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VEHICLE SECURITY AND ACCIDENT PREVENTION USING FACE RECOGNITION

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Abstract -In recent decades we can see that the number of accident rates due to tired driving is increasing rapidly. In addition to that, the vehicles have been stolen from various locations and the usage of vehicle by a third-party without the permission of the owner has been reported. As a solution for these two cases, we can us face recognition along with health monitoring system to control the vehicle. It is a beneficial factor for new generation because people always rely on smart equipment for making life safer and easier.

These technologies can help the vehicle owners or drivers to get away from accidents by monitoring our facial analysis such as blinking of eyes, head directions, expressions in face, can be detected by the sensors. Besides this, according to the fussy logic and artificial intelligence, the central processing and controlling unit will recognize the face to give access to the vehicle and the owner can also allow the permission remotely to use the vehicle by an external person in case of emergency, else it deny. If anyone try to start the vehicle then an alert signal will be send to the owner or to the concerned authorities. For extra accuracy, brain wave sensors are used along with the face detection.

The brain waves are accurately detected by the EEG and the algorithm used for efficient methods of face recognition is "Eigenface". Remarkably, the various types of sensors used in vehicles which are autonomous otherwise called self-driving uses GPS, radar, lidar, sonar, odometry and inertial measurement units to park the vehicle if the driver sleep.

1. Introduction

From the recent decades, the population of vehicles have been increased day by day. Due to this reason, the accident rate is also increasing simultaneously. To drive safely and securely, government and vehicle manufacturing companies eagerly implementing new technologies in the vehicles. As a part of invention of new technologies in this field, we are contributing our idea of face recognition for vehicle security and accidental prevention to enrich the advancement in automobile technology.

2. Face Recognition

To make the whole process easier, both the face detection and sleep monitoring system is incorporated into Raspberry Pi 4, which is the processing unit for face recognition. Moreover, a high definition night vision camera is connected to the processing unit to collect the face image of the person handling the vehicle. Furthermore, a dictionary of the owner's face is created as a reference image, which is compared with the face of the person sitting on the driver seat to grand permission or not.

Along with the face detection system, sleep monitoring system starts to work after starting the vehicle. The monitoring system starts focusing on the eyes of the driver to monitor the movement of it, whether the driver sleep or not. In addition with the camera, brain wave sensor connected to the processing unit is also used to sense the sleeping brain signal.

If the processing unit detects any hazardous situation of driver going to sleep, the processing unit send control signal to the vehicle control unit to prevent the cause of accident by taking the control of the vehicle and park the vehicle to a safe place.

Fig -1: Figure (Face analyzing to unlock the door)

3.

Advanced driver face processing Unit (ADFPU)

The Raspberry pi 4 is the processing unit which uses python as the language to express the 'Eigenface' algorithm. Moreover, the camera capture the image of the person handling the vehicle and then compared it with the database image (authorized person). The vehicle turns ON if the data base matches and if it finds an odd result, spontaneously a SMS request with an alert signal is passed to the registered owner's mobile number. The vehicle can be turned ON only if the registered owner grand permission to access the vehicle with a reply message. The alert signal is passed with the help of Requisition transceiver.

In addition to that, after starting the vehicle, the processor will monitor the health status of the driver, by focusing only to the eyes of the driver along with the EEG signal. This combined system can realize the moment when the driver become unconscious. Whenever the processing unit detects any hazardous situation, a control signal is passed over to the VCU and the vehicle become autonomous.

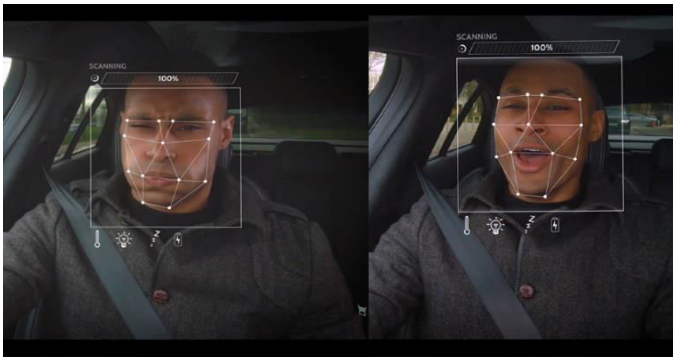


Fig -2: Figure (sleeping mood detection)

3.1 Requisition transceiver (GSM module)

The Requisition transceiver is used to send and receive command to the registered owner via SMS. It is connected to the ADFPU. The message is encoded and decoded by the processing unit.

3.2. Sensors for driver monitoring system

The sensors given below are used for monitoring physical state of the driver.

3.2.1 Camera

Driver Monitoring System is also known as Driver Attention Monitor which uses night vision camera to analysis facial expression of drivers. Moreover, in order to track face through night vision camera, the camera is fixed in the dash board. The camera will monitor the facial expression of drivers and send real time data to the processing unit.

3.2.2 Brain wave sensor

In addition to camera, brain wave sensor is incorporated. The feature of detecting brain waves to ensure the safety of the vehicle by using the technology Electroencephalography(EEG) which can analyze the brain impulses, whether the driver is conscious or not.

4. Vehicle Control Unit (VCU):

For every technologies there are control units, vehicles also have a control unit called Vehicle Control Unit (VCU). VCU has an access to each breakers that give power to sensors and components. The control unit accept activate signal from the driver monitoring system, if the driver become unconscious. Commands to the VCU is given by the on board computer integrated itself by analyzing the inputs from different sensors .The sensors mounted around the vehicle send back the collected details such as obstacles and the sensors used to detect the vehicle power train and mobility continuously gives feedback to the VCU. The VCU take the whole control of the vehicle by analyzing the inputs and take action accordingly. The initial stage of an autonomous vehicle is Advanced Driver Assistance System (ADAS) this follows the rules of road safety. It gives throttle input by analyzing the torque required by measuring the terrain condition and the vehicle torque. It manages different other task like power limiting, breaking and monitoring the road safety system. Moreover, the major key is the combination of sensors and actuators to execute the software by using powerful processors and sophisticated algorithms.

4.1. Sensors Used For Self-Driving

Autonomous vehicle should have a better vision than human beings considered as the success of technology. There are different types of sensors to support this by providing environment visuals, obstacles and so on.

4.1.1 : Camera

It always reflex the surrounding and we can believe that visuals moped by a camera never lies and it gives an accurate data. Camera is placed in every sides of the vehicle to assure safety. There are various types of cameras and some vehicles use fish-eye camera which has a wide range of panoramic vision use to detect behind images for parking. Even though they are beneficial they have certain limitations according to climate.

4.1.2: Radar

The demerits of cameras can be outweigh by radars. Mainly radars are used in ships, aircraft and weather forecasting. The waves which produced from the sensor will hit the obstacle then afterwards it moves back to the sensor by collecting the required data such as distance, speed, etc. Radar is also similar as camera, because it is placed every corners of the vehicle to detect the structure of obstacles. They cannot handle some situations without driver.

4.1.3: Laser Focus

The above mentioned two sensors are widely used in parking and advanced driving assistance. In addition to that, with the help of human supervising system the sensor can manage low levels of autonomy. Laser is used for an additional capability that can measures the distance using pulsing lasers which enhance autonomous capability. The surroundings are viewed as 3D images, it can display the obstacles, road geography and each features about environment by producing invisible lasers. The register memory in the on board computer stores data from signals which returns back continuously. Such signals produce “Point clouds” which can assure the diversity of collected data.

5. Advantages

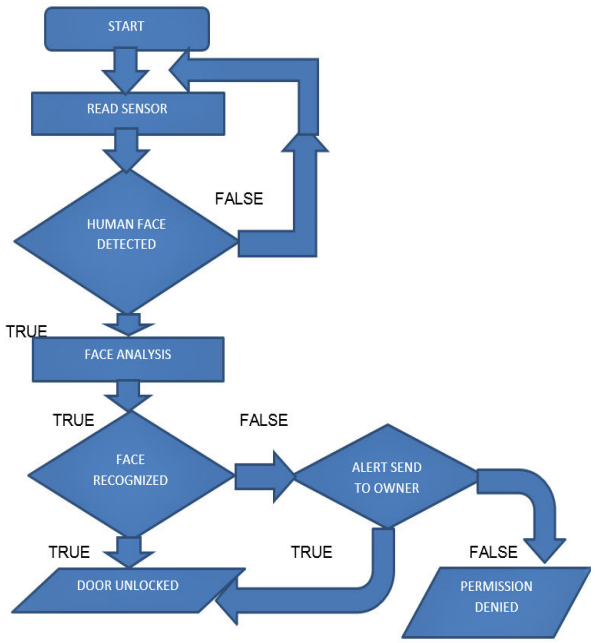
* Easy to install in every automatic vehicles

* increase the driving confidence

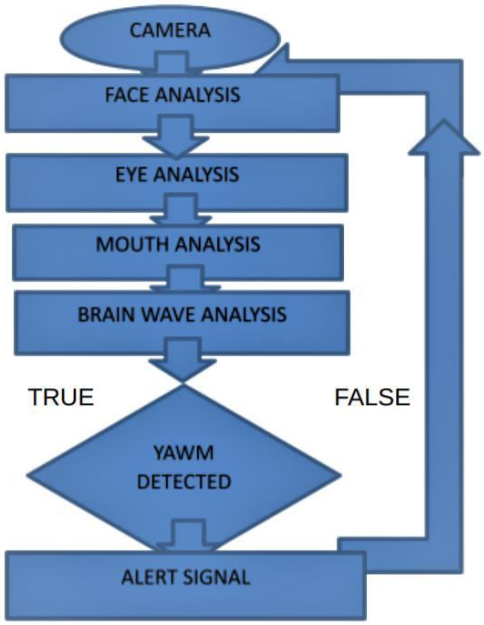
* Low installation cost

* Precise autonomous capability

6. Flow chart



6.1 Facial Recognition for Vehicle Security



6.2:Accident prevention using face recognition

7.Conclusions

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