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Drowsiness detection with driver assistance for accident avoidance based systems

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ABSTRACT

This concept proposes a new approach to automotive safety and security with automatic car system based on autonomous region. We are proposing three concepts that are different but nearly related to a tired driver detection system and an external traffic detection system based on intrusion. In recent times, automotive crashes related to fatigue have actually magnified. We have proposed a driver alert system to minimize these issues by observing the driver's eyes and sensing using the IR sensor as well as a driver based local environment recognition using the ultrasonic sensor.

Keywords— *Drowsiness detection, Advanced driver assistance system, Driving-system design, Eyes Detection, Face Detection*

1. INTRODUCTION

This concept proposes a new approach to automotive safety and security with automatic car system based on autonomous region. We are proposing three concepts that are different but closely related. A sleepy driver Recognition system and external vehicle - based traffic detection system. In recent times, the automotive fatigue-related accident has magnified. In order to diminish these problems, we proposed a driver watchful system by watching the driver's eyes and recognizing as well as local environmental recognition. The world has faced substantial encounters in congestion and crashes with a rising number of vehicles. Current information from the World Health Organization [1] showed that every year 1.24 million persons perish from the accident.

Much study and growth of Advanced Driver Assistance (ADAS) have been shown in years. It is predictable that ADAS will bring effectiveness such as reduction of heavy load, reduction of accidents and reduction of petroleum use. The ADAS market size in 2014 amounted to US$ 4.3 billion [2], and the market will grow to US$ 60.14 billion in 2020[3], giving a report. Some countries have forced drivers on their cars to use ADAS in recent years, allowing ADAS to grow faster in the future. Several higher-performance ADAS studies have also been conducted. If these systems are executed, vehicles may not require any physical driver.

Additionally, in recent years, advanced driver assistance systems have turn out to be progressively important to prevent accidents and drive ease. They can cut traffic congestion by monitoring the traffic, which will continue to lead to autonomous driving (AD). Before the whole AD structure is accomplished, ADAS plays a significant role in automobiles and people-automobile connections will still be vital.

2. LITERATURE SURVEY

In recent ages, Advanced Driver Assistance Systems (ADAS) has developed progressively to avoid accidents and ease of driving. By smoothing traffic flow, they can also cut traffic crowding. ADAS will continue its future development, leading to autonomous driving (AD). Human-vehicle is relatively limited compared to ADAS through the steering wheel and pedals. However, ADAS will still play a vital role in vehicles until a complete AD structure is attained. And interactions between humans and vehicles will still be essential.

Second, we are setting up a framework to analyse the road situation where onboard sensors provide driver, traffic and vehicle information.

Finally, we recommended multi - hindrance detection and trailing algorithms that are supported on previous frameworks using multiple sensing elements, including radar, camera, and lidar. These sensors are consolidated using a localized fusion track-to-track approach.

We collect lidar data and then categorize hindrance into two parts to reduce the category effect and appearance of static and moving objects hindrance. Using Kalman filter, future collisions are evaluated to calculate the local path of movable obstacles,

estimate the maximum likelihood of fusing distributed local path into the global path, and finally calculate the future distribution of global track collisions. Our experimental outcomes give that our approach is effective in assessing and predicting the road situation.

Numerous selected IVS 05 issues are deliberated to provide a comprehensive summary of smart vehicle study viewpoints and advanced projects [5]. Specifically, we focus on vehicle detection developments, vehicle gesture control, and communications, as well as driver care and monitoring.

A vigorous multilane technique of finding and tracing is proposed in this study [6]. This system can report exciting circumstances by the extents provided by LIDAR. The proposed method uses steerable filters for the recognition of lane features. The similar lanes theory is introduced in order to further expand the toughness. The spotted initialize filters for tracing without perceptive of data about the motion. Due to its ease for multilane detection, the image processing events are performed in the opposite perspective mapping image. Experimental report indicates that this study's system is robust in contradiction of different driving circumstances.

3. SYSTEM ANALYSIS

3.1 Existing System

The IR sensor placed the aid of the user on the eye in complex placing the sensor directly over the eye in order to sense the problem with the system.

3.2 Drawbacks

- Compiler-performance dependent
- Poor code density
- RISC set format size instructions
- A small number of instructions

3.3 Proposed method

- Driver support system based on camera
- Detection of the availability of external vehicles
- Attention-based on human detection

3.4 Advantage

- Driver support system with user-focused cameras that offer user support free of charge.
- M2M communication systems.

4. SYSTEM DESIGN

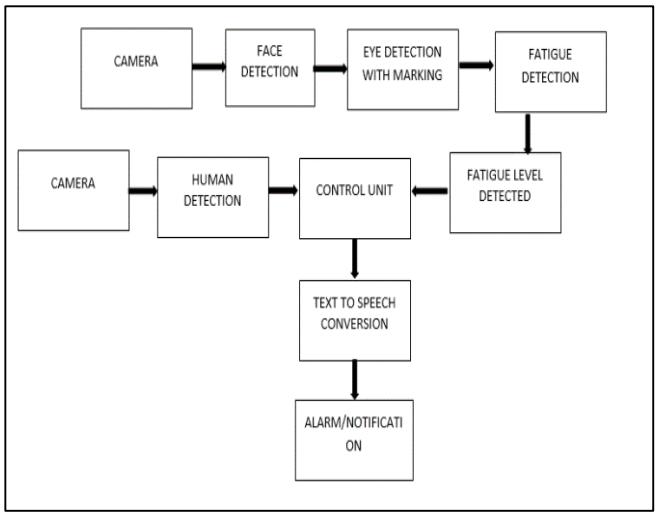

Fig. 1: Hardware flowchart

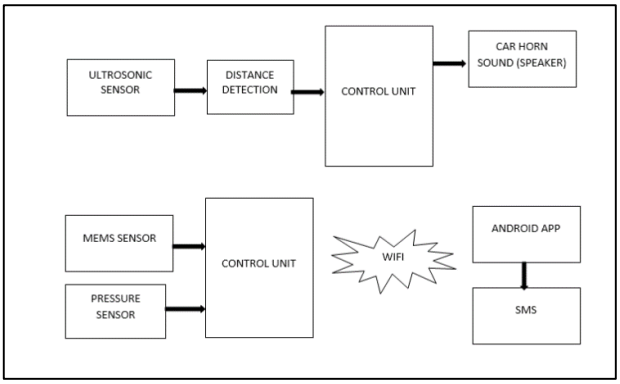

Fig. 2: Software flowchart

5. METHODOLOGY

5.1 Face detection

Since face recognition is one of the most popular areas of research, many algorithms have suggested it. Many of them are based on the same idea, considering face detection as a task of binary classification. In other words, the task is to decide, given a part of the image, whether or not it is a face. This is achieved by first integrating the given area into characteristics and then using algorithm trained on an example in this case images to determine whether these characteristics represent a human face. Because faces can appear at different locations and can also appear in varying sizes, a window - sliding method is also often used. The idea is to classify all locations and scales into the sections of a picture as a face or totally non-face extracting facial regions from the image input is a process with a standardized intensity and uniform size.

- The characteristics of the appearance are extracted from the detected facial part that describes facial changes like skin texture.
- This system model uses an executable file (.dll - dynamic URL library) file to extract the face region.
- The haar-like features and method of adaptive boosting are used for processes of face detection.

5.2 Fatigue detection

Detection of driver drowsiness is a vehicle safety technology designed to prevent driver drowsiness accidents. Most studies showed that about 20% of most road collisions involve fatigue on certain roads, up to 50%. Some of today's driver patterns can be learned and driver drowsiness can be detected.

5.3 Ultrasonic sensor

Ultrasonic sensors use ultrasonic waves to measure distance. The head of the sensor radiates an ultrasonic wave and receives from the target. Ultrasonic sensors calculate the distance to the specific target by analyzing the time of emission and receipt.

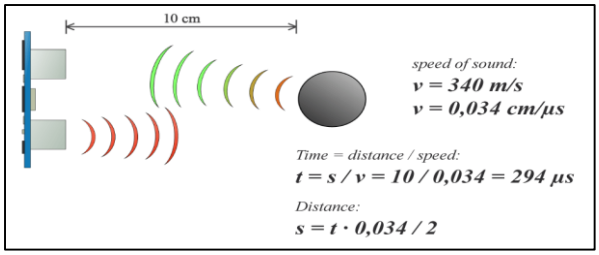

Fig. 3: Ultrasonic sensor

5.4 MEMS sensor

MEMS is a new technology which can also be represented as reduced mechanical and the other electromechanical components (i.e. devices as well as structures) which are made by microfabrication process in their simplest form.

Fig. 4: MEMS sensor

5.5 Pressure sensor

A pressure sensor is devices that measure the gas or fluid pressure against steel, silicone and so forth, as the measured values are converted into an electric signal as an output.

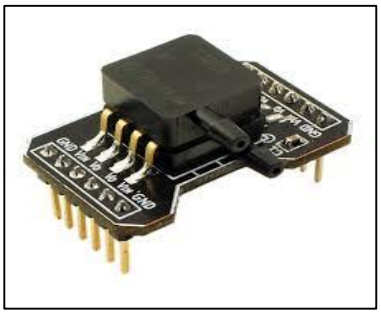

Fig. 5: Pressure sensor

6. REQUIREMENTS OF THE PROJECT

6.1 Hardware involved

6.1.1 Raspberry Pi: The Raspberry Pi Foundation in the UK is developing a small computer system in primary schools as well as developing countries for the development of information technology training. The original model is popular with applications such as robots than expected sealing outside its target market. This chapter describes the hardware modules used by the sensors and the Raspberry Pi Interface in order to control and update home automation devices. The product includes RaspBerry Pi 3 (10-bit ADC) Relay Circuit, Temperature Sensor (LM35), Light Dependent Resistor (LDR).

- Ultrasonic sensor
- MEMS sensor
- Pressure sensor
- HDMI converter
- SD card
- Monitor
- Keyboard and Mouse

6.2 Software required

6.2.1 Raspbian OS: Raspbian is a Raspberry Pi-optimized, Debian-based free operating system. The OS consists of a number of fundamental Raspberry Pi programs and tools. In June 2012, around 35 000 packages have been completed and optimized for the best possible performance given by Raspberry Pi. However, Raspbian remains in active development and focuses on enhancing more Debian packages as possible for stability and performance.

6.2.2 Python: Python is a high-level language that is used for coding purposes on different platforms like Arduino and CPython.It was created by Guido van Rossum in the year 1991. It features automatic memory management, multiple programming support including standard library.

6.2.3 IDLE: IDLE has two main types, the window Shell and the window Editor. There may be multiple editor windows available at the same time. Output windows are an edit window subtype, such as Edit / Find in Files. They still have the same top menu as the Editor windows, but they have a different default menu and title.

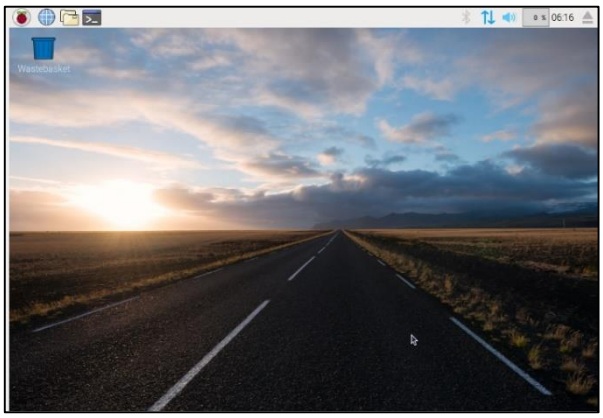

Fig. 6: Raspbian OS snapshot

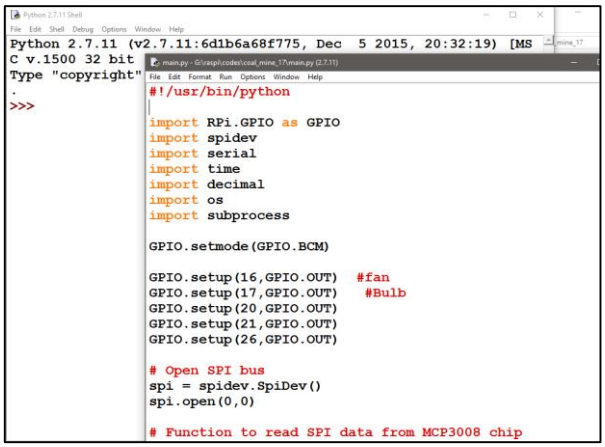

Fig. 7: Python IDLE snapshot

7. FLOW OF PROGRAM

7.1 Workflow

After completion of the hardware part and the connection let's begin.

Steps:

- Give the power supply to the Raspberry Pi module. The OS will start and the following display can be seen.
- Go to File option
- Create a folder and again create a file inside it by right click and new -> folder, type the name of the created folder.
- Copy the code written from the text and paste n the respected file.
- Locate your directory and copy the location.

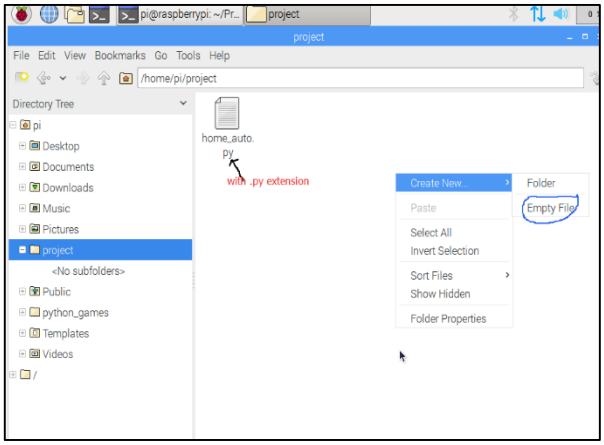

Fig. 8: Creating a Python File

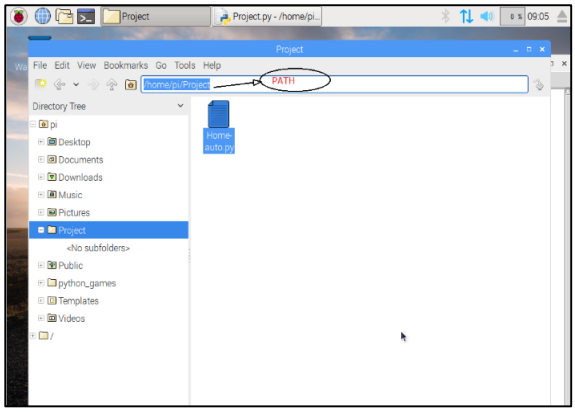

Fig. 9: Directory path

7.2 Program flow

Once the program is executed it will enter into an infinite while loop and start printing Light intensity present in the room using LDR and temperature of the room using temperature sensor and the Temperature on the terminal where the program has been executed and also on the web page (which will be discussed in the next session). If the LDR value is more than 500 i.e. less light intensity, Bulb will glow and if the Temperature sensor value is more than 150 i.e. temperature is more, Fan will be ON. If the values are less than vice-versa. Flow chart of the program is described below followed by the image of the output in the terminal.

7.3 Web Page (Installation and Connecting)

Designing a web page depends on the individual web designing language skills, we will go through a basic web page without any style using HTML and PHP language. Before starting with web designing, some software has to be set up and install in our raspberry OS. Ensure that you have an internet connection. The software's are Apache HTTP server: It is a server for hosting more than one HTTP - based websites for creating web servers.

Open the terminal and type the installation command:
sudo apt-get install apache2

Be sure with the commands all should be small letters, Linux is case sensitive and if u give capital letter it will through an error. Also when the software start installing it will say additional space will be added, Do you want to continue press "y" and enter as shown below.

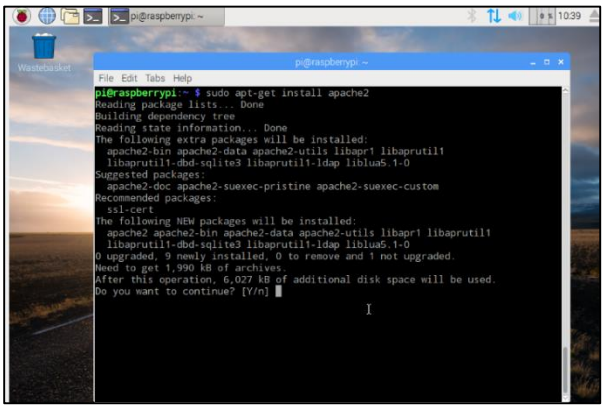

Fig. 10: Software installation

Then install PHP in our system but before that, it is good to update your system.

- ***sudo apt-get update***
- ***sudo apt-get install php5***

To connect our python program to the web server we have to install another program name WiringPi, before that we have to initialize the git-core to download WiringPi. Type the given commands:

- ***sudo apt-get install git-core***
- ***git clone git://git.drogon.net/wiringPi***
- ***cd wiringPi***
- ***. /build***

After installing the required software successfully, type /var/www/HTML in the upper box as shown below and press enter to open the apache server location.

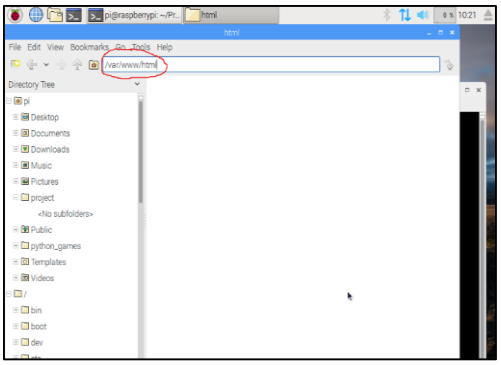

Fig. 11: Apache server location

Before creating a file, you should give administration permission, to do so type the following command in the terminal.
sudo chown pi: /var/www/HTML

Now create a file with an extension of **.PHP** and paste the source code and save it.

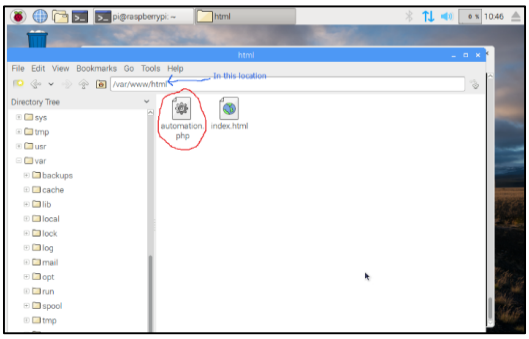

Fig. 12: Creating .php File

- Follow the steps to run the python program as mentioned in the section.
- Now to open your web page first you should know you **IPADDRESS,** for that type these following command in the terminal. ***Ifconfig***

Ensure that if you are connected to Ethernet your IP address should be under **eth0** and if you are connected to Wi-Fi it will be under **wlan0.**

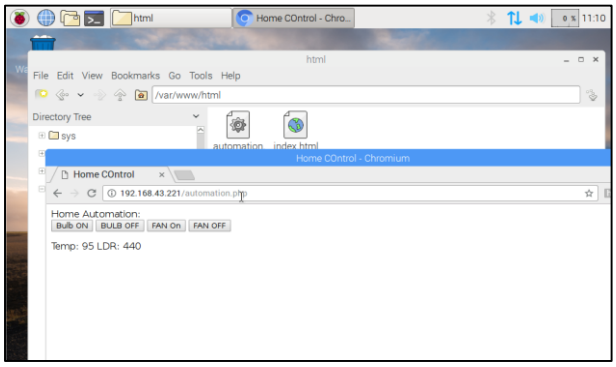

Fig. 13: Web page

- Now open your web page and type your IP address followed by your .php file in my case it is automation.
- If you are connected to the similar network you can control and see an update on any device connected to a similar network by just typing the IP address followed by .php file name as shown above.

8. FUTURE REQUIREMENTS

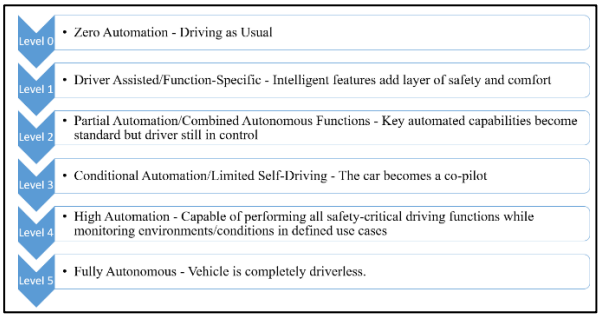

Fig. 14: Level of automation

8.1 The future of autonomous vehicles

In the coming future, the automatics cars will take the place in the society where the human or the driver will be replaced by these new automatic machines with AI-powered with high accuracy and accurate monitoring system. These systems can detect the human motion around the cars and the precautions and required steps can be taken.

8.2 Driverless cars and individual behaviour

The driverless cars will take over and will have a great impact on the world economy as the plan and the design of automatic cars are such that they are much better than human. People are not that capable of taking the stress to an extent due to which there might be a risk of accidents and these can be life-threatening. But on the other hand, the AI based cars will not have these problems or issues with the drowsiness and fatigue and they can run the vehicle without any problem for a longer period. This will same life and time will be managed in the future.

8.3 Changes in technology

In the future I expect automatic and AI-powered vehicles to be more widespread. These types of technology are upgrading day by day with different types of methods and improvements into the vehicles. These changes can be termed as the next generation of the automobiles which will be used in the whole world and these systems will include the lane monitoring, traffic control, human detection control, fatigue detection as well as a walking stick for the blind people who are not able to travel. They can also use these vehicles to go from one place to another without any hesitation and without any problem.

9. RESULT

The development of smart vehicles and the automatic driving system which can be proved very useful for mankind in the future generation. This paper includes detailed information about the working and the modelling of the technology used. In the existing system, there were some flaws which are taken care with the introduction of the autonomous vehicles. The Smart cars will detect the location and the motion of the moving objects in front of the car so that the car will take precautions and the driver and the moving person will remain unharmed.

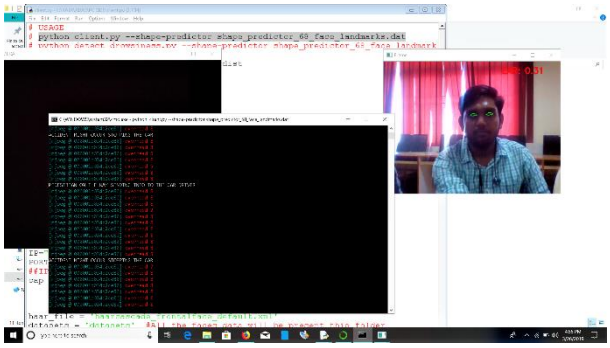

Fig.15: Detecting drowsiness Level

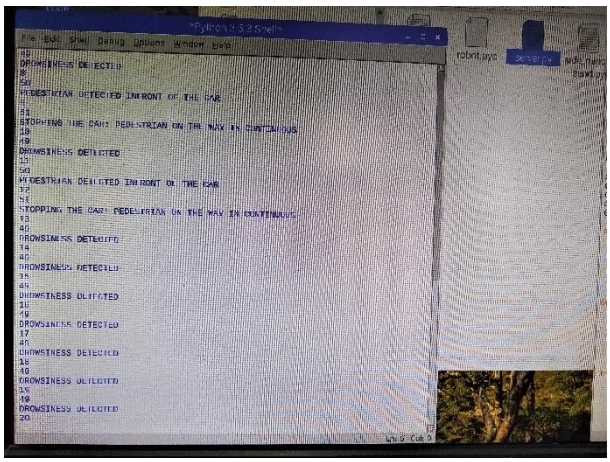

Fig. 16: Generating the output in the display

10. CONCLUSIONS

In this detailed research, we concluded the usefulness of the automatic driving system. These systems do not need any expertise driving knowledge but it will be programmed such that they will do their job with high accuracy. The ADAS will help the driver during any health issues and also in the long journey that the most drivers face i.e. fatigue which will result in a major accident. The traffics accidents will also reduce with this technology and the death ratio will also reduce. The current environment will be the best to test these vehicles at their best so that in the near future they should be more useful for the people.

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