Design and Implementation of Vehicle Safety and Security System

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***Abstract*— A large number of vehicles can now be seen on the roads. Most people nowadays prefer to have at least one vehicle for themselves or their families. Owners are afraid that their vehicles will be stolen from a common parking lot or from outside their homes due to the development of strong stealing techniques. One of the most successful and important applications of image analysis is biometrics. It takes a holistic approach to technology and has potential applications in areas such as information society, smart cards, access control, and so on. This fingerprint recognition concept can also be applied to vehicle security. Everyone must have access to a vehicle. At the same time, driver drowsiness and speed control are critical. when the vehicle is moving at a high speed, the sensor detects it and causes the fuel to stop, causing the vehicle to stop. Systems for detecting driver drowsiness can make use of cameras, eye-tracking sensors, and other hardware to monitor visual cues, where drowsiness can be detected through eye-blinking frequency. The camera can detect the driver's drowsiness and cause the driver to awaken.**

The main benefit of the application is the increased range of transmission and reception over the internet, which will allow the authorized person to be notified from anywhere in the world.

Keywords — Raspberry Pi, IR Sensor, Attainy 85, Servo motor, Finger Print Sensor, Camera Module.

I. Introduction

Most people nowadays prefer to have at least one vehicle for themselves or their families. Owners are afraid that their vehicles will be stolen from a common parking lot or from outside their homes due to the development of strong stealing techniques. Vehicle use is becoming increasingly important throughout the world, and preventing theft and accidents caused by driver drowsiness, as well as speed control, is required. Vehicle manufacturers are improving their products' security features by incorporating advanced automated technologies.

The primary goal of this proposed system is to reduce the number of accidents caused by driver drowsiness, improve transportation safety, and protect vehicles from theft.

Vehicle security can benefit from biometrics. This is accomplished by recognizing the authorized person's fingerprint and unlocking the engines. And when the vehicle is moving at a high speed, the sensor detects it and stops the fuel flow, allowing the vehicle to stop. The driver's drowsiness can be detected using a camera. Driver drowsiness detection systems can use cameras, eye-tracking sensors, and other hardware to monitor visual cues, where drowsiness can be detected through eye-blinking frequency. The camera can detect the driver's drowsiness and cause the driver to awaken.

II. *Literature Survey*

Drowsy Driver Detection System has been developed in this paper using a non-intrusive machine vision-based concept. To detect fatigue, the system employs a small monochrome security camera that points directly at the driver's face and monitors the driver's eyes. When fatigue is detected, a warning signal is issued to warn the driver. This report explains how to locate the eyes and determine whether they are open or closed. The driver's drowsiness can be detected using a camera. It calculates the Eye Aspect Ratio, the Eye Closure Ratio, and the yawning rate. It also detects head posture in order to monitor the driver's attention. The system detects eye blinks with 97% accuracy. Cameras can be used in driver drowsiness detection systems Eye tracking sensors and other hardware are used to monitor visual cues, and drowsiness is detected by the frequency with which the eyes blink [1].

The system can be used as a location detector as well as a possible deterrent against vehicle theft. The accuracy of GPS locations demonstrates that the error is within acceptable limits for locating the vehicle when theft occurs. However, it can be further developed into a more accurate system with better GPS modules such as AGPS and Cell Tower Triangulation systems programmed in the controller so that if the signal is lost, an assisting system or program can pinpoint the coordinates even if the satellite signal is lost. We can connect the system to the vehicle alternator to reduce the system's battery consumption [2].

The developed driver abnormality monitoring system is capable of detecting drowsiness, drunkenness, and reckless driving behavior in a short period of time. The Drowsiness Detection System, which was developed based on the driver's eye closure, can distinguish between normal eye blinking and drowsiness and detect drowsiness while driving. The proposed system can help to avoid accidents caused by sleepiness while driving. The system works well even when drivers wear spectacles and in low light conditions if the camera produces a higher-quality image. Various self-developed image-processing algorithms are used to obtain information about the position of the head and eyes. During monitoring, the system can determine whether the eyes are open or closed. When the eyes are closed for an extended period of time, a warning signal is sent is published. The processing evaluates the driver's alertness level based on continuous eye closures [3].

The program for the Automatic Vehicle Speed Control System has been implemented in the microcontroller. When the load varies, the engine's uniform speed is automatically maintained within the specified limits. Using this speed limiting mechanism, the vehicle's speed can be controlled and accidents avoided [4].

According to this study, there may be safety benefits to using this technology, such as reduced stress, fewer lane changes, and longer following distances for younger drivers. However, many drivers are unaware of their systems' limitations, which raises safety concerns. The study's misunderstandings, such as the false assumption that systems will help avoid a collision with a stopped vehicle. Drivers should be made more aware of situations in which their system is unlikely to react. More research is needed to determine the overall safety impact of these systems based on the potential safety benefits and problems. The system's future scope is hardware implementation. We can also include buzzers, indicator lights, and speed controls. In this system, a keyboard and a keyboard encoder IC are used [5].

In this paper, we discuss the work that, in today's global world, accidents are on the rise. As a result, our proposed system is the best solution for reducing accidents. This project warns drivers to slow down in appropriate places and indicates the location of the obstacle. The system operates in all weather conditions due to the use of RF technology. This system is more effective for any type of automobile, such as bikes, cars, lorries, buses, and so on. We can modify the system by using GPS to identify zones and a GSM module to send user information to loved ones. We can also modify this with an efficient braking system in conjunction with carburetor airflow control [6].

III. Methodology

- The Fingerprint sensor first captures the fingerprint images, matches the uniqueness of each fingerprint read by the sensor, and compares it to the one stored in its module or local system database.
- The Driver drowsiness detection system can use cameras, eye tracking sensors, or other hardware to monitor visual cues where drowsiness can be detected through the eye blinking frequency of the driver.

- And the Speed control system automatically controls the speed of the motor vehicle. The system is a servomechanism that takes over the throttle of the car to maintain a steady speed as set by the driver.

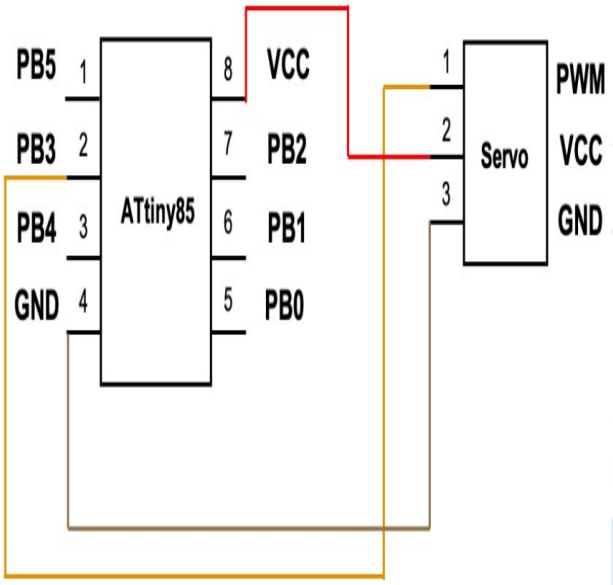

Fig1: Attiny85 with Servo motor for Speed Control

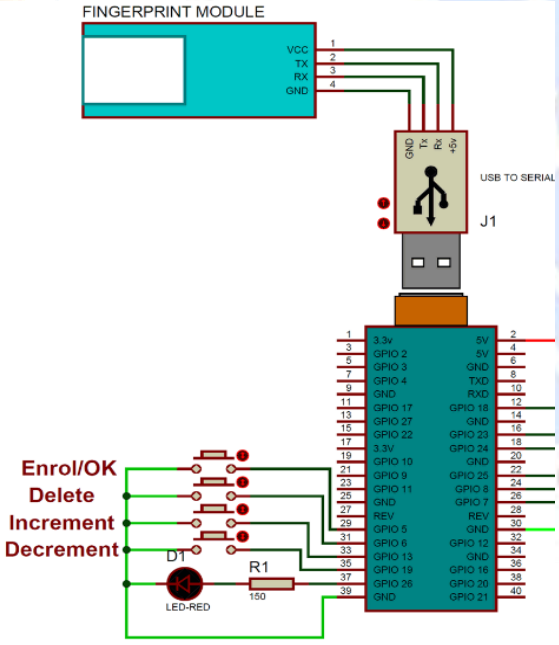

Fig 2: Raspberry Pi with Finger Print Sensor

Block Diagram

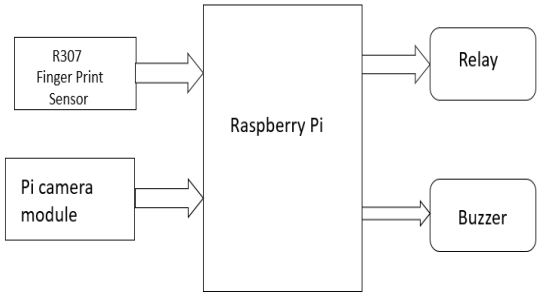

Fig 1: Raspberry Pi with Finger Print Sensor and Pi Camera module

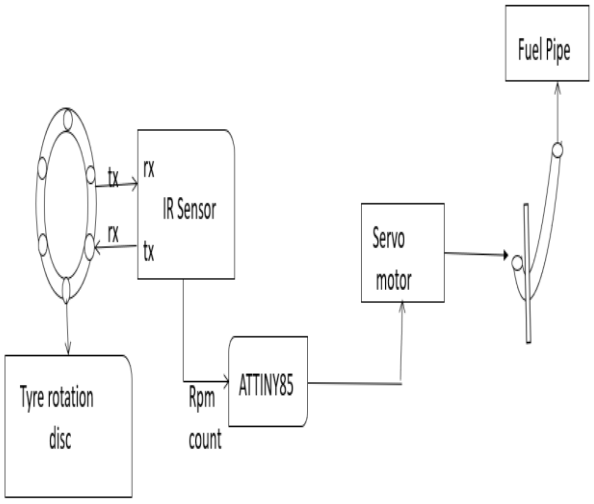

Fig 2: Attiny85 with servomotor and IR Sensor

A. Raspberry Pi 3B+

Raspberry Pi 3B+ is an advanced version of Raspberry Pi 3B model that was introduced in 2016. It is a tiny computer board that comes with a CPU, GPU, USB ports, I/O pins, Wi-Fi, Bluetooth, USB, and network boot and is capable of doing some functions like a regular computer. Features of the B+ version are almost the same as the B model however USB and Network boot and over Ethernet facility only come with the B+ model. Also, two extra USB ports are added to this device.

B. Fingerprint module

A fingerprint sensor is a type of technology that identifies and authenticates the fingerprints of individuals in order to grant or deny access to a computer system or a physical facility. It is a type of biometric security technology that utilizes a combination of hardware and software techniques to identify the fingerprint scans of an individual.

C. ESP32 Camera

The ESP32 cam Wi-Fi module Bluetooth with OV2640 Camera module 2MP for face recognition has a very competitive small size camera module that can operate independently as a minimum system with a footprint of only 40X27 mm, a deep sleep current of up to 6mA and is widely used in various IOT applications.

d. buzzer

A buzzer or a beeper is an audio signaling device that may be mechanical, electromechanical, or piezoelectric. Alarm clocks, timers, and confirmation of human input, like a mouse click or keyboard, are common uses for buzzers and beepers. A voice device known as a buzzer transforms an audio model into a sound signal.

***e.* Servomotor**

A Servomotor is a rotary actuator or a linear actuator that allows for precise control of angular or linear position, velocity, and acceleration It consists of an appropriate motor connected to a position feedback sensor. It also requires a relatively sophisticated controller often a dedicated module designed specifically for the use of servo motors.

f. IR Sensor

The IR sensor or infrared sensor is one of the kinds of electronic components used to detect specific characteristics in its surroundings through emitting or detecting IR radiation. These sensors can also be used to detect or measure the heat of a target and its motion.

g. Potentiometer

A Potentiometer is referred to as a pot. A variable resistor is a potentiometer. A three-terminal variable resistor with manual adjustment is called a potentiometer.

h. ESP8266

ESP8266 is a WIFI module, but it is actually a microcontroller. This microcontroller has the ability to perform WIFI-related activities hence it is widely used as a Wi-Fi module. We can link ESP8266 modules to the Wi-Fi network since they can function as a station. In order to create its own Wi-Fi network, it can also function as a soft access point (soft AP).

FLOWCHART:

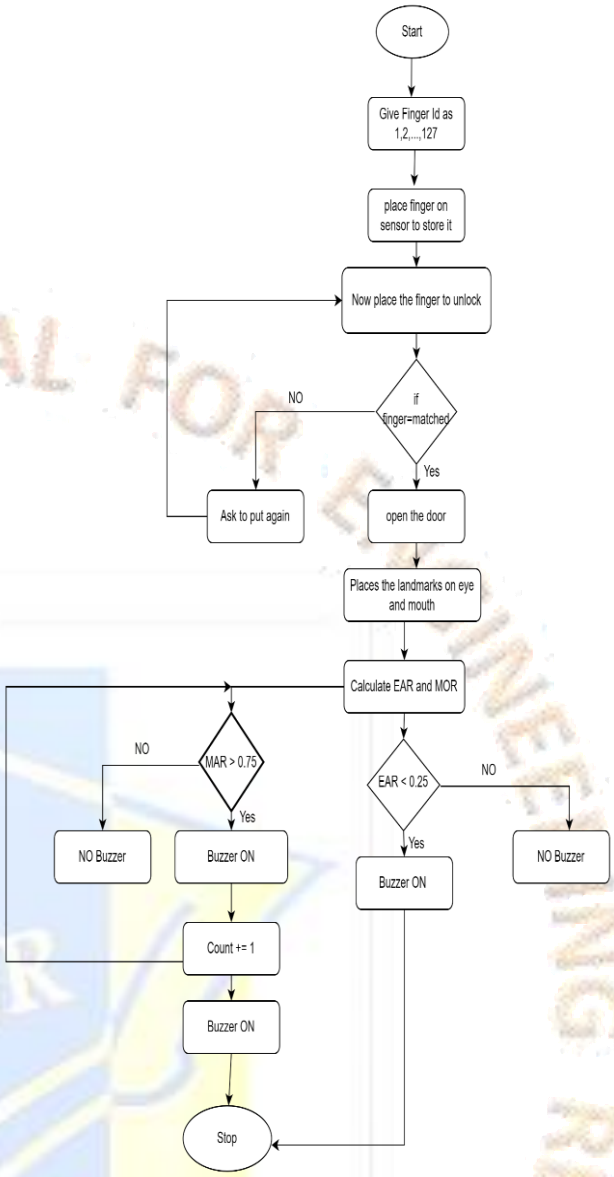

Fig 1: Finger Print and Drowsiness Detection

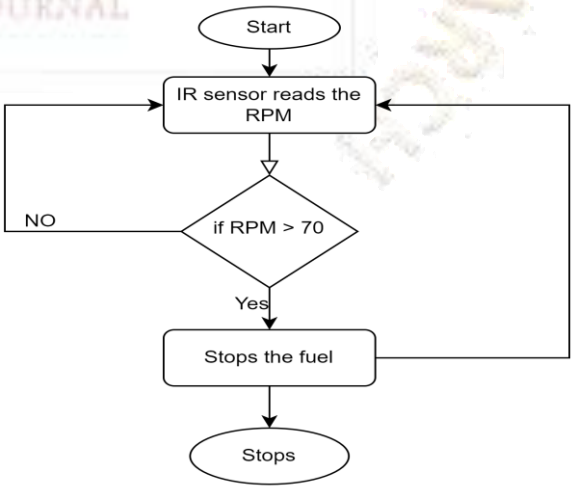

Fig 2: Speed Control

Analysis:

In this proposed paper we have analyzed that the fingerprint is detected to protect the vehicle from theft. It allows only the accessed people to drive the vehicle by storing their fingerprint images in the memory module. Next coming to the driver drowsiness, the Pi camera which is placed in front of the driver continuously checks the eye blinking frequency of the driver On the other hand, the speed of the vehicle is controlled by the servomotor which works on the principle of servomechanism.

OUTPUTS:

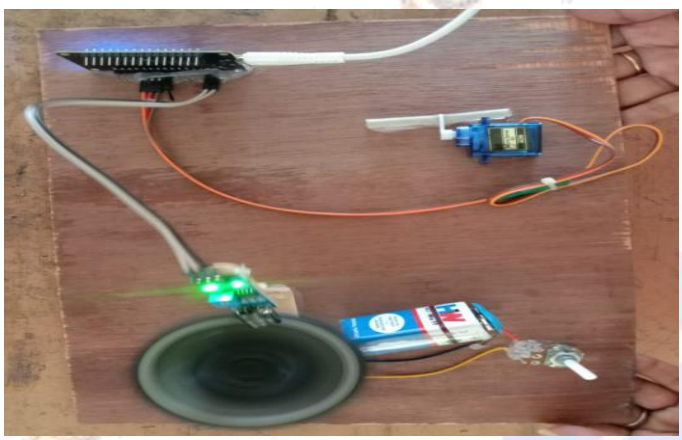

Fig 1: Servo motor stops the fuel when speed is high

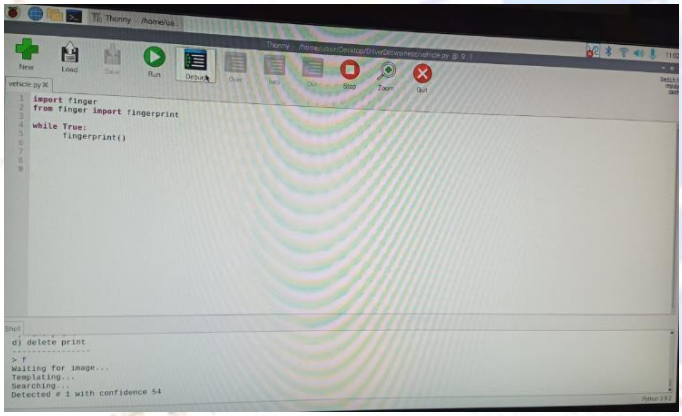

Fig 2: Fingerprint enrollment

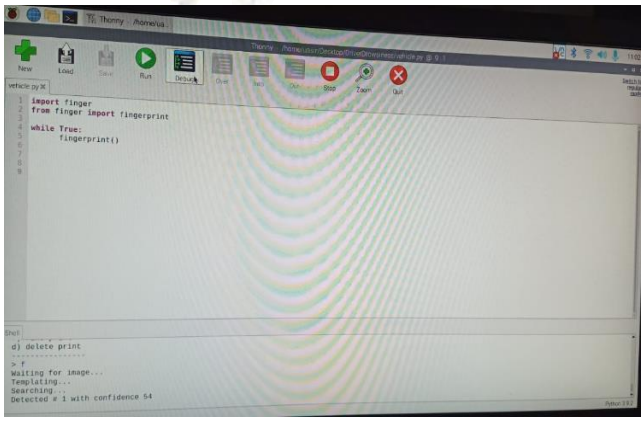

Fig 3: Fingerprint finding

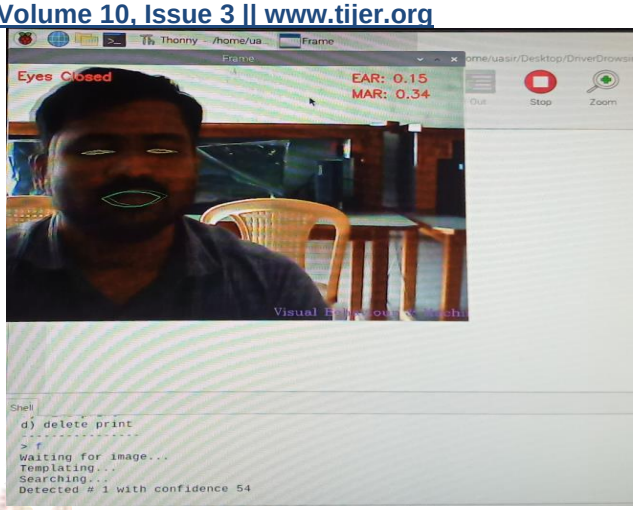

Fig 4: Drowsiness detection

v. onclusion

This paper has specifically concentrated on vehicle security and driver safety by implementing some of the major techniques and principles. This study suggests that there may be safety benefits from using this technology. However, many drivers are not aware of the limitations of their systems which may raise safety concerns. The misunderstandings evidenced in the study, such as the false assumption that systems will help avoid a collision with a stopped vehicle.

References

[1]. Satish C J1 Shivendra Pratap2: Research on Vehicular Anti-Theft Protection and Tracking System. First Semi-Annual Research Report Virginia Polytechnic Institute and State University, April 2018, NHTSA Cooperation Agreement Number DTNH 22-91- Y-07266.

[2]. Achira Gopal, V.V Vineeth: Driver drowsiness detection. Proceedings of the 13th International Conference on Experimental Safety Vehicles, November 2017.

[3]. Shubhangi Sanjay Bhargava, Monika Vijay Jadhav, Aditi Sunil Patil: Automatic Vehicle Speed Control Current Status and Future Prospects. Proceedings of IVHS America, pp. 245-256, April 2017.

[4]. P. Veera Swamy, Janu Chaitanya, K. Jaya Sai Keerthi: RF-based Speed control system for vehicles International Research Journal of Engineering and Technology (IRJET),2020.

[5]. Gopal P. Gawande, Shruti V.Gavhale, Irshad A.Zariye, Sagar P.Ritpurkar, Speed Control and Automatic Braking System, 2014(IJERT).