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Anti Theft and Accident Avoidance System for Low Visibility Environment

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Abstract -As the amount of urban vehicles is growing at a rapid rate, vehicle thievery and accidents are one of the biggest concerns of general masses. Thus, there is a need to develop a system for providing security from problems like theft and accidents, especially because of lack of visibility during the rainy season and winter season, using IOT for both vehicles and passengers. In this paper we propose an anti-accident system for various vehicles like car, trucks using object detection and recognition. However, for the proper application of object detection algorithms in real-time, the systems need to have minimal computation time and comprehensive performance analysis needs to be conducted before deployment. This paper is aiming to use a saliency map in IoT based embedded devices for object detection in low light to avoid accidents. For analysis, a camera will be connected with Raspberry Pi for video feed and OpenCV library would be used. The car will have an anti theft system i.e owner and some specific individuals shall be able to access the features of the vehicle. Hence we aim to make the vehicle safer for the common man.

Key Words:Deep learning, OpenCV, Saliency map, Raspberry pi, Pi camera, Ultrasonic sensor, IR sensor, Foggy environment.

1. INTRODUCTION

The Internet of Things(IoT) can be defined as a network of objects or people called "things" that are embedded with softwares and sensors which allows these objects to collect and exchange data.
The major goal of IoT is to connect the smart devices like computers, smartphones and laptops to devices that are relatively dumber than them and in the process establish a network harmony between themselves that does not require human governance.
Currently, road accidents are the most often occurring accidents in daily life. The most common cause is rear-end collisions and driver errors such as fatigue, discomfort, or use of a phone while driving. These accidents can be reduced if the human errors are removed. In recent years, there have been a lot of studies for a system to avoid collision, basically proposing a system to reduce the severity of a collision or avoid it completely, by detecting objects and taking necessary steps to avoid them. In the actual driving situation it is desirable for the driver to be able to look out for the obstacles, even in foggy environments. In order to prevent a collision of the vehicles and the obstacles the current technologies use various sensors such as optical sensors, radio detection and ranging (RADAR), sound navigation and ranging (SONAR), light detection and ranging (LIDAR), and laser sensor to detect obstacles. After the detection is done, these systems either issue a warning to the driver or braking automatically without any driver input when a collision is imminent.[6] However, these have both advantages and disadvantages as well as steep costs. We would like to reduce the cost of the detector and improve the performance of the vehicle by making the vehicle have the ability to see and recognize the obstacles like human beings by computer vision system. Anti Accident and Anti Theft system proposes a secure way to travel in foggy weather conditions. This systemalso takes into account safety of the vehicle when the user is not around to give you alert messages if anyone tries to break in your car.

2. PROPOSED SYSTEM

The figure [Fig 1] displays the proposed architecture of our system. In this system a security system is placed for validating that the person has the authentication to access the vehicle. After the validation of the person, the ignition of the vehicle takes place and the system comes online with the pi-camera capturing the data. Once captured the live video feed is displayed on the website while it further undergoes possessing. The saliency map formula is applied to give an enhanced and clearer view. For the purpose of avoiding collision an ultrasonic sensor has been installed in the front of the vehicle. Once the obstacle is detected and it passes the given threshold value, the buzzer installed in the vehicle buzzes. This is the indication for the driver to apply brakes.

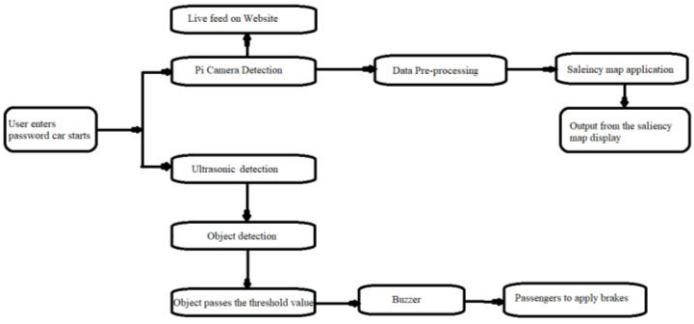

Fig - 1: Proposed Architecture

2.1 Saliency

Saliency, often mistaken for object detection, follows a very different and very human concept of data perception. Instead of defining anything as an object, it follows the principle of

capturing the first thing that would stand out in an image enabling the user to focus on the important part of the image.

Saliency detection has three major types:
i. Static saliency
ii. Motion saliency
iii. Objectness saliency

In this paper motion saliency has been used. The algorithm follows a frame-by-frame input and establishes the moving objects by processing the frames. These objects are the 'salients' in the image.[8]

Saliency map module

The frames are converted to grayscale images. In this paper grayscale was filter used but the filter may vary depending on the algorithm and the requirements. The saliency map contains values in the range (0,1) and is scaled to the range of (0,255). The value should be an unsigned 8 bit integer.[8] Once all the frames are processed the it break out of the process loop and cleanup our processes image. This step it to get clearer frames for output. The final output is displayed on the monitor.

2.2 Pi Camera module

Once the pi camera starts capturing the video feed, the video stream is imported and motion saliency object is initialized in the code. After that the video is looped and captured on the top of each cycle. The frame is selected and re-sized, this helps in making the computer vision techniques inside the loop run faster as there is less area to be processed. Speed of processing is of utmost value when objects are in motion. This is followed by the computing of the saliency map. This map is not a single map but the combined output of several outputs mapped together.

2.3 Ultrasonic sensor module

The ultrasonic sensor works on the principle of detecting reflected rays and calculating the distance based on the time the wave takes to come back. The transmitter sends of the sound wave, which then bounces off the obstacle, which in this case are the automobiles or humans, and the reflected wave is detected by the receiver. The distance can be calculated by the formula:

$$\text{Distance (s)} = \frac{time(t) * (speed\ of\ sound)}{2}$$

After calculating the distance it compares it to the given threshold value. If the value is less than the threshold the buzzer rings to alert the driver. The figure [Fig 2] shows the working of the sensor.

Das verknüpfte Bild kann nicht angezeigt werden. Möglicherweise wurde die Datei verschoben, umbenannt oder gelöscht. Stellen Sie sicher, dass die Verknüpfung auf die korrekte Datei und den korrekten Speicherort zeigt.

Fig - 2: Ultrasonic sensor working

2.4 Intelligent Security System

The website will have the provision of entering ID and password. If the person is registered then the system works as it , if the wrong password is entered three times an alert is sent to the owner of the car.[2] Only after the verification will the car ignition take place and the rest of the system will come online.

3. IMPLEMENTATION

The paper begins with the user identifying themselves. If the user is registered then the functions run smoothly. In case of wrong or no password attempt an email the message is displayed that wrong password has been entered as show in figure [Fig 3].

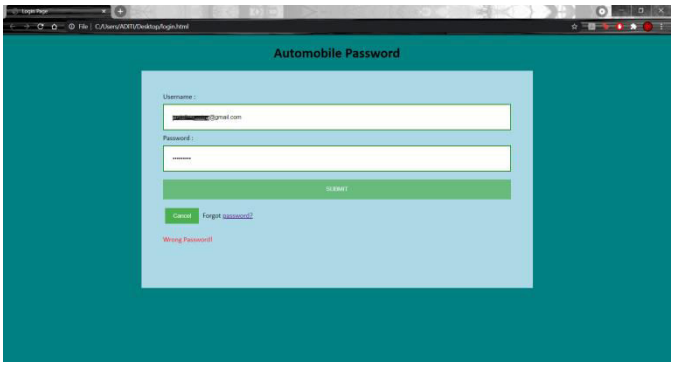

Fig- 3: Wrong password alert

This alert is followed by an email to the owner stating that the an intruder has been detected. The mail acts as a warning in case the wrong password attempt was made by some unauthorized personnel. Else the mail states that if the activity is known, the mail is to be ignored as shown in figure [Fig 4].

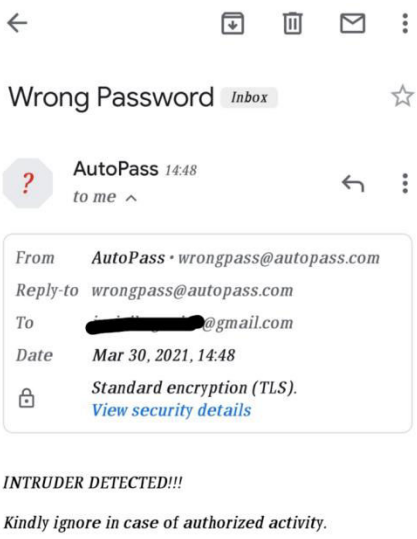

Fig - 4: Email alert on owner's mobile phone

Figure [Fig 5] displays the video feed captured when a cycle passes by the pi camera. This video will be constantly available on the website and can be used to check the victim/culprit in case on an accident.

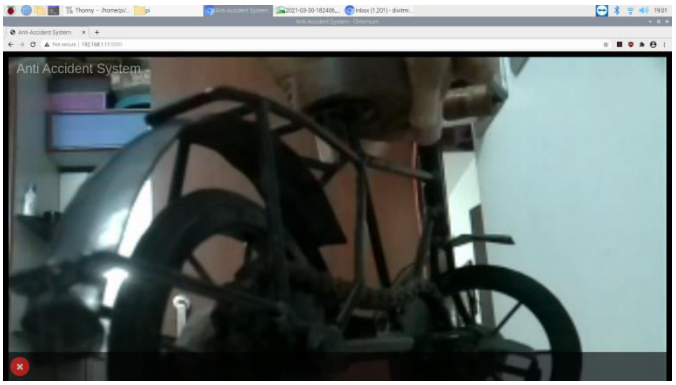

Fig - 5: Live feed on the website

As the bicycle moves in front of the camera in low visibility environment the feed is captured and processed with the saliency algorithm. This is visible in figure [Fig 6].

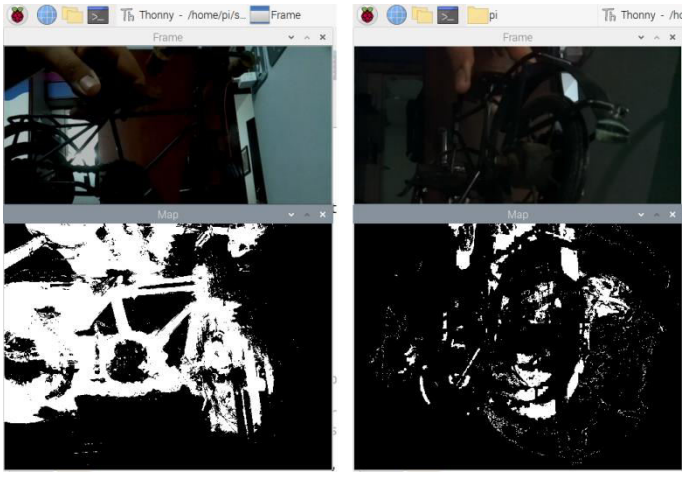

Fig- 6: Saliency map bicycle detected

4. CONCLUSION

In this paper, the study of different methodologies and their algorithm is used to create a system where a vehicle accident in foggy weather can be avoided is proposed. A brief explanation of IOT concept and different anti collision and object detection methods are mentioned. The literature survey done in this paper is a comparative study of different methodologies and algorithms used by various researchers over the years to create a system for avoidance of accidents. This helped us in choosing an appropriate algorithm for our system i.e. Saliency map algorithm to be implemented. An overview on Anti Accident and Anti Theft is presented along the proposed architecture. An explanation of the algorithm used in this systemis also provided. The dataset and output of expected results that we may get is also provided in the report. The applications of this system are identified and presented.

The future scope of this paper is to develop the system towards full autonomous. This paper only deals with a particular environment but it has potential to go in the direction of self driving cars. In this system we can also work to make an automatic braking system which can be integrated with the working system to develop the paper further in self driving car concept.

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