

VIGILANCE MONITORING USING OPEN CV, PYTHON AND ACCIDENT PREDECTION SYSTEM

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ABSTRACT

Driver fatigue and collisions with other vehicles are common causes of accidents. Therefore, controlling driver fatigue and accidents is very important in terms of saving life and property. This project aims to create a driver drowsiness detection prototype using a network camera to monitor the driver, where the driver is driven by open CV and the image and video processing algorithms of the Dilib home library. If the driver falls asleep, the Arduino's vibration motor automatically decides to slow down the car and moves the car to a safe place on its own so the driver can rest, and when an incident occurs, a notification is sent to the designated contact person. This approach improves vehicle safety by integrating ultrasonic and accelerometer sensors to detect and prevent collisions. The system is designed to reduce damage and injuries by stopping the vehicle's engine in the event of an encounter with another vehicle or an accident.

Keyword: Python, Open CV, Dilib, ATMEGA328P, Accelerometer sensor, Ultrasonic sensor, Gear Motor, L298 motor driver, Sg90 Servo motor.

1. INTRODUCTION

In this model the main part of the project is using a computer with python installed and equipped with a webcam for face selling and sleep. Webcams constantly monitor faces and analyze them using computer vision algorithms to detect signs of sleep, such as eyelid drooping or yawning. Real-time analysis can instantly detect whether the computer vision algorithms are OpenCV, Dilib NumPy algorithm, and whether the embedded system reduces the driver's fatigue by moving the driver's seat with the help of vibration motor, when the driver has a warning effect due to fatigue. motor reduction. It will track the speed of the vehicle with the help of the proximity sensor, automatically move the vehicle to a safe place by monitoring obstacles with the help of the ultrasonic sensor, and in case of an accident, it will warn the predefined contacts with messages sent via e-mail via SMTP. Protocol for predefined calls and events detected by the accelerometer sensor. This helps improve the safety of human life, vehicles and property.

2.LITERATURE SURVEY

[1] Electroencephalography (EEG) for sleep research Electroencephalography (EEG) is a method for measuring the electrical activity of the brain. It can be used to measure large body movements such as heart rate, eye blinks, and even head movements. It can target humans or animals to capture active cells. It uses special equipment that places sensors on the head area to detect electrical signals in the brain. In this way, there are four types of frequencies that can be defined in EEG, such as alpha, beta, theta and delta. The increase in power in the alpha and theta bands indicates that the driver is experiencing fatigue and exhaustion. The disadvantage of this method is that it is very sensitive to noise around the sensor. For example, when people are doing an EEG test, the environment should be quiet. Noise interferes with sensors that detect brain activity. Another disadvantage of this method is that even if its results are accurate, it is not suitable for real driving use.

[2] This technique aims to learn dynamic patterns and distinguish heart rate variability (HRV) signals obtained from electrocardiogram (ECG) or photoplethysmography (PPG) sensors for research purposes. Since wearable devices are easily affected by the slightest movement, they often produce noise in the signal. Therefore, we need to find good features in the noise HRV signal to distinguish between sleep and wakefulness. To this end, we investigate three types of recurrent lines (RP) generated from the R-R interval (RRI) of the heart: Bin-RP, Cont-RP, and ReLU-RP. Here Bin-RP is a binary recurrence graph, Cont-RP is a continuous recurrence graph, and ReLU-RP is an initial recurrence graph obtained by filtering Cont-RP using the rectified linear unit (ReLU) function. Using each RP as input features for a convolutional neural network (CNN), we analyzed their effects on sleep/wakefulness. To perform the experiment, we recorded sleep and sleep RRI in a virtual driving environment using an ECG sensor on the Polar H7 band and a PPG sensor on the Microsoft (MS) band 2. The results found that ReLU-RP was the most specific and reliable sleep detection method regardless of sensor type (e.g., ECG or PPG). In particular, the ReLU-RP based CNN model shows its performance compared to other traditional models. In sleep/wake classification, ECG accuracy increases by 6-17% and PPG accuracy increases by 4-14%.

[3] Photoplethysmography (PPG) is a simple and inexpensive optical measurement method frequently used to monitor heart rate. PPG is a non-invasive technique that uses light and imaging on the skin to measure the volume of circulating blood. Recently, many researchers around the world have considered extracting important information from PPG signals as well as heart rate estimation and pulse oximetry readings. The second derivative wave of the PPG signal contains important health information. Therefore, analysis of these patterns can help researchers and doctors evaluate various cardiovascular diseases such as atherosclerosis and arterial stiffness. In addition, learning the second-order derivative wave of the PPG signal may also help in the investigation and diagnosis of various heart diseases that may occur in the future. Continuous monitoring of time for early detection and analysis of these diseases is an important method realized by the latest technology in sensor technology and wireless communication. The purpose of this article is to briefly discuss some current advances and challenges in PPG-based screening technology and then discuss some of the current capabilities for using these tools in the clinic.

3. METHODOLOGY

Drivers who drive without sleep for a long time can cause accidents. This project involves using the network to recognize the driver's face with the help of Dilib and open CV library and move the seat by sending activation signal to ATMEGA328P and using python's vibration engine and speed to drive the driver's vibration engine. After detecting the driver's fatigue, the vehicle will choose the safest place to stop and allow the driver to rest for a while. To move the car, we use the L298n engine, Sg90 servo motor, wheels and ultrasonic sensors to detect problems and move the car with the help of servo motors. Open CV is an image processing tool that uses Dilib to distribute captured images. Dilib uses various machine learning algorithms. The eye value is measured according to the human eye and eye stretch, the eye value is calculated by the webcam used at different points: P1, P2, P3, P4, P5 and P6. The final output is displayed on the screen; For example, when detecting sleep, the controller tries to vibrate the car and stops it for the estimated sleep time. The vibrator vibrates to prevent the rider from falling asleep. Using embedded and IoT technology, when an accident occurs, we can immediately measure the safety of the employee involved in the accident by notifying the contact person in advance.

Eye aspect ratio = $(P1-P2 + P3-P5) / (2P1-P4)$



Fig:Land Marks of closed eye and open eye

The Eye Aspect Ratio (EYE) algorithm using the DILIB model is used the landmarks of eye and to calculate the eye aspect ratio. The EYE value is used to determine whether the eye is closed or not. If the eye opening is less than the threshold, the embedded system will do the job by using the ATMEGA328P.

3.1 TECHNOLOGIES USED

1. Python: python is a high-resolution, general-purpose programming language. Python's design philosophy emphasizes readable code and extensive use of free space. PYTHON is dynamically typed and supports a variety of operating systems, including operating systems, operating systems, and operating systems

2. Image processing: Digital image processing on computers uses computer algorithms to process digital images.

3.IOT Technology: The Internet of Things, or IoT, is a network of physical devices. These devices can transfer data to one another without human intervention. IoT devices are not limited to computers or machinery. The Internet of Things can include anything with a sensor that is assigned a unique identifier (UID). The primary goal of the IoT is to create self-reporting devices that can communicate with each other (and users) in real time.

4.Embedded Systems: Embedded systems operate through software-hardware interactions. Software tells hardware to process data, perform calculations, and communicate with other devices. This is done with a special printed circuit board that creates hardware to perform specific tasks.

5.Libraries used:

Dilib: Dlib is mostly used for face recognition purposes. They analyzed the object/face using the functions called HOG (Histogram of oriented gradients) and CNN (Convolutional Neural Networks).

Open cv: OpenCV stands for Open-Source Computer Vision Library, an opensource computer vision and machine learning software library. It was originally developed by Intel and is currently maintained by the developer community at the OpenCV Foundation. OpenCV is a large open-source library for computer vision, machine learning, and image processing. It can process images and videos to identify objects, faces, and even human handwriting. Integration with many libraries like NumPy (the best math library) can increase the number of weapons in your arsenal, meaning anything that can be done in NumPy can be combined with OpenCV.

3.2 TOOLS USED

ATMEGA328P 8-bit AVR microcontroller with 32K bytes of in-system 002 programmable flash memory. It is one of the high performances AVR machine microcontrollers with many pins and functions. It uses 8-bit CMOS technology and RISC CPU, which improves its performance and efficiency.

Relay: A relay is an electrical switch used to turn a relay on and off. The circuit is controlled with a weak signal or multiple circuits need to be controlled with a single signal

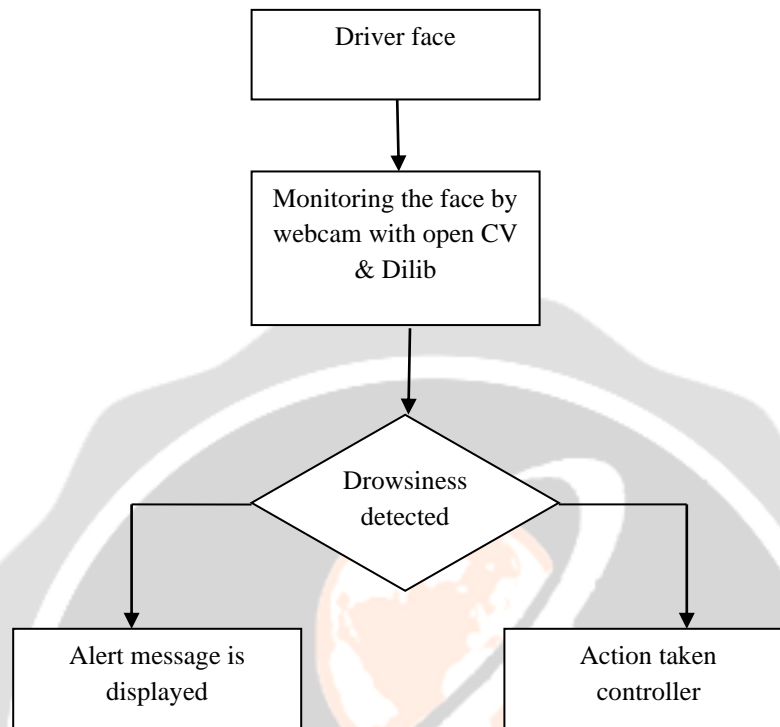
Accelerometer Sensor: Accelerometer sensor is a sensor that can measure size, damping, elasticity components. Precision Components and Adaptive Circuits. During the acceleration process, the sensor uses Newton's second law to measure the inertial force of the mass to obtain the acceleration value.

Ultrasonic Sensor: An ultrasonic sensor is an electronic device that calculates the distance to the target by emitting ultrasonic waves and converting these waves into a fire electrical signal. Transmitted ultrasonic waves travel faster than sound.

SG90 Servo Motor:SG90 Servo Motor is the output of Arduino, which is an electric motor that can control the angle of the device. SG90 is a 9g micro servo motor with a force of 1.8 kg/cm³ and a rotation angle of approximately 180.

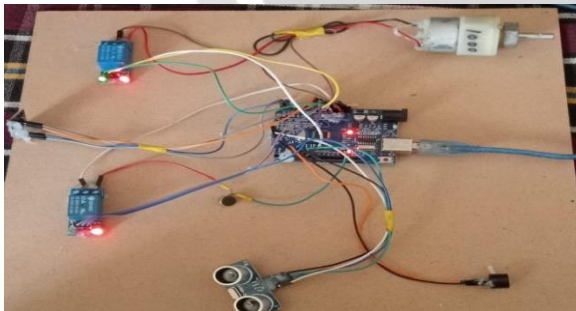
L298N motor: L298N is a DC motor and its driver is Two DC Driver of two H-bridge Motors, which can control the speed and direction of the motor simultaneously. This module can drive DC motors with voltages between 5V and 35V and a maximum current of up to 2A.

4. FLOWCHART



5.RESULTS:

5.1 Experimental kit:

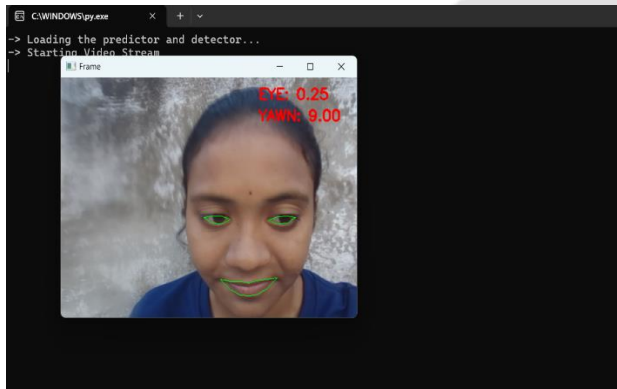


1.Drowsiness detected:

The network camera monitors sleep, and if sleep is detected, a sleep alert message is displayed and a control signal is sent to the control unit to vibrate the motor and cause the vehicle to slow down. When an event occurs, it sends a message with location information to previously mentioned contacts.



2.Drowsiness not detected:



6.CONCLUSION:

In conclusion, this project uses high-tech open source cv, python, we connect system sketch and python for instant operation. The project needs to understand the python library for drawing c use of Arduino devices, and the accuracy of the project is fast. and can instantly detect driver fatigue in a fraction of a second.

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