ACCIDENT DETECTION SYSTEM USING IMAGE PROCESSING AND ACCIDENT LOCATION DETECTION SYSTEM

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Abstract: The development of an accident prevention system using image processing technology is a crucial area of research for ensuring the safety of individuals on the road. In recent years, there has been a significant increase in the number of accidents that occur due to obstacles on the road. These obstacles can be anything from pedestrians to animals, and their presence on the road can be challenging for drivers to detect and avoid. The proposed project aims to develop an accident prevention system that uses image processing technology to recognize obstacles on the road and alert drivers in real-time. The system will use a camera mounted on the front of the vehicle to capture images of the road ahead. The images will be processed using computer vision techniques to identify any obstacles in the vehicle's path. The system will also have the ability to calculate the distance between the vehicle and the obstacle, enabling it to provide early warning signals to the driver. In addition, the system will be able to detect the speed of the vehicle and adjust the warning signals accordingly. The proposed system will be designed to work in all lighting conditions, including low light and adverse weather conditions. The system will be able to detect obstacles at a distance of up to 100 meters, providing ample time for the driver to take appropriate action. The proposed system has the potential to significantly reduce the number of accidents caused by obstacles on the road. The system will provide drivers with real-time alerts, enabling them to react quickly and avoid potential accidents. The system will also be cost-effective and easy to install, making it an attractive option for vehicle manufacturers and owners.

Keywords – Accident prevention and Detection system, Image processing, OpenCV, Secondary system, Accident prevention and Detection system for Electric Vehicles, GPS and GSM.

I. INTRODUCTION

According to a report, Driving an average of over 13,000 miles a year, American drivers witness plenty on their commutes. Heading down the road at 40, 50, or even 60-plus miles per hour, it's also one of the last places you'd want to encounter furry friends. It's a serious safety concern that claims both human and animal life, but we rarely stop to consider the scale of the issue. In a given year, there are over 260,000 crashes involving animals accounting for 12,000 human injuries, and over **150 human fatalities**.

To avoid saddening statistics like the ones above, it's important we remove wildlife as safely as possible from roadways where they may be injured and put drivers in dangers as well. This drastic report shows accidents that occurs in US only, the reports of the rest of the world could amuse us all. So, to prevent accidents we've developed and designed this project.

Now a days it has been an accepted fact that major part of the accidents is due to the uneven interruptions, inappropriate driving by the drivers. Driving is a complex task. Drivers need to use a number of skills while driving. Road accident is most unwanted thing to happen to a road user, though they happen quite often. The most unfortunate thing is that we don't learn from our mistakes on road. Most of the road users are quite well aware of the general rules and safety measures while using roads but it is only the laxity on part of road users, which cause accidents and crashes. Main cause of accidents and crashes are due to human errors. The two major reasons for accident are the sudden intervention before the vehicles when they are at uncontrollable speed and the lack of presence of mind of the drivers when a sudden intervention of humans, animals or any kind of objects. For this reason, developing systems that actively monitors the road and detects the object which intervenes the vehicle. Many efforts are reported within the literature for developing an energetic safety system for reducing the amount of cars accidents because of reduced vigilance.

The Main purpose of this project is to monitor any kind of thing which intervenes the vehicle and prevents the accident by stopping the motor. The proposed project comes

under Embedded as it works in both software and hardware side. The object sensing part is taken care of python, OpenCV and TensorFlow software and tools. The stopping of the motor is achieved with the help of Arduino UNO microcontroller, relay and PWM controller. This proposed system is an active system which processes within seconds of time. The updated version of this project can be applied to the railways transportation too. As there is no existing automation system to prevent train accidents like suicides in railway tracks hitting of animals which passes the track, this project is very helpful to prevent those uncertain events that happens. And also if the prevention system fails due to miscellaneous reasons and the car met with the accident. The Secondary system which comprises of vibration sensor which detects the accident sends the exact location to the concerned persons with the help of the GPS and GSM Module.

II. LITERATURE SURVEY

Accident Prevention And Detection System Using Image Processing And IoT – MARCH 2019 International Journal Of Computer Sciences and Engineering IoT provides the ease of monitoring and gaining image data through the internet. The Need for high-quality image data is increasing to the extent that real-time skin detection is required. Real-time skin detection within IoT is implemented on the basis of Artificial Intelligence(AI) Algorithms, Which can detect human skin by using cameras in real time.

Accident Prevention and Detection System Using Image Processing and IoT - March 2019 international journal of computer sciences and engineering IoT provides the ease of monitoring and gaining image data through the Internet. The need for high-quality image data is increasing to the extent that real-time skin detection is required. Real-time skin detection within IoT is implemented on the basis of artificial intelligence (AI) algorithms, which can detect human skin by using cameras in real time.

Automatic Driver Drowsiness Detection and Accident Prevention System using Image Processing October 2019 International Journal of Innovative Technology and Exploring Engineering Sleep is a primary need for human beings. The individual desires at least eight hours of sleep to hold on his day by day routine. When someone lacks in take enough relaxation his or her frame does not characteristic(function) properly. First of all, drivers need enough sleep to boost up their work. When we don't have enough sleep, we may become drowsy and falls asleep. Sometimes a few seconds of drowsiness can cost the lives of both driver and passengers as well. So, this gadget proposes a lively monitoring assistant that analyzes drivers' eye blinking action and additionally, mouth portion which exams whether driving is yawning. The system monitors the inputs from the camera located in the driving area and the pictures are captured continuously. These pictures are made into frames that assist the machine to discover drowsiness of the driver.

Vision Based Intelligent Traffic Analysis System for Accident Detection and Reporting System G. Elumalai, O. S. P. Mathanki S. Swetha – 2015 A traffic accident detection system that is vision based that can detect, detect, record, and report traffic accidents, which uses the idea of picture queuing that is highly applicable to intersections that are widely prone to deadly accidents.

III. METHODOLOGY

The project's primary goal is to prevent road accidents caused due to vehicles in some uncontrollable situations. Also this project is designed mainly for the Autonomous Electric Vehicles (EV's) as it requires more safety concerns than manually driving vehicles. The main motive of this project is to stop the vehicle automatically when there is a chance of accident happens due to collision of the vehicle to the obstacles like humans, animals and also non-living things that comes in the way of the vehicle. If the primary system of accident prevention fails then the secondary system helps us to find the detection of the Accident location. This System's workflow happens according to the block diagram given in fig.1.

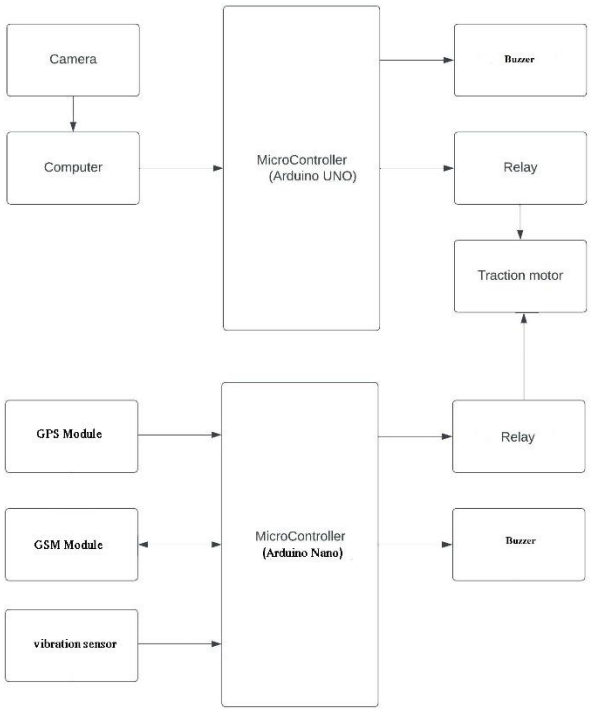

Fig.1: Block Diagram

A. Technical Background

This Project deals with fields like IoT, Image Processing and Automation. Also, it deals with both software and

hardware side equally in terms of contribution. The Hardware part of the project helps in controlling the speed of the vehicle and stops it automatically when the software side of the system detects an obstacle using Image Processing. Python, Anaconda and TensorFlow plays a major role and contributes a lot in this Accident prevention project. The Secondary system of the project deals with Geo-Location with the help of GPS and GSM Module.

B. Proposed Solution

This project was designed to create an effective system that prevents the occurrence of the road accidents by stopping the automatically by the Image Processing. The problems with existing methods are:

•In the existing system, there is no other Image processing technology that detects the obstacles that intervenes the vehicles and causing accident.

•Most of the Autonomous Electric Vehicles has Sensors in its system which detects the objects that is not effective as its range is very small.

•In the existing system there is no such vehicle is equipped that brakes or stops the vehicle.

•Only alarming and indication of the drivers about the obstacle is available in the existing system.

•The existing system doesn't work autonomously.

•No Other system has secondary emergency system, if the primary system malfunctions.

C. Hardware Components (Required for prototype)

1. Arduino UNO
2. Pulse-width modulation speed controller
3. DC shaft motor
4. Vibration sensor
5. Arduino NANO
6. Neo 6m GPS Module
7. SIM 800a GSM Module

D. Software Requirements

1.Python IDE (Preferably Anaconda)

2.TensorFlow

3.OpenCV

IV. IMPLEMENTATION

This Project can be implemented by integrating it in the Autonomous Electric Vehicles and also in normal vehicles with some modifications. The Camera which is going to detect the object can be fixed in the hotspots of the car that are needed to be watched carefully. This camera can be connected to the microprocessor i.e. Arduino UNO through wires and also can be connected wirelessly with some modifications. In this project the camera is connected to the microprocessor using wires. The Pulse-Width modulation controller which controls the speed of the shaft DC motor of the prototype is connected with the Arduino UNO and the shaft DC motor.

E. Working principle

The camera detects the object that is going to make collision with the car. This can be recorded and recognized by the Microprocessor. This image which is recorded is processed using with the help of the OpenCV and with the help of the TensorFlow tool. This image which is going to process is done by a frame to frame process. A Frame is processed after Processing the previous frame. If the Image that is processed that consists of an object , the code which we designed in python reflects to the microprocessor. After the microprocessor comes to know the object is detected it makes the normally closed relay into normally open relay. Then the connection to the motor is stopped with the help of the PWM Controller.

F. Circuit Diagram

The circuit diagram consists of the Arduino UNO connected with the PWM Speed controller across a relay module and the other end of PWM Controller is connected with the shaft DC Motor. The secondary system interfaced with the primary system is also shown in the circuit diagram. The circuit diagram of is shown in Fig. 2.

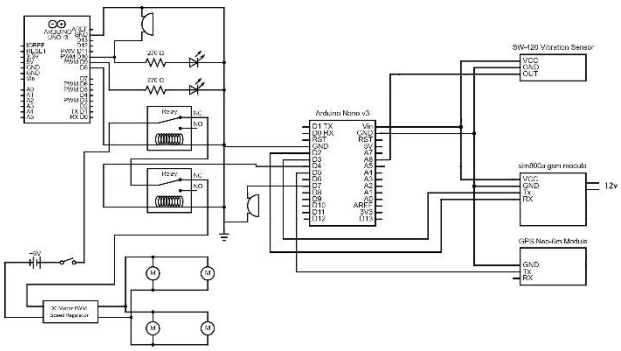

Fig.2: Circuit diagram

V. SIMULATION

A. Prototype Image

The Prototype Image of Accident prevention system using Image processing is shown in Fig. 3.

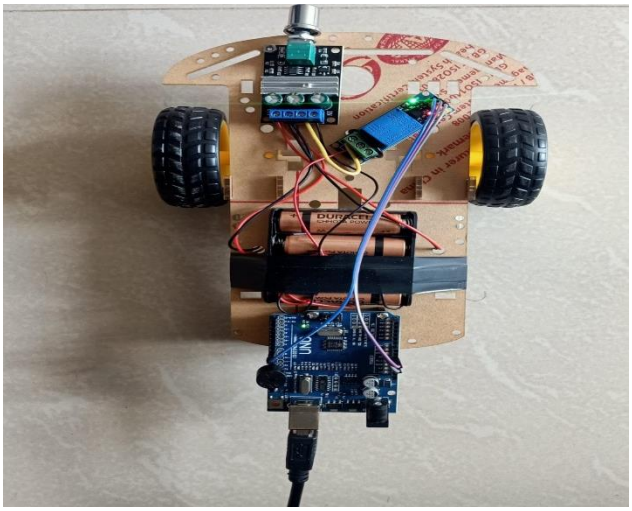

Fig.3: Prototype Image

VI. RESULTS AND OBSERVATIONS

This project is designed in a way to stop the vehicle automatically that if any object is detected in the way of the vehicle that can possibly make an accident. Also the objects detected are also indicated in the python prompt as it is shown in fig.4 & fig.5.

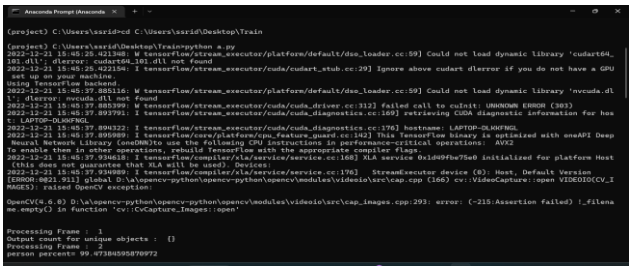

Fig.4: Output in Anaconda Prompt

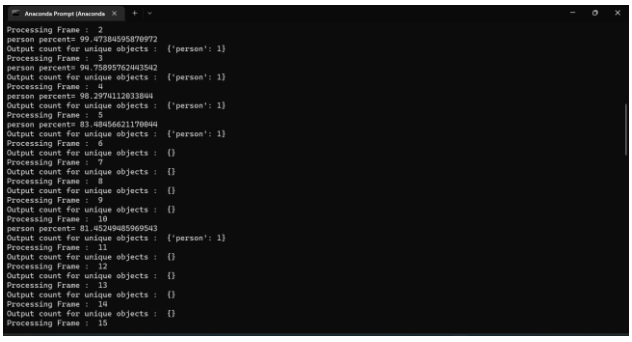

Fig.5: Output in Anaconda Prompt

VII. CONCLUSION

This proposed system can reduce the prevention of accidents that happen due to intervention of humans and animals during driving. The system projected during this analysis provides correct detection of humans, animals and objects. This application can be enforced within the real time to scale back traffic accidents rate on crowded areas where accidents occur often. Braking of the vehicle can be achieved when objects detected in the camera. Also if this primary system fails and the car met with an accident, the accident is detected using the vibration sensor and the exact location of the accident is sent through SMS to the concerned persons mobile number.

VIII. FUTURE SCOPE

High resolution cameras are implemented on the vehicle to increase the number of frames per second. And the quality of the pictures can be so sharp and accurate while implementing the high resolution cameras. The Accuracy of the system can also be increased by implementing such cameras. High level processors must be established in the vehicle as in the current Autonomous Electrical vehicles. So, by implementing high level processors the processing time of the project can also be reduced which is a main constraint to prevent the accident. By establishing high resolution cameras and high level processors the total processing time of the system is estimated within a second. By this the total time duration happens within a fracture of seconds.

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