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Road Accident Prevention Using OpenCV

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Abstract:- Nowadays, many people are losing their lives due to fatal road accidents or due to drowsiness or fatigueness. Here fatigue can be referred to as micro sleep or sleep for a few seconds and it may lead to a huge accident due to which people can die. So it is very important to drive safely. Many times a driver who is driving a vehicle for more than the limit then he/she gets tired and even sometimes due to overeating the driver gets drowsy. In such cases the chances of occurrence of accident are more due to drowsy driving. So, In this paper, a real time drowsiness detection and alert to the driver system is described. Along with this, sometimes accidents can be occured due to overheating of vehicle engines. In such cases drivers may forget to check coolant level or due to some reason radiator and coolant level is not showing proper result while driving for a long distance. To avoid the overheating of the engine and to prevent further misfortune, the system is designed to avoid such things by giving voice messages to the driver.

Keywords:- *OpenCV, Eye Aspect Ratio, Image Processing.*

I. INTRODUCTION

Driver fatigue or drowsy driving is one of the road accident type for the road transport industry. Reason behind the accidents which occurs due to drowsiness is due to lack of sleep or when driver drive the vehicle for long time without taking break. Truck drivers, car drivers, and night shift workers are at risk of falling asleep while driving mostly at night time and most of them road accidents are occur due to the drunkenness of the driver. According to the experts it has been observed that when the drivers do not take the break they tend to run a high risk of becoming drowsy. Another problem faced by drivers is overheating of the engine. There are many causes of overheating of engines like leaks in the cooling system, condensed coolant, low level of oil, etc.

II. RELATED WORK

In the country maximum deaths occur due to road accidents. It is one of the major loss to India caused by a Human error. This contributes to significant family suffering and income for dependents and pain for a lifetime or temporary or partial. **Government** and **NGOs** have taken many activities, awareness programs, and distribution of pamphlets, posters, etc. to reduce the accident rate and by implementing various road safety programs.

One of the biggest causes of accidents and deaths is fatigue driving. Therefore, one can refer to an active research area as driver's micro sleep time. The majority of the standard ways are either vehicle, or physiological, or behavioural-based. Some methods are interrupting and distract the driver, some require sensors like Electromyography for data handling.

III. DROWSINESS DETECTION

This project provides a driver acquisition solution for drowsiness detection based on continuous eye monitoring using a camera. Micro-sleep is a short sleep time that lasts 2 to 3 seconds, which is a good sign of fatigue. So it is to monitor the driver's eyes continuously through a camera, find the driver's sleeping position, and a timely warning is issued. The system detects the driver's sleepy state and gives a warning about the status of the alarm, and then the system will reduce car speed.

Drowsiness detection is feasible by calculating the Eye Aspect Ratio(EAR). The Eye Aspect Ratio is instead a far more effective solution that involves an awfully easy calculation that supported the ratio of distances between facial landmarks of the eyes. This method for eye blink detection is quick, coherent, and straightforward to implement.

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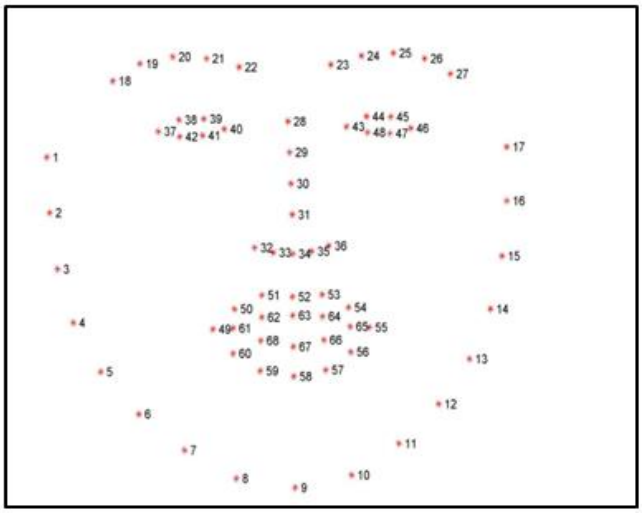

Fig. 1: Visualising 68 Facial Landmark coordinates

In terms of blink detection, we are only interested in two sets of facial structures — the eyes.

Each human eye is represented by 6 (x, y)-coordinates, starting at the left corner of the eye (as if you were looking at the person), and then working in the clockwise direction around the remainder of the region.

IV. ENGINE OVERHEATING

The cooling system plays an important role in control engine temperature. Engine overheating can be prevented by using an efficient cooling system and helps the car run in its efficiency. Failure of part of the cooling system leads to engine temperature and when the cooling level decreases heat begins. Both Environmental and energetic considerations are nowadays changing the perspective in the cooling system design. Many in fact are the possible achievable opportunities:

1. Engine warm-up period has to be limited to enhance catalytic converter efficiency (therefore limiting Pollutant emissions)
2. Lubricant temperature can be optimized and stabilized to increase engine mechanical efficiency, limiting energy losses.
3. Temperature fluctuation of the metal parts should be lowered to raise their resistance to thermal fatigue.

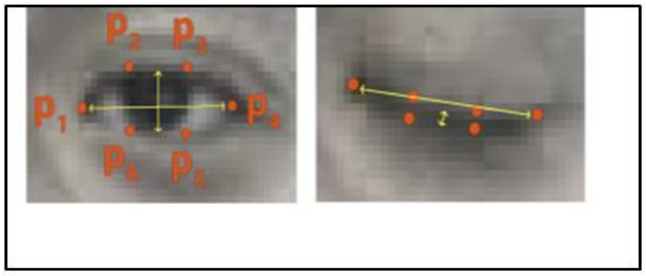

Fig. 2: Eye Aspect Ratio Coordinates

$$EAR = \frac{\|p_2 - p_6\| + \|p_3 - p_5\|}{2\|p_1 - p_4\|}$$

Fig. 3: Eye Aspect Ratio Equation

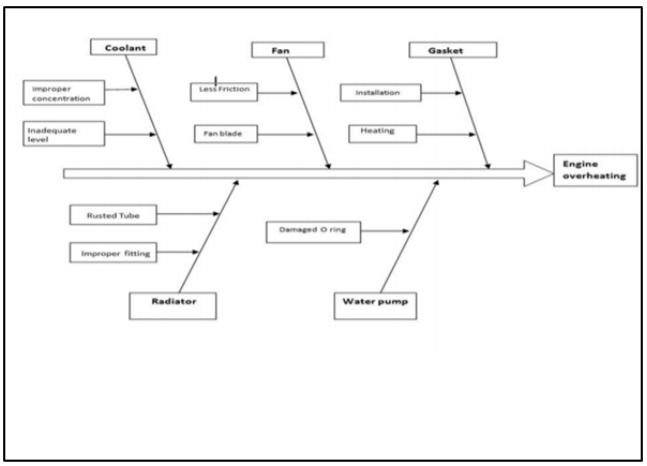

Fig. 4: Causes of Engine Overheating

V. SYSTEM ARCHITECTURE

The proposed system will give the combined solution for drowsiness detection and overheating of vehicle engines. When a driver is in a drowsy state it is more likely that an accident can happen, so after detecting a drowsy state the proposed system will reduce the speed of the vehicle. After detecting fatigueness of the driver, the system will give an alert to the surrounding vehicles. If the temperature of the vehicle engine rises then a voice message will be given to the driver to avoid the damage.

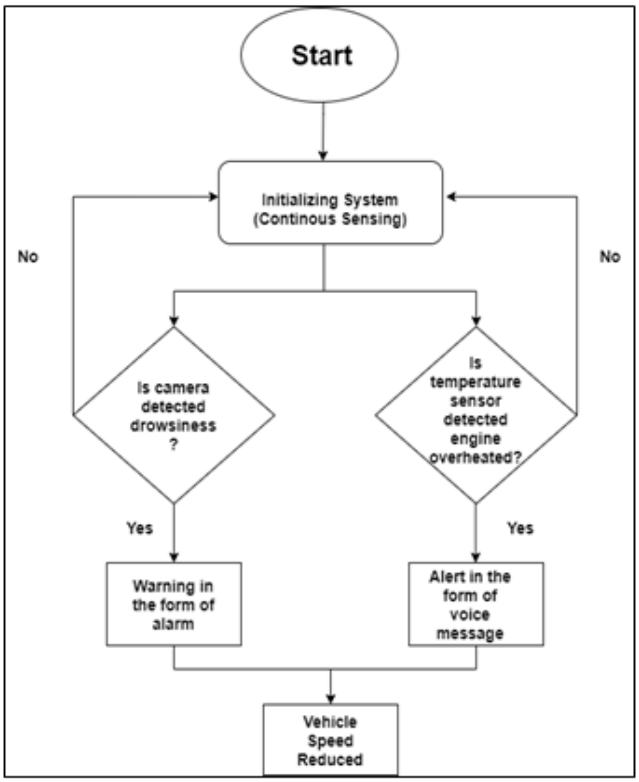

Fig. 5: Flow Chart of System

This system will be useful to maintain a safe distance between two vehicles. This proposed system can be developed in less time. The system can be designed at a low cost.

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This system can be proposed in the automobile industry. The developed system can be fixed into cabs like ola, uber, etc. Also, this system can be used in public transport to avoid the collision.

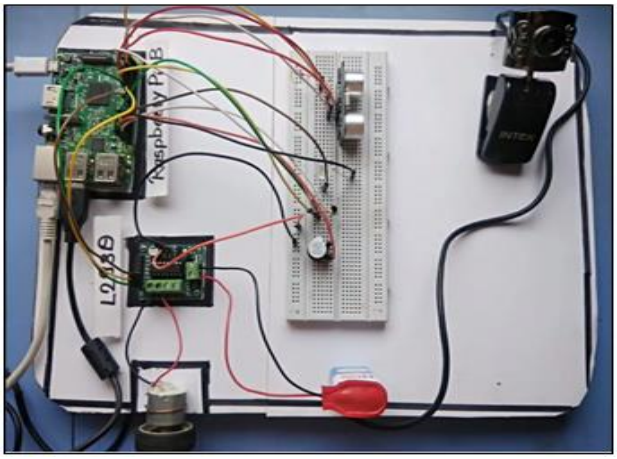

Fig. 6: System Model

VI. MATHEMATICAL MODEL

1. DROWSINESS DETECTION

The EAR i.e Eye Aspect Ratio can be calculated using a very simple formula as shown below. EAR is the best solution to calculate distance between facial landmarks.

$$EAR = ||p2 - p6|| + ||p3 - p5|| / 2*||p1 - p4||$$

where p1, . . . , p6 are the 2D landmark locations, depicted.

The EAR is mostly same when an eye is open and is getting null that is close to zero while closing an eye. It is partially person and head pose insensitive.

The EAR i.e eye aspect ratio of the open eye has a small variance among individuals and it is fully invariant to a uniform scaling of the image and in-plane rotation of the face.

Since eye blinking is performed by both eyes simultaneously, the EAR of both eyes is averaged.

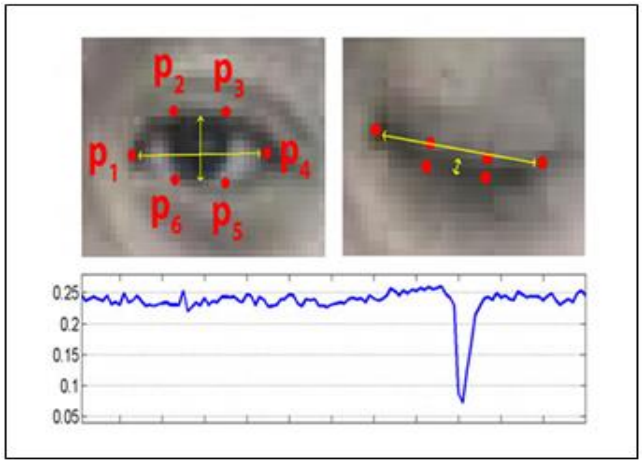

Fig. 7: Top-Left: Visualization of eye landmarks when the eye is open. Top-right: Eye landmarks when the eye is closed. Bottom: Plotting the eye aspect ratio over time. The dip in the eye aspect ratio indicates a blink.

As we will see, the eye aspect ratio is constant (indicating the eye is open), then rapidly drops to zero, then increases again, indicating a blink has taken place. In our drowsiness detector case, we'll be monitoring the eye aspect ratio to see if the value falls but doesn't increase again, thus implying that the person has closed their eyes. If the eye aspect ratio falls below certain threshold, we'll start counting the number of frames the person has closed their eyes for. If the amount of frames the person has closed their eyes exceeds, we'll sound an alarm.

2. ENGINE OVERHEATING

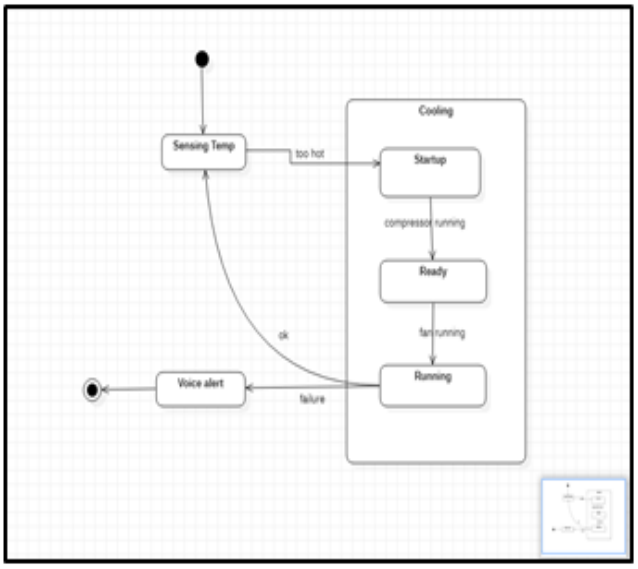

Fig. 8: State Diagram of Engine Overheating

In the initial state, the sensor will be continuously sensing the temperature. If the temperature is exceeding the threshold temperature or too hot then the cooling mechanism will start. This includes starting the compressor and fan and running both and if there is a failure with the cooling mechanism then the voice alert is given which leads to the final state.

General Description of DS18B20 :

The DS18B20 digital thermometer offers 9-bit to 12-bit Celsius temperatures also have an alarm working with a user's unparalleled potential for maximum configuration and lower trigger points. DS18B20 temperature sensor connects with a 1-Wire bus(and ground) for central microprocessor communication. Also, the DS18B20 can get power directly in the data line ("parasite power"), which stops the need for an external power supply.

Each DS18B20 has 64 unique serial code, viz allows multiple DS18B20s to operate on the same 1-Wire bus. Therefore, it is easy to use a single microprocessor to control many DS18B20s distributed over a large area. This feature benefit many applications like HVAC environmental controls, temperature monitoring systems within buildings, equipment, or machinery, and system monitoring and control systems.

VII. SOFTWARE USED

Software used for the proposed system contains microcontroller Raspberry pi 3 B model, Raspbian OS with installation of python, OpenCV library for image processing and libraries such as CV2, videostream, dlib library for face recognition.

Along with this some sensors are required which includes external camera module,temperature sensor DS18B20, buzzer for alert, jumper cables, GPIO pins and package.

GPIO i.e General Purpose Input Output pins can be used to accept or source various logic voltages.

VIII. CONCLUSION

Purpose of our project is to help solve real life problems in a very cost effective way. Whenever the driver feels drowsy and closes his eyes for more than a second, the buzzer is blown. As a result, it alerts the driver. And if vehicle engine gets overheated then alert in the form of voice message will be given to the driver.

This system is useful in the prevention of road accidents so that many lives can be saved. The system can be made within a short period of time.

REFERENCES

[1]. Singh, I., & V.K.Banga, P. (2013, August). Development of a drowsiness warning system using a neural network. Retrieved April 26, 2021, from https://www.rroij.com/open-access/development-of-a-drowsinesswarning-system-using-neuralnetwork.php?aid=41896

[2]. Ibrahim, O., ElGendy, H., & ElShafee, A. M. (2011).Speed Detection camera system using image processing techniques on video streams. International Journal of Computer and Electrical Engineering, 771-778. doi:10.7763/ijcee.2011.v3.418

[3]. Jackson, K. F. (2012, June). Development and evaluation of a collision avoidance system ... Retrieved April 26, 2021, from https://hal.pratt.duke.edu/sites/hal.pratt.duke.edu/files/u13/Development%20and%20Evaluation%20of%20a%20Collision%20Avoidance%20System%20for%20Supervisory%20Control%20of%20a%20Micro%20Aerial%20Vehicle.pdf

[4]. Yadav, V., Teli, A., Darvesh, G., Baraskar, R., & Kumar, M. (2020, February). Smart Road Safety and Vehicle Accident Prevention System for Mountain Roads. Retrieved April 26, 2021, from https://www.irjet.net/archives/V7/i2/IRJET-V7I2622.pdf

[5]. Jamil, T., Mohammed, I., & Awadalla, M. H. (2016). Design and implementation of an eye blinking detector system for automobile accident prevention. SoutheastCon 2016. doi:10.1109/secon.2016.7506734

[6]. Priyanka, S., Hemalatha, G., & Saranya, C. (2017). Sudden unintended acceleration avoidance and drowsiness detector for automobile accidents prevention. 2017 Third International Conference on Science Technology Engineering & Management (ICONSTEM).

[7]. Adla, R., Al-Holou, N., Murad, M., & Bazzi, Y. A. (2013). Automotive collision avoidance methodologies sensor-based and its-based. 2013 ACS International Conference on Computer Systems and Applications (AICCSA). doi:10.1109/aiccsa.2013.6616458

[8]. Momin, Md.Sourove Akther & Kader, Golam & Roy, Pratik & Hasan, Md & Zuhane, Md. (2016). International Journal of Research Automatic Signal and Alarming System To Avoid Engine Overheating. International Journal of Research.

[9]. Itenderpal Singh, Prof. V.K.Banga, (Page No: 3614-3623) DEVELOPMENT OF A OF A DROWSINESS WARNING SYSTEM USING NEURAL NETWORK. International Journal of Advanced Research in Electrical, Electronics (An ISO 3297: 2007 Certified Organization) Vol. 2, Issue 8, August 2013)s

[10]. Hoyoung, L., Rosebrock, A., Jalil, A., Harsha, Shukla, A., Paruchurisaikrishna, . . . (Faster) Facial landmark detector with dlib - PyImageSearch says:. (2021, April 17). Drowsiness detection with OpenCV. Retrieved April 26, 2021, from https://www.pyimagesearch.com/2017/05/08/drowsiness-detection-opencv/

[11]. Kumar, A., & Patra, R. (2018). Driver drowsiness monitoring system using visual behaviour and machine learning. 2018 IEEE Symposium on Computer Applications & Industrial Electronics (ISCAIE). doi:10.1109/iscaie.2018.8405495

[12]. J. M. Kumar, R. Mahajan, D. Prabhu and D. Ghose, "Cost effective road accident prevention system," 2016 2nd International Conference on Contemporary Computing and Informatics (IC3I), 2016, pp. 353-357, doi: 10.1109/IC3I.2016.7917988

[13]. Kirk, M. (n.d.). Department of computer science and technology. Retrieved April 26, 2021, from https://www.cl.cam.ac.uk/projects/raspberrypi/tutorials/temperature/