Characteristics of raw eye movement data were analyzed, and a comprehensive data processing procedure was proposed. Steps in this procedure include preliminary inspection of raw data, the checking and correction of actual sampling frequency, the selection of eye movement data, small gaps filled-in, data filtering, and fixation identification. By this procedure, raw eye movement data collected by eye-trackers can be used to identify types of eye movements and obtain fixation points in eye-tracking experiment. In the end, a paradigm test was designed to examine the correctness of data processing flow, and the application of eye movement data was also discussed.

DISADVANTAGES

- False positive rate is high

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III. SYSTEM ANALYSIS

3.1 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.

3.1.1 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

3.2 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.

3.2.1 ADVANTAGES

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

IV. SYSTEM IMPLEMENTATION

MODULES DESCRIPTION

1. INTERFACE CREATION

The advancement of technologies for averting drowsiness at the wheel is a key dilemma in the field of accident prevention systems. Preventing drowsiness during driving necessitates a scheme for precisely perceiving deterioration in driver's vigilance and a means for alerting and reviving the driver. Drowsy Driver Detection System has been developed, using a non-intrusive machine vision based concepts. This system offers a method for driver eye detection, which could be used for observing a driver's fatigue level while he/she is maneuvering a vehicle. In this module, we can capture the driver faces from real time camera. The driver face can be registered in admin interface.

2. FACE CAPTURE

In this module, we can implement face detection using LDA algorithm. LDA (Linear Discriminate Analysis) is enhancement of PCA (Principal Component Analysis). PCA doesn't use concept of class, whereas LDA does.

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Face images of same person is treated as of same class here. Both PCA and LDA do dimensionality reduction. They transform images as a vector to new space with new axes. The projection axes chosen by PCA might not provide good discrimination power. LDA tries to find projection axes, such as classes are best separated. First video can be captured and apply binarization tool to detect the.

3. EYE DETECTION:

Each face detected is stored for half a second to crop the image in order to detect the eye. Our proposed algorithm is used for eye detection. This algorithm divides the face horizontally into two segments i.e. upper segment and a lower segment. Upper segment contains the image between the forehead to the eyes, and lower segment contains the image between the nose to the chin. We take into account the upper segment and lower segment is discarded. The upper segment again is divided horizontally into 2 segments, this time upper up segment from the forehead to an eyebrow and the upper lower segment from eyebrow to a lower eyelash. After the eyes have been extracted from the image it is then that the current frame is replaced by a new one. The eyes extracted are now categorized in two parts through vertical calibration - the left eye and the right eye.

4. ABNORMAL PREDICTION:

After the eye has been detected, the next step is to detect the eyes condition either they are open or close, so for this purpose intensity values are used. A graph is plotted which calculates the intensity distance in the eye separately through the eye lashes and eye brow and check the state of an eye on this intensity distance. If distance is large, eye is close and when distance is less, eye is open. The distance can be evaluated by analyzing the samples of images. Both the eyes are binarized to determine the threshold value and then the results are produced. If the system encounters five consecutive frames with the eyes closed the alarm is triggered for the next five frames.

5. NOTIFICATION SYSTEM:

In this module send notification to admin and also user at the time of abnormal prediction. If the eyes are closed less than 50% means, provide voice alert for self-assessment. Then send SMS alert using SMS gateway services. And also abnormal face can be capture in Email.

V. SYSTEMDESIGN

SYSTEM ARCHITECTURE

VI. SOFTWARE DESCRIPTION

FRONT END: .NET FRAMEWORK

The .NET Framework (pronounced dot net) is a software framework developed by Microsoft that runs primarily on Microsoft Windows. It includes a large library and provides language interoperability (each language can use code written in other languages) across several programming languages. Programs written for the .NET Framework execute in a software environment (as contrasted to hardware environment), known as the Common Language Runtime (CLR), an application virtual machine that provides services such as security, memory management, and exception handling. The class library and the CLR together constitute the .NET Framework. The .NET Framework's Base Class Library provides user interface, data access, database connectivity, cryptography, web application development, numeric algorithms, and network communications. Programmers produce software by combining their own source code with the .NET Framework and other libraries. The .NET Framework is intended to be used by most new applications created for the Windows platform. Microsoft also produces an integrated development environment largely for .NET software called Visual Studio

Design Features

Interoperability

Because computer systems commonly require interaction between newer and older applications, the .NET Framework provides means to access functionality implemented in newer and older programs that execute outside the .NET environment. Access to COM components is provided in the System. Runtime. Interop Services and System. Enterprise Services namespaces of the framework; access to other functionality is achieved using the P/Invoke feature.

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VII. SYSTEM TESTING

Software testing is a method of assessing the functionality of a software program. There are many different types of software testing but the two main categories are dynamic testing and static testing. Dynamic testing is an assessment that is conducted while the program is executed; static testing, on the other hand, is an examination of the program's code and associated documentation. Dynamic and static methods are often used together.

Testing is a set activity that can be planned and conducted systematically. Testing begins at the module level and work towards the integration of entire computers based system. Nothing is complete without testing, as it is vital success of the system.

Testing Objectives:
There are several rules that can serve as testing objectives, they are

1. Testing is a process of executing a program with the intent of finding an error
2. A good test case is one that has high probability of finding an undiscovered error.
3. A successful test is one that uncovers an undiscovered error.

If testing is conducted successfully according to the objectives as stated above, it would uncover errors in the software. Also testing demonstrates that software functions appear to the working according to the specification, that performance requirements appear to have been met.
There are three ways to test a program

1. For Correctness
2. For Implementation efficiency
3. For Computational Complexity.

VIII. CONCLUSION AND FUTURE ENHANCEMENT

8.1 CONCLUSION

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.

8.2 FUTURE ENHANCEMENTS

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

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