International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 04 | Apr-2018 www.irjet.net p-ISSN: 2395-0072

Improvising Reliability of Autonomous Car using Risk detection

Naga Digvijay Kumar G[1], Rupesh Reddy T[2], Karthikeya Gupta P[3], Ravi Kiran Y. A.[4]

Mr. Mohan Gowda[5]

[1,2,3,4]*U.G Student, Fourth year, Department of Computer Science, GITAM School of Technology, GITAM University, Bangalore, Karnataka*

[5]*Assistant Professor, Department of Computer Science, GITAM School of Technology, GITAM University, Bangalore, Karnataka*

Abstract-*Technology has become a catalyst in health care system. The human reliability factor on machines has become a very important question. As we all know autonomous cars have moved from the future technology to presently used technology. There is a lot more space in the room to develop the overall system. Blending the technology, with the correctly measured software systems leads us to the accurate machines. In this project a micro controller is used to communicate several different modules to detect whether a person is going through fatigue conditions or distracted or in a medical emergency. When the system detects a person is going through any of the above mentioned conditions the system control goes from Manual mode to Auto mode and this information is sent to caretakers and doctors.*

1. INTRODUCTION

As per statics 40% of daily accidents are occurred due to fatigue reasons. According to studies there are more chances of getting accidents whenever driver is distracted for more than 2 sec. The advances in the image processing technology help us to continually observe the user's health parameters. They provide vital information helping us to monitor and analyze his/her state. In the era of human life, the demand of automated cars is increasing enormously, along with this the opportunities to minimize on road associated risks is also increasing. The advantage of using a drive less car is that it helps to be on road moving even when the passenger or driver is unwilling to drive. But there are instances where the driver will be in control of the car and a situation arises where it would have been better if the car was under control to avoid a potential accident. It is this boundary which we try to explore where our paper discusses a potential solution which can be implemented so that the car will be able to identify such an instance and take the appropriate actions.

The advances in image processing technology help us to continually observe the onboard driver using the camera on the dashboard. The collected data is calculated and the decision is taken based on the outcome of the system. When the system detects any abnormality in the user behavior the system control goes to Auto mode from Manual mode. Also, an alert message is then sent to doctor, caretaker alerting the person's condition.

2. Literature survey

Singh Himaji Paramar, from Govt. Engineering College, Bharuch, has proposed his idea on Drowsy Driver Warning System using Image Processing. Many road vehicle crashes are occurred due to drowsiness of driver and his distraction.

He proposed few methods which can be implemented to detect the drowsiness of the driver. They are: Localization of Face, Localization of Eyes using Raster Scan Algorithm, Tracking the eyes in the subsequent frames, Detection of drowsiness Dr.Kanniga Professor gives a solution for monitoring the patient in any place.

This System would constantly monitor important physical parameters like Temperature, Heartbeat, and Pressure and would compare it against predefined value set and if these values cross a particular limit it would automatically alert the doctor via SMS.

T. Thanya, proposed system architecture for continuous monitoring of heart problem patients. They use hardware of Arduino which consist of Wi-Fi module, Pulse Oxy Meter Sensor which combines the simple optical heart rate sensors and noise cancellation circuitry and through this it will get reliable pulse regarding which uses only 4mA current and good mobile application.

As Abhinaya Balaji author catch-point's blog mentioned his views on MQTT Protocol. It is a publish/subscribe-based lightweight protocol for machine communication on top of the TCP/IP Protocol. This gives a persistent connection to their servers without killing battery life. It offers 3- Qualities of Service Levels (QOS) when compared to the HTTP. It has simple commands, small headers with a compact binary headers size of 2 bytes and it offers one too many distributions.

The above existing methods make use of complex algorithms and techniques which can also be performed by making using of simple mathematical equations and some image processing tools. Our proposed system eliminates the use of heavy hardware and relies on API's and basic microcontrollers to obtain a system that is much more efficient and simple.

3. SYSTEM DESIGN

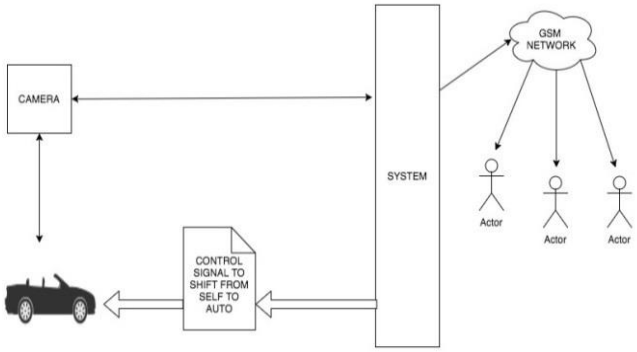

Fig: 1 (System Architecture)

Our system makes use of the Raspberry Pi technology as the central component that is plugged together with all the other modules. These other components consist of camera module, car, and SMS technology.

The onboard camera will monitor the driver and provide the individual frame data to the system. After this our algorithm will work on each individual frame of the video feed and try to identify the drowsy condition. The system initiates a control signal to the auto-pilot unit of the autonomous car when the drive is drowsy and hence activates auto mode. Once the auto drive mode is activated by our system the car is now in control and the drive will be free from the potential risk of an accident that could have happened if the driver was still manually controlling the car. Along with changing the drive mode, we are also making using of the SMS technology to send the driver's status to registered caretakers. The sending of an SMS from the system happens by means of using a cloud communication website which provides us with an API that can be added to the algorithm to get the required service. An optional feature that can be added to our system is to also alert the onboard driver when he is drowsy, this can happen by means of an alarm or large text being used to display the warning sign on the car onboard screen.

4. IMPLEMENTATION & OBSERVATION

The facial detection and the drowsiness condition identification is done by the utilization of OpenCV 3 and Dlib C++ packages. OpenCV Haar Cascades are used for the purpose of identifying a face in a frame of the video. We make use of the Dlib package to locate certain key facial features on a face this is done by tracing out points for these areas as follows:

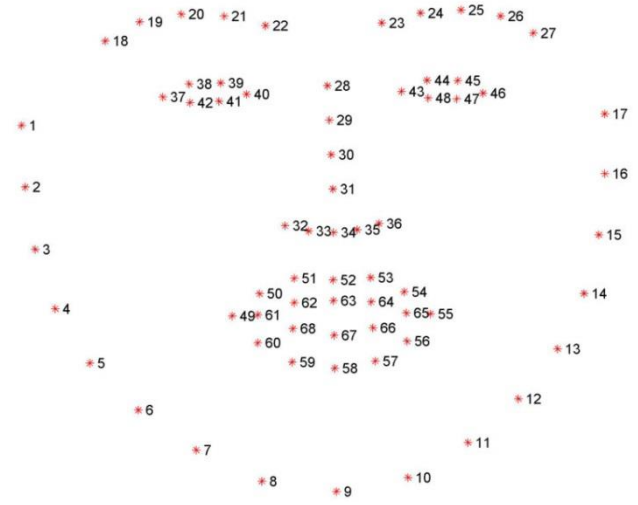

Fig: 2 (Dlib facial feature points)

The points corresponding to the eye area which are the points that are required to implement our algorithm are as visualized in the left top corner clip of below image:

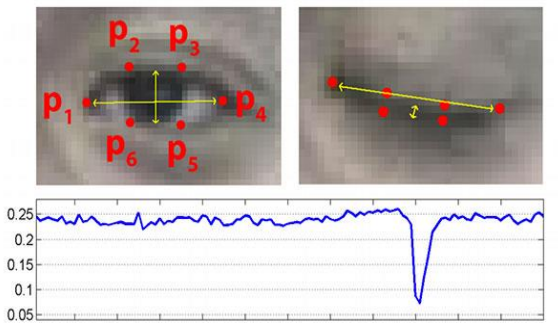

Fig: 3 (Eye points and EAR graph plot)

The algorithm used in this project to detect if the eye facial feature is closed or open is done by an equation called the EAR (Eye Aspect Ratio) which is as follows:

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

The beauty of this equation is that as long as the eye is open the value of the EAR equation will be almost at a constant value, but once a person blinks (as shown in fig 3) or closes his eye the distance between the points P2-P6 and P3-P5 will decrease and the distance between the points P1-P4 will remain large due to which as the denominator of the equation is large and numerator is a small value, then the value of the equation will fall drastically. Now if we start incrementing a COUNTER variable for every continuous frame in which the person's eye is closed and once this value exceeds the threshold which we set, then our drowsy condition is met and the necessary actions can be taken.

Our secondary objective of sending a SMS to the driver's respective caretakers is done by making use of "Twilio" an online cloud communications website for sending programmable SMS , "Twilio" provides us with an API, which can be imported into our code and lets us send custom messages to multiple registered caretakers. Twilio provides us with a dummy number which can be used as the message originator. Once we create an account in "Twilio" it provides us with an ID and an authentication sequence which have to be added in our code, these authentication sequences help us to register and log all the SMS sent from the code to who all added in the account, so as to receive messages. Twilio also provides us with a bug or error displaying screen which can be used to identify in which cases the messages sent have failed to which particular persons.

5. Result and Discussion

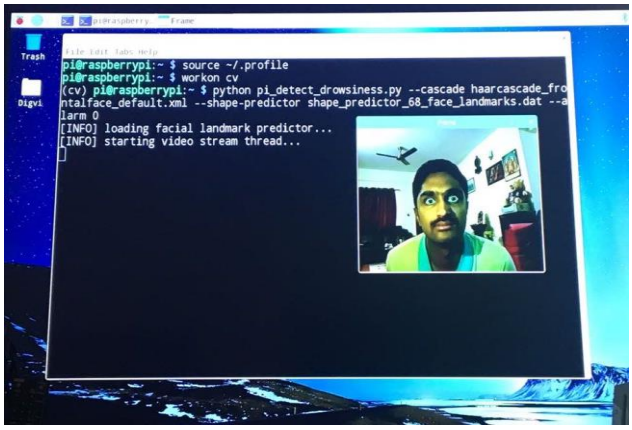

Fig: 4 Normal condition (Eye convex open)

Once the system is running, the eye regions are continuously monitored and hence the bounding lines around the eye are wide open.

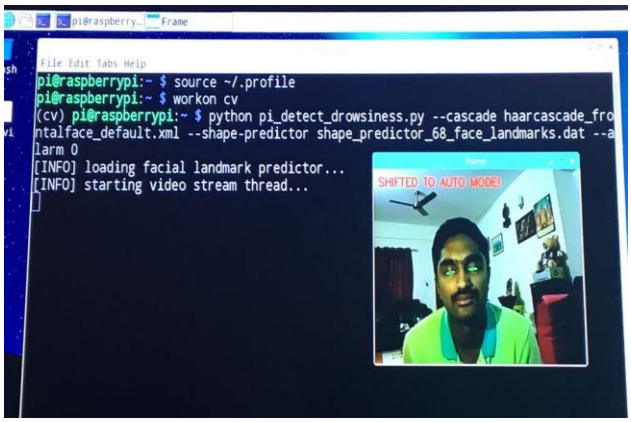

Fig: 5 In drowsiness state (Eye convex closed)

When drowsy condition is met, we observe that the bounding lines also shrink and then the respective actions are taken. Here the screen is indicating that the car is now in auto-pilot mode.

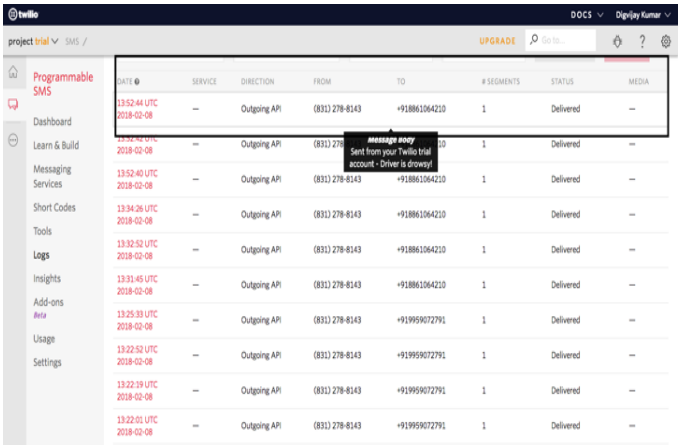

Fig: 6 (Log of sent messages)

The above figure shows the messages which are sent by the Twilio service. The black rectangle box in the image shows the latest message which was sent by the system when the driver was drowsy.

The following image shows the received message in the phone of the person who was added as the receiver as shown in previous log screenshot.

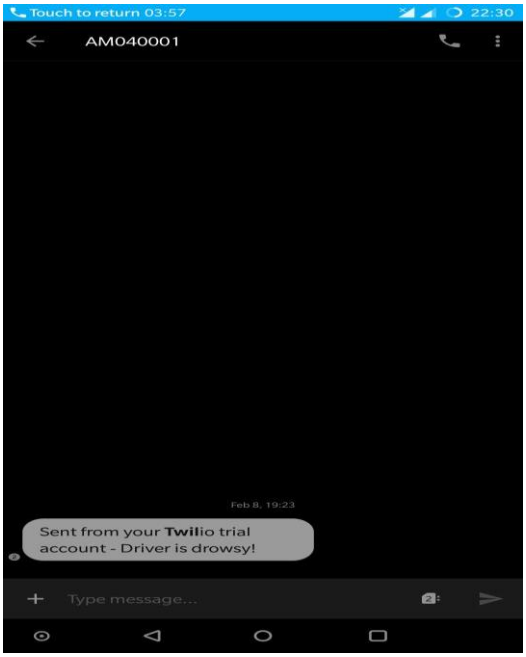

Fig: 7 (Message screenshot on mobile)

6. Conclusion

In this paper we have implemented a safety enhancing feature for an autonomous car where if the driver on board is found to be drowsy and unfit to drive then the car automatically takes control of itself from the manual drive mode. The use of the raspberry pi technology has provided us with the advantage of adding this system to the car in an easy manner and also the price required is feasible for practical use.

This technology will be especially useful for people who stay on road for a long time or which are not getting the required amount of rest for the number of hours spent on road. By adding this system to a self-drive car, we exploit that thin boundary between shifting from a manual drive to an auto drive mandatorily when the driver's safety is at risk. An additional function implemented is to notify the car driver of the transition, also with addition of a message sending facility to caretakers so that by intimating the respective concerned people, further concern can be provided for the driver and if any secondary attention is need for the onboard person in the car then the caretakers can handle it.

REFERENCES

[1] Singh Himaji Paramar et al. "Drowsy Driver Warning System Using Image Processing" International Journal of Engineering Development and Research

[2] Neeha Khan et al. "Fatigue Detection System Using image processing on video sequences" International Journal of Engineering Research and Technology.

[3] Francesso Azzola "MQTT Protocol Tutorial"

https://www.survivingwithandroid.com/2016/10/mqtt-protocol-tutorial.html

[4] https://www.pyimagesearch.com/2017/10/23/raspberry-pi-facial-landmarks-drowsiness-detection-with-opencv-and-dlib/

[5] Miss Kanchan Manohar Sontakke "Efficient Driver Fatigue Detection and alerting System International Journal of Scientific and Research Publications.

[6] Vijayalaxmi, D. Elizabeth Rani, "Driver Fatigue Estimation Using Image Processing Technique" I.J. Information Technology and Computer Science, 2016, 6, 66-72

[7] http://blog.catchpoint.com/2017/05/30/protocol-for-internet-of-things/

[8] T.THANYA, P.NIRMALA, "IOT BASED PATIENT LIFE SECURE SYSTEM", International Journal of Management and Applied Science, Volume-3, Issue-3, Mar.-2017

[9] Gurjashan Singh Pannu et.al "Design and Implementation of Autonomous Car using Raspberry Pi" International Journal of Computer Applications.

[10] https://www.hivemq.com/blog/how-to-get-started-with-mqtt

[11] Prakash Choudhary et.al "A Survey Paper On Drowsiness Detection & Alarm System for Drivers" International Research Journal of Engineering and Technology (IRJET).

[12] Mohamad-Hoseyn Sigari, Mahmood Fathy, and Mohsen Soryani "A Driver Face Monitoring System for Fatigue and Distraction Detection" Hindawi Publishing Corporation International Journal of Vehicular Technology.

[13] Jay D. Fuletra, Bulari Bosamia: A Survey On Driver's Drowsiness Detection Techniques presented at IJRITCC

[14] VIOLA P, JONES MJ. 'Robust real-time face detection'. Int. J. Comput. Vision. 2004; 57: 137–154

[15] W. Horng, C. Chen, Y. Chang, et al. "Driver fatigue detection based on eye tracking and dynamic template matching" International Conference on Networking, Sensing & Control. IEEE