GAN Implemented for Image Monitoring

[1]Hasan Tashif, [2]Vanashri Kulkarni, [3]Dylan Felix, [4] Deeksha Suresh, [5]Thyagaraj Tanjavur

[1,2,3,4]B.E.Students, [5]Assistant Professor
Department of Electronics and Communication,
B.M.S Institute of Technology and Management, Bangalore, Karnataka, India

***Abstract*: This project aims to deliver a distraction monitoring system for the logistic company to keep track of the driver's performance and give rating on a regular basis accordingly. Every year, many car accidents due to driver fatigue and distraction occur around the world and cause many casualties and injuries. Driver face monitoring systems is one of the main approaches for driver fatigue or distraction detection and accident prevention. Driver face monitoring systems capture the images from driver face and extract the symptoms of fatigue and distraction from eyes, mouth and head. These symptoms are usually percentage of eyelidclosure over time (PERCLOS), eyelid distance, eye blink rate, blink speed, gaze direction, eyesaccadic movement, yawning, head nodding and head orientation. The system estimates driver alertness based on extracted symptoms and alarms if needed. In this paper, after an introduction to driver face monitoring systems, the general structure of these systems is discussed. Then a comprehensive review on driver face monitoring systems for fatigue.**

***Index Terms*: driver drowsiness, GAN, Machine Learning Model, python, openCV**

I. INTRODUCTION

This project aims to deliver a distraction monitoring system for the logistic company to keep track of the driver's performance and give rating on a regular basis accordingly. With online shopping and many logistics in the rising. A single accident can incur heavy losses to the supply chain. so this project will target the logistics company that can monitor their driver's performance in real time.
Our project proposes a solution to monitor the drivers of the logistics company on a real time basis.It is done by analyzing facial and cognitive distraction experienced by the driver which is explainedin the first few chapters and how his driving performance affects several factors within the company. We will also be providing driver performance data on the cloud and the data is parallelly stored on the database. This processed data is visualized via mobile application and is explained in detail in the last few chapters.
The driver data can be used for allotting performance based salary for drivers in the logistic department or another use case is for insurance companies to assess their clients if the client is a good driver for insurance to be provided to the client.
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II. OBJECTIVES

With online shopping and many logistic companies on the rise, a single accident can incur heavy loss to the supply chain department and not only disrupts the flow of the supply chain, but also causes injury to life and damage to property. These accidents occur primarily due to driving while feeling distracted or drowsy and it is paramount to monitor such behavior to avoid drastic outcomesin case of driving heavy duty vehicles. Therefore, it is natural for logistic companies to invest in securing their goods and ensuring that there is safe transportation of goods.
The objective of our project is to provide a novel solution to handle the aforementioned problems by monitoring the driver's performance by analyzing the facial features of the driver in real-time while storing the event-triggered data in the cloud and using the cloud services to send mobile alerts when the driver is drowsy or distracted via a mobile application in a cost effective and in an efficient manner.

III. PROBLEM STATEMENT

Driver Fatigue is often caused by four main factors: sleep, work, time of day, and physical.

- Often people try to do much in a day and they lose precious sleep due to this.
- Often by taking caffeine or other stimulants people continue to stay awake. The lack of sleep builds up over a number of days and the next thing that happens is the body finally collapses and the person falls asleep.
- To solve this problem we used this to detect the GAN Implemented for Image Monitoring.

IV. LITERATURE SURVEY

To understand the concepts and the work that has already been carried out, it is important to do a literature survey on the existing work in this field. Several research has been done in this field or related to this field that supports as a base to undertake this project. We found out certain limitations in the previous existing system. Few of them are:-

- If car technologies are going to prevent or at least warn of driver fatigue, what symptomsdoes the driver give off that can be detected
- According to research, there are multiple categories of technologies that can detect driverfatigue. The first is the use of cameras to monitor a person's behaviour. This includes monitoring their pupils, mouth for yawning, head position, and a arietyof other factors.
- The next of these technologies is voice recognition. Often a person's voice can give off clues on how fatigued they are. The detail explanation of the underlying techniques of drowsiness detectionthat are mostly used for the detection purpose

V.METHODOLOGY

1. SYSTEM REQUIREMENTS

1.1SOFTWARE REQUIREMENTS

- Python IDE
- Open CV
- DLib
- SolvePnP

1.2HARDWARE REQUIREMENTS

- Raspberry Pi
- RPi Camera

2. SYSTEM ANALYSIS & IMPLEMENTATION

2.1 SYSTEM ANALYSIS

This project gives sole emphasis on the topic of distraction detection using computer vision, cloud storage and Database Management System.

The onboard driver monitoring will be used to check the state of the driver to see if he is feeling drowsy or is experiencing any form of distraction while driving. This is done through Computer Vision using a Deep Learning Technique called Convolutional Neural Network (CNN) which is used in the majority of the research nowadays due to its high efficiency and accuracy.

The OpenCV libraries that are used for facial recognition and processing of the captured image from Raspberry Pi (RPi) cameras are DLib and SolvePnP. The RPi camera which captures the image is also processed on the Raspberry Pi which acts as an edge device.

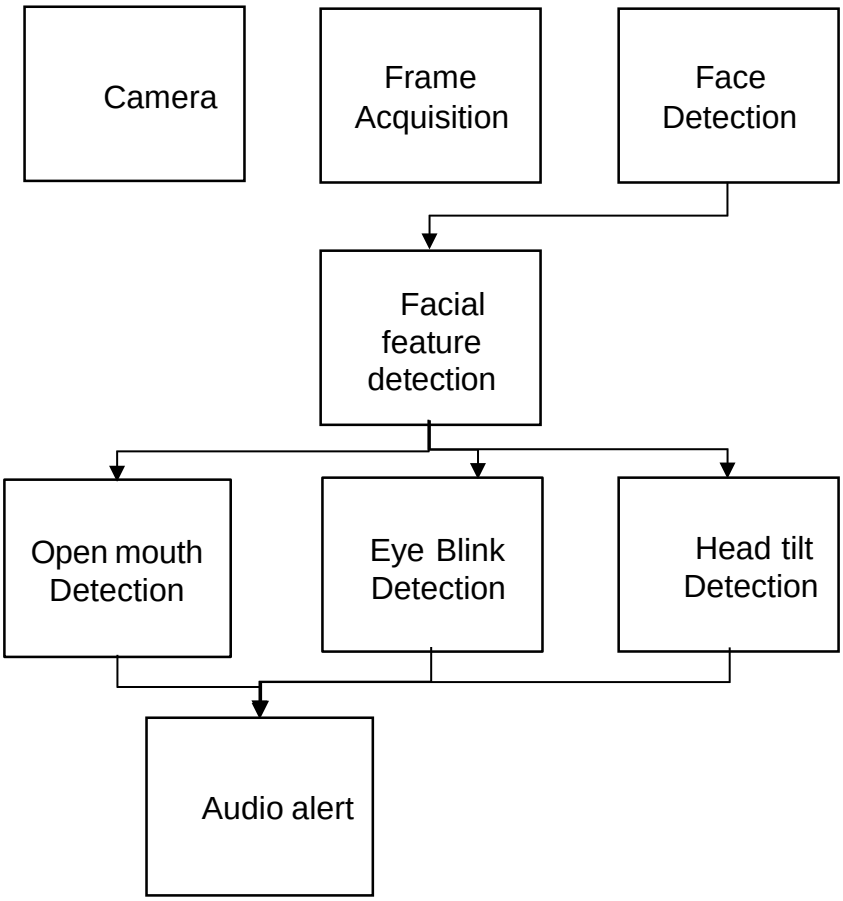
The semi-processed data is sent to the IBM Watson IoT cloud which comes under WIoTP and is stored in a database with help of NodeRED which is a programming toolused for wiring hardwaredevices, APIs and online services together.

The triggered event, which is sent to the cloud, is then sent as a notification to the administrator ofthe logistics company via messaging application named Telegram using NodeRED bot. The RPi does the following steps once it captures the frame:

1) Cropping ROI

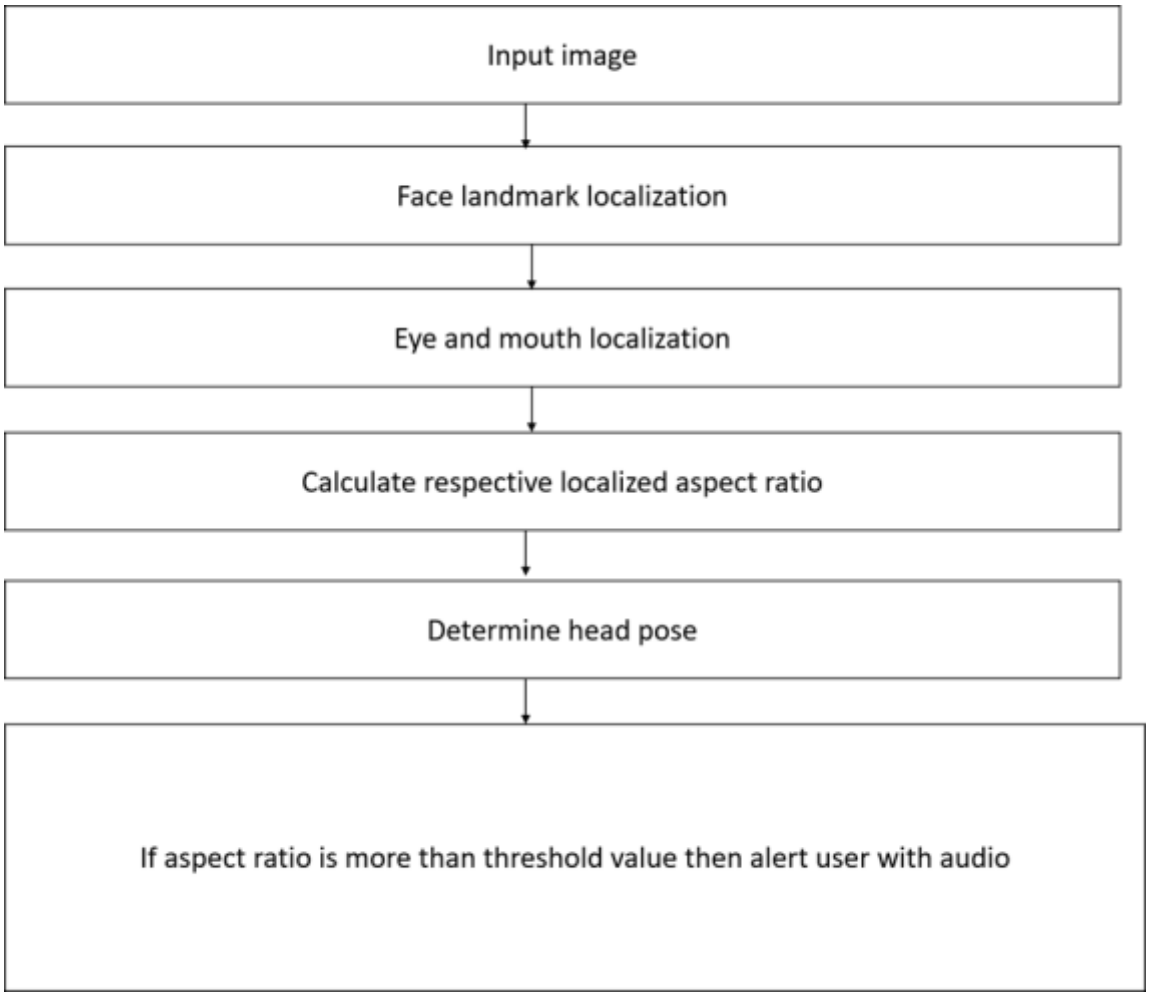
2) Facial Landmark detection

3) State Identification



2.2 IMPLEMENTATION

Computer vision is an interdisciplinary scientific field that deals with how computers can be made to gain high-level understanding from digital images or videos. From the perspective of engineering, it seeks to automate tasks that the human visual system can do.



VI. RESULTS AND DISCUSSIONS

The system has been successfully tested on our laptops and also deployed in a truck which is thenmonitored in real-time. The project was done in two parts i.e., test phase and deployment phase. Inthe test phase, more emphasis was given for the literature survey on this particular use-case of our project, designing the system, selection of algorithms which can be used for facial detection and tracking, deciding on the software used that provides faster and efficient results, code finalization, integration and monitoring of data is sent .

In the deployment phase, the focus point was to deploy the hardware prototype on a truck and monitor the behavior of the driver in real-time. Also more emphasis was given to the integration of software with the hardware components, cloud monitoring, data accumulation in the database, sending the triggered event message to the administrator of the logistic company, debug any errorsand incorporate improvements.

The monitoring of the behavioral patterns of the driver has been done with help of facial detectionand tracking. The DLib library used for facial landmark detection is done with the help of SP68 model. By properly fine-tuning the pre-trained model of SP68 which contains 68 facial features that have been manually marked across 7764 images by researchers, it was possible to customize the detection process in such a way that satisfies the constraints of the system we are developing. Such constraints are executive speed, memory and storage consumption,overall accuracy and robustness.

Moreover, by selecting only the relevant landmarks such as eyes and lips of the person, it is possible to create specific models that localize a particular subset of landmarks, thus eliminating unnecessary points and using only the landmarks of facial features which are required.

The facial rotation detection and tracking have been monitored with help of SolvePnP library which basically creates a 3D projection of a 2D image obtained frame by frame from the camera.This is done by marking the points of the edges of the face and comparing each other with the relative distances between each point to find the facial rotation of the driver.

REFERENCES

[1] Johns, M.W., 2000. A sleep physiologist's view of the drowsy driver. *Transportation research part F: traffic psychology and behaviour*, *3*(4), pp.241-249.

[2] Barr, L., Howarth, H., Popkin, S. and Carroll, R.J., 2005. A review and evaluation of emergingdriver fatigue detection measures and technologies. National Transportation Systems Center, Cambridge. US Department of Transportation, Washington. Disponível em< http://www. eECE. rpi.edu/~ qji/Fatigue/fatigue_report_dot. pdf.

[3] Tefft, B.C., 2012. Prevalence of motor vehicle crashes involving drowsy drivers, United States, 1999–2008. *Accident Analysis &Prevention*, *45*, pp.180-186.

[4] Sharma, S., Shanmugasundaram, K. and Ramasamy, S.K., 2016, May. FAREC—CNN based efficient face recognition technique using Dlib. In *2016 International Conference on Advanced Communication Control and Computing Technologies (ICACCCT)* (pp. 192-195). IEEE.

[5] Tango, F. and Botta, M., 2013. Real-time detection systemof driver distraction using machine learning. *IEEE Transactions on Intelligent Transportation Systems*, *14*(2), pp.894-905.

[6] Chang, K., Oh, B.H. and Hong, K.S., 2014, January. An implementation of smartphone- baseddriver assistance system using front and rear camera. In *2014 IEEE International Conference on Consumer Electronics (ICCE)* (pp. 280-281). IEEE.

[7] Boyko, N., Basystiuk, O. and Shakhovska, N., 2018, August. Performance evaluation and comparison of software for face recognition, based on dlib and opencv library. In *2018 IEEE Second International Conference on Data Stream Mining & Processing (DSMP)* (pp. 478-482). IEEE.

[8] Lashkov, I., Kashevnik, A., Shilov, N., Parfenov, V. and Shabaev, A., 2019, August. Driver Dangerous State Detection Based on OpenCV & Dlib Libraries Using Mobile Video Processing. In *2019 IEEE International Conference on Computational Science and Engineering (ECE) and IEEE International Conference on Embedded and Ubiquitous Computing (EUC)* (pp. 74-79). IEEE.

[9] García-García, M., Caplier, A. and Rombaut, M., 2018, June. Sleep deprivation detection for real-time driver monitoring using deep learning. In *International Conference Image Analysis and Recognition* (pp. 435-442). Springer, Cham.

[10] Manoharan, R. and Chandrakala, S., 2015, February. Android OpenCV based effective driverfatigue and distraction monitoring system. In *2015 International Conference on Computing and Communications Technologies (ICCCT)* (pp. 262-266). IEEE.

[11] Baek, J. W., Han, B. G., Kim, K. J., Chung, Y. S., & Lee, S. I. (2018, July). Real-time drowsiness detection algorithm for driver state monitoring systems. In 2018 Tenth International Conference on Ubiquitous and Future Networks (ICUFN) (pp. 73-75). IEEE.

[12] Tombeng, M.T., Kandow, H., Adam, S.I., Silitonga, A. and Korompis, J., 2019, August. Android-Based Application to Detect Drowsiness When Driving A Vehicle. In 2019 1st International Conference on Cybernetics and Intelligent System (ICORIS) (Vol. 1, pp. 100-104). IEEE.

[13] Alshaqaqi, B., Baquhaizel, A.S., Ouis, M.E.A., Boumehed, M., Ouamri, A. and Keche, M., 2013, May. Driver drowsiness detection system. In 2013 8th International Workshop on Systems,Signal Processing and their Applications (WoSSPA) (pp. 151-155). IEEE.

[14] Coşkun, M., Uçar, A., Yildirim, Ö. and Demir, Y., 2017, November. Face recognition based on convolutional neural networks. In 2017 International Conference on Modern Electrical and Energy Systems (MEES) (pp. 376-379). IEEE.

[15] Li, N. and Busso, C., 2014. Predicting perceived visual and cognitive distractions of drivers with multimodal features. IEEE Transactions on Intelligent Transportation Systems, 16(1), pp.51- 65.

[16] Johnston, B. and de Chazal, P., 2018. A review of image-based automatic facial landmark identification techniques. EURASIP Journal on Image and Video Processing, 2018(1), p.86.

[17] Heath, Nick (March 13, 2014). "How IBM's Node-RED is hacking together the Internet of things". techrepublic.com. CBS Interactive. Retrieved January 16, 2017

[18] Community staff writer (June 14, 2016). "Version 0.14 released". nodered.org/blog. Node- RED. p. 1. Retrieved July 6, 2016. MQTT with TLS support