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Automatic Engine Locking System using IoT

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Abstract: **As the population keeps on increasing, so does the demand of vehicles for easy transportation. But unfortunately this has also resulted in an increase in vehicle thefts as well as DUI related accidents. This report proposes a system made to ensure less vehicle thefts and accident cases resulting in a safe environment. The system consists of components like: Raspberry Pi, Arduino Uno, an Alcohol Sensor, a Pi Camera and a microphone. The features of this system include Voice Recognition, Face Authentication, Alcohol Detection and Drowsiness Detection. Face authentication is done using the Pi Camera with the help of OpenCV libraries. These libraries create and train datasets of the users face and the authentication is done using this trained dataset. Pi AUI Suite is used for implementing the voice commanding. An Android App is also developed and connected to the system which will automatically display the data to the owner.**

Index Terms**-- Raspberry Pi, Arduino, OpenCV, Security.**

1. INTRODUCTION

In this 21st century that we live in, a lot of the things around us have been automated to make our lives easier. This automation is known to us as the Internet of Things (IoT). The Internet of Things is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

Increasingly, organizations in a variety of industries are using IoT to operate more efficiently, better understand customers to deliver enhanced customer service, improve decision-making and increase the value of the business.

This project aims to bring IoT inside automobiles to ensure safety for the people inside as well as outside the vehicle and aims to transfer the crucial data from this system to the user's smart phone via an Application.

2. PROBLEM STATEMENT

"A motor vehicle is stolen every 40.9 seconds in the United States."

According to the NHTSA - Every day, almost 30 people in the United States die in drunk-driving crashes — that's one person every 50 minutes. These deaths have fallen by a third in the last three decades; however, drunk-driving crashes claim more than 10,000 lives per year. In 2010, the most recent year for which cost data is available, these deaths and damages contributed to a cost of $44 billion that year.

NHTSA estimates that in 2017, 91,000 police-reported crashes involved drowsy drivers. These crashes led to an estimated 50,000 people injured and nearly 800 deaths.

3. LITERATURE SURVEY

A literature survey was carried out to analyze related works based on the topic by other authors whose results are already published in well-known journals.

In [1], the place of the vehicle is identified using Global Positioning System (GPS) and Global System for Mobile communication (GSM). These systems constantly watch a moving vehicle and report the status on demand. When the theft is identified, the responsible person sends SMS to the micro-controller, which then issues the control signals to stop the engine motor. The authorized person needs to send the password to controller to restart the vehicle and open the door.

The developed instrument in [2] is an embedded system based on GSM technology. The instrument is installed in the engine of the vehicle. An interfacing GSM modem is also connected to the micro controller to send the message to the owner's mobile. The main objective of this instrument is to protect the vehicle from any unauthorized access, through entering a protected password and intimate the status of the same vehicle to the authorize person (owner) using Global System for Mobile (GSM) communication technology. This system deals with the concept of network security. The main concept in this design is introducing the mobile communications into the embedded system. The entire unit is designed on a single board.

1. METHODOLOGY

In this study, an automatic engine locking system will be built. This system will be started with the user's voice using a microphone. The alcohol sensor will be attached to the microphone in order to detect the alcohol levels. The system will then detect the face of the driver to verify if he/she is an authorized driver or not. This will be done using OpenCV2 python libraries and using HaarCascade data-sets to define faces by training and testing them.
After it is confirmed that the driver is authorized, the camera will continuously detect drowsiness symptoms in the driver by analyzing the eyes. If the Eye Aspect Ratio(EAR) is below the set threshold limit for a particular period of time, then the system declares that the user is drowsy and stops the engine.
An application will also be built to send all the data including the current driver's name, the alcohol level as well as whether the driver is drowsy or not to the owner of the vehicle.

4.1. FLOWCHART

The flow of how the system works is demonstrated in Figure 1.1.

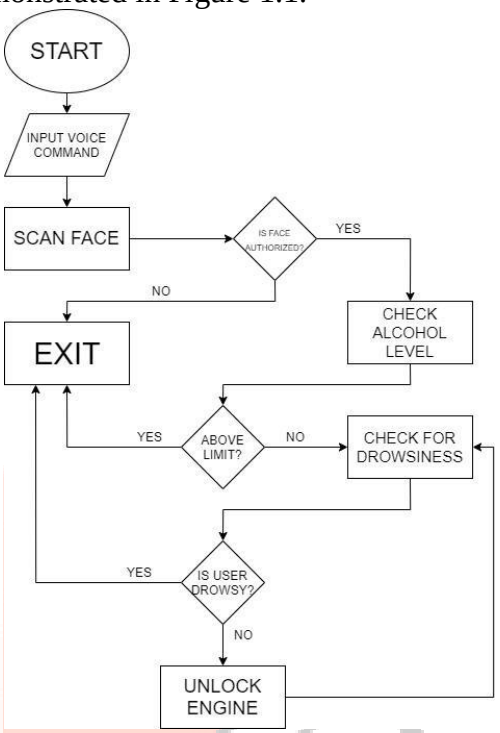


Figure 1.1

4.2. BLOCK DIAGRAM

A diagram showing in schematic form the general arrangement of the parts or components of the system is shown in Figure 1.2

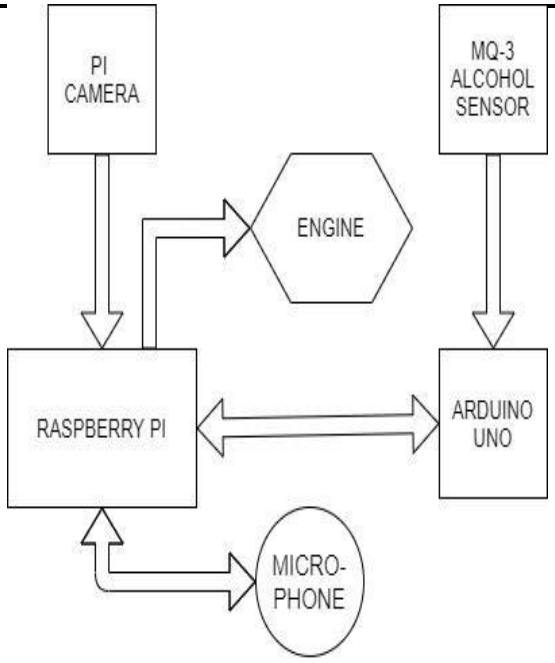
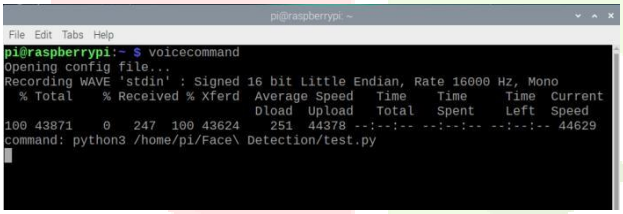


Figure 1.2

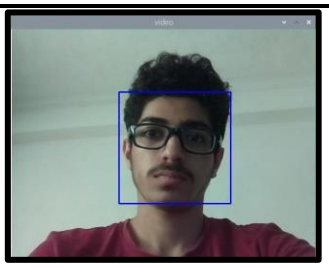
4.3. VOICE RECOGNITION

Pi AUI Suite is used to implement Voice Recognition in the system. This is basically done with a STT(Speech-To-Text) algorithm wherein whatever is spoken on the microphone is converted to text and then a specific command is run on the Raspberry Pi.



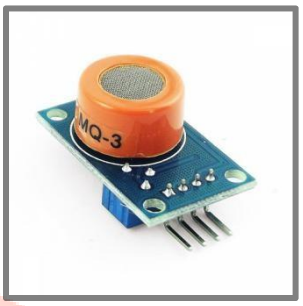
4.4. FACE AUTHENTICATION

The OpenCV Libraries and Haarcascade classifiers help in the task of face authentication. This is done by testing and training data-sets containing pictures of faces of the driver and then matching the live picture with these trained data-sets.



4.5 ALCOHOL DETECTION

The alcohol level of the driver is measured using a simple MQ-3 Sensor attached to an Arduino Uno. This measurement is sent serially from the Uno to the Raspberry Pi.



4.6 DROWSINESS DETECTION

Detection of drowsiness symptoms in the driver is done with the help of *HaarCascade* for Face detection and *dlib* libraries for Facial Landmark Prediction. Using these two, the Pi Camera checks the Eye Aspect Ratio(EAR) and if it is below a threshold i.e if the driver's eyes are almost closed for a given amount of time, the system will declare the driver is drowsy and the engine will stop running.

4.7. ANDROID APPLICATION

A simple android application was also developed to send all the crucial information to the owner of the vehicle in which the system is installed. This would include the date and time at which the vehicle was started, name of the driver, the alcohol level as well as whether the driver was drowsy or not.

2. CONCLUSION

Hence we successfully implemented a working system consisting of :

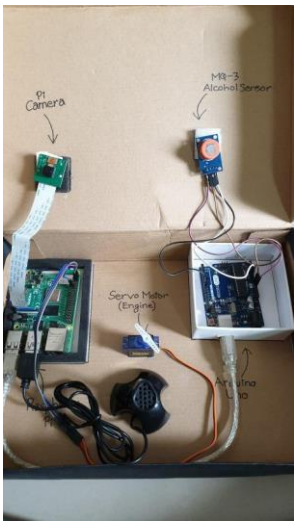
1. Voice Recognition,
2. Face Authentication,
3. Alcohol Detection and
4. Drowsiness Detection

which would potentially help in preventing the problems which we addressed in the problem statement mentioned previously.

This total system turned out to be a low cost system, at approximately 4,500 Rupees as a one time investment which would keep preventing accidents and robberies for a long time.

An application was also developed as an extension to the system which would be installed on the vehicle owner's smart-phone and would display all the data collected by the system right in the palm of the owner.

We hope that this prototype system will be endorsed by major vehicle companies and implemented in their vehicles in the future.



Experimental setup of the system

6. REFERENCES

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