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SYNOPSIS ON

"Driver Distraction and Drowsiness Detection System"

PROJECT ID: CSE19PT26

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE AND ENGINEERING

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2019 – 2020

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Introduction

In the current age where large amounts of people use cars to get to their destination, it is increasingly becoming important to take driver's current state into consideration. The driving capabilities of a person can be largely affected by the current state he is diving in. A state of a driver can either be healthy, ill, drowsy etc. An ill or a drowsy driver cannot drive a car to his utmost capabilities. He's a potential threat to himself and the others around him as well. Many fatal accidents amongst four wheelers occur due to reasons like being drowsy while driving. Various studies have suggested that around 20% of all road accidents are fatigue-related, up to 50% on certain roads.

A system to keep a driver's physical condition in check is required to keep the driver and others around him safe. Thus, out of the need arises the Driver drowsiness detection system. Various technologies can be used to try to detect driver drowsiness.

Steering pattern monitoring:

Primarily uses steering input from electric power steering system.

Vehicle position in lane monitoring:

Uses lane monitoring camera.

Driver eye/face monitoring:

Requires a camera watching the driver's face.

Physiological measurement:

Requires body sensors to measure parameters like brain activity, heart rate, skin conductance, muscle activity.

We particularly pay attention to the Driver eye/face monitoring. The driver eye/face monitoring method makes use of machine learning concepts. The monitoring method can be implemented by using technologies like machine learning, IoT etc.

The Driver eye/face monitoring systems can operate basically in three modes:

- **Detection and authentication of a facial image**: The system searches for a facial structure in the given live feed. If found, it can compare the input facial image with the facial image related to the user which is requiring the authentication. It is basically a 1:1 comparison.

- **Identification of alertness level of the driver**: This system will detect the alertness level of the driver depending on major features like the eyesight of the driver, the head pose, usage of phone while driving etc.
- **Detection of eyelid movement:** it will monitor the eyelid movement of the driver and will recognize fatigue level of the driver.
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There are different types of face recognition algorithms, for example:

- **Eye cascade Algorithm**
- **Eigen faces (1991)**
- **Local Binary Patterns Histograms (LBPH) (1996)**
- **Fisher faces (1997)**
- **Scale Invariant Feature Transform (SIFT) (1999)**
- **Speed Up Robust Features (SURF) (2006)**

Each method has a different approach to extract the image information and perform the matching with the input image. However, the methods Eigen faces and Fisher faces have a similar approach as well as the SIFT and SURF methods. Each facial detection and recognition algorithms make use of Machine learning to work.

Machine Learning with Python

Machine Learning evolved from computer science that primarily studies the design of algorithms that can learn from experience. To learn, they need **data** that has certain attributes based on which the algorithms try to find some meaningful predictive patterns. Majorly, ML tasks can be categorized as concept learning, clustering, predictive modelling, etc. The ultimate goal of ML algorithms is to be able to take decisions without any human intervention correctly. Predicting the stocks or weather are a couple of applications of machine learning algorithms.

There are various machine learning algorithms like Decision trees, Naive Bayes, Random forest, Support vector machine, K-nearest neighbour, K-means clustering, etc.

Machine learning involves computer to get trained using a given data set, and use this training to predict the properties of a given new data. For example, we can train computer by feeding it 1000 images of cats and 1000 more images which are not of a cat, and tell each time to computer whether a picture is cat or not. Then if we show the computer a new image, then from the above training, computer should be able to tell whether this new image is cat or not.
Process of training and prediction involves use of specialized algorithms. We feed the training data to an algorithm, and the algorithm uses this training data to give predictions on a new test data. One such algorithm is K-Nearest-Neighbour classification (KNN classification). It takes a test data, and finds k nearest data values to this data from test data set. Then it selects the neighbour of maximum frequency and gives its properties as the prediction result.

Dependencies are:

- Tensorflow
- OpenCV
- Scipy
- Numpy
- Keras
- Matplotlib
- Pandas
- Python

Feasibility Study:

Significance of project:

- Driver errors and carelessness contribute most of the road accidents occurring nowadays. One of the major driver errors is caused by drowsiness.
- The resulted errors and mistakes contribute much loss to the humanity
- . In order to minimize the effects of driver abnormalities, a real time detection system for abnormality monitoring has to be inbuilt with the vehicle.
- This project focuses on a driver abnormality detection system in the following phases:
  Sensing Phase: Eye Camera is used for sensing the eyes of the driver.
  Detection Phase: The analysis of information from the camera is done to deduce the driver's current driving behaviour style. The state of eyes (open/close) is deduced.
  Correction Phase: Corrective measures include engaging the driver by making a voice based assistant or by playing EDM which will be helpful in alarming him at once.

Methodology:

- A camera will be set up that monitors the stream for faces.
- If a face is found, facial landmark detection will be applied to extract the eye regions.
- From the eye regions, the eye aspect ratio (detailed here) is computed to determine if the eyes are closed.
- As per the eye aspect ratio, if the eyes have been closed for a sufficiently long enough amount of time, an alarm will be generated to wake the driver up.

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