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Machine Learning Based Surveillance System for Automatic Detection of Bike Riders without Helmets, Triple Riders and Overspeed Detection Billing System

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ABSTRACT: Motorcycle accidents have been rapidly growing through the years in many countries. In India more than 37 million people use two wheelers. Therefore, it is necessary to develop a system for automatic detection of helmet wearing and triple rides for road safety. Therefore, a custom object detection model is created using a Machine learning based algorithm which can detect Motorcycle riders. On the detection of a Helmetless rider and triple rides, if the bike riders didn't wear helmets and if they are going with triple rides then at that time the License Plate is extracted and the license Plate number is recognized using an Optical Character Recognizer. This Application can be implemented in real-time using a Webcam. In this project, we can classify the image which consists of three riders using a deep learning process. In this, CNN based architecture is designed to classify the image. The process of this project is first we train the image taken from the webcam. Then by considering input from the webcam the network will generate the output based on the trained data. This will get an accuracy of 70 %.

KEYWORDS: Over Speed Detection, Optical Character Recognizer, CNN, Web Camera, Embedded System, Micro Controllers, Transmitter, Receiver

I.INTRODUCTION

An embedded system is a microprocessor-based computer hardware system with software that is designed to perform a dedicated function, either as an independent system or as a part of a large system. At the core is an integrated circuit designed to carry out computation for real-time operations. Complexities range from a single microcontroller to a suite of processors with connected peripherals and networks; from no user interface to complex graphical user interfaces. The complexity of an embedded system varies significantly depending on the task for which it is designed. Embedded system applications range from digital watches and microwaves to hybrid vehicles and avionics. As much as 98 percent of all microprocessors manufactured are used in embedded systems. Embedded systems are managed by microcontrollers or digital signal processors (DSP), application-specific integrated circuits (ASIC), field-programmable gate arrays (FPGA), GPU technology, and gate arrays. These processing systems are integrated with components dedicated to handling electric and/or mechanical interfacing. Embedded systems programming instructions, referred to as firmware, are stored in read-only memory or flash memory chips, running with limited computer hardware resources. Embedded systems connect with the outside world through peripherals, linking input and output devices. The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. A thing in the internet of things can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an Internet Protocol (IP) address and is able to transfer data over a network. Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and

improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it to learn for themselves. The process of learning begins with observations or data, such as examples, direct experience, or instruction, in order to look for patterns in data and make better decisions in the future based on the examples that we provide. The primary aim is to allow the computers learn automatically without human intervention or assistance and adjust actions accordingly

II. LITERATURE SURVEY

1. Lokesh Allamki, Manjunath Panchakshari, Ashish Sateesha, K S Pratheek, "Helmet Detection using Machine Learning and Automatic License Plate Recognition", International Research Journal of Engineering and Technology (IRJET) Volume: 06 Issue: 12 | Dec 2019

Machine learning (ML) is the field of Artificial Intelligence in which a trained model works on its own using the inputs given during training period. Machine learning algorithms build a mathematical model of sample data, known as "training data", in order to make predictions or decisions and are also used in the applications of object detection. Therefore, by training with a specific dataset, a Helmet detection model can be implemented. Using this helmet detection model helmet-less riders can be easily detected. Based on the detected classes the license plate of the rider is cropped out and saved as an image. This image is given to an Optical Character Recognition (OCR) model which recognizes the text and gives the License Plate number as output in the form of Machine encoded text. And it can also be implemented in real time using a Webcam.

Summary: From this article, I have taken the concept of machine learning and image recognition.

2. A. Adam, E. Rivlin, I. Shimshoni, and D. Reinitz, "Robust real-time unusual event detection using multiple fixed-location monitors," IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 30, no. 3, pp. 555–560, March 2008.

We present a novel algorithm for detection of certain types of unusual events. The algorithm is based on multiple local monitors which collect low-level statistics. Each local monitor produces an alert if its current measurement is unusual and these alerts are integrated to a final decision regarding the existence of an unusual event. Our algorithm satisfies a set of requirements that are critical for successful deployment of any large-scale surveillance system. In particular, it requires a minimal setup (taking only a few minutes) and is fully automatic afterwards. Since it is not based on objects' tracks, it is robust and works well in crowded scenes where tracking-based algorithms are likely to fail.

Summary: From this article, I have taken the concept of image processing.

3. Viola and Jones, "Robust Real-time Object Detection", IJCV 2001.

This paper describes a visual object detection framework that is capable of processing images extremely rapidly while achieving high detection rates. There are three key contributions. The first is the introduction of a new image representation called the "Integral Image" which allows the features used by our detector to be computed very quickly. The second is a learning algorithm, based on AdaBoost, which selects a small number of critical visual features and yields extremely efficient classifiers. The third contribution is a method for combining classifiers in a "cascade" which allows background regions of the image to be quickly discarded while spending more computation on promising object-like regions. A set of experiments in the domain of face detection are presented.

Summary: In this project I have taken the concept of real time object recognition.

III. PROPOSED SYSTEM

In this proposed system, we can classify the image which consists of three riders using a deep learning process. In this, a CNN based architecture is designed to classify the image. The process of this project is first we train the image taken from the webcam. Then by considering input from the webcam the network will generate the output based on the trained data.

WORKING PRINCIPLE

Motorcycle accidents have been rapidly growing through the years in many countries. In India more than 37 million people use two wheelers. Therefore, it is necessary to develop a system for automatic detection of helmet wearing for road safety.

Therefore, a custom object detection model is created using a Machine learning based algorithm which can detect Motorcycle riders. On the detection of a Helmetless rider, the License Plate is extracted and the License Plate number is recognized using an Optical Character Recognizer. This Application can be implemented in real-time using a Webcam or a CCTV as input.

In this system, the whole system flourished using two sections. The first section consists of transmitter section which contains webcam for capturing images of person without helmet and persons who is riding triples. The captured images is proceeded to next stage that is matlab processing. In matlab, the captured images are processing with CNN object detection to find helmet is there or not. The output from matlab is processed to zigbee transmitter. The second stage is the receiver section, it consist of GPS (Global Positioning System) Module, GSM (Global System for Mobile Communication) Module, Zigbee receiver and for output buzzer is used. The output from first section is received using zigbee receiver. If any data is received, then the gsm will send message to the owner of vehicle with a message of "Traffic rule violated". The gps continuously check for vehicle speed. If any vehicle with over speed detected, then also the gsm will send message as "traffic rule violated". Simultaneously if over speed detected, then the buzzer will hoot

IV. RESULTS

The camera, various types of modules, RFID reader and tags are integrated into the board. In the below diagram, we can see the child location, longitude, latitude from the parent mobile through the cloud server connected to the mobile .if any problem occurs to the child, an alert message will be indicated to the mobile of the parent, so the parent can view the location and the position of the child immediately. The following diagram shows the output of this monitoring system



Fig. 1 output setup

The above Fig. shows the circuit setup. The Fig.12 shows the output. If child is outside then parent will get sms in their phone with message “Child is outside” along with map link location, which is shown in first output figure. Similarly parent will get images and video of child surroundings, which is shown in second

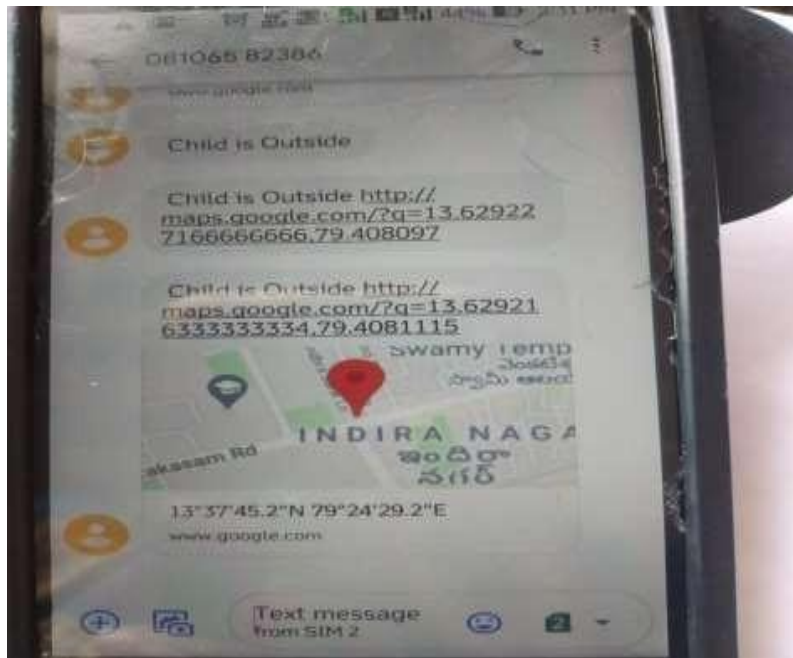


Fig 2 . Output sample

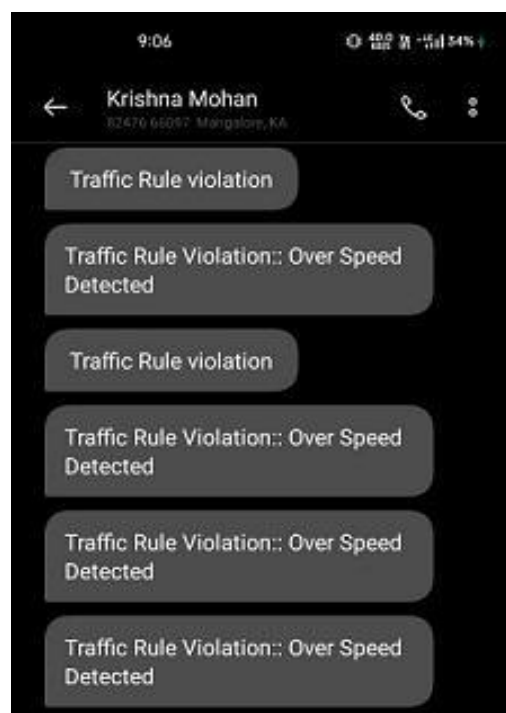


Fig.3. Output



V. CONCLUSION

From the results shown above it is evident that the object detection is well suited for real-time processing and was able to accurately classify and localize all the object classes. The proposed end-to-end model was developed successfully and has all the capabilities to be automated and deployed for monitoring. For extracting the number plates some techniques are employed by considering different cases such as multiple riders without helmets and designed to handle most of the cases. All the libraries and software used in our project are open source and hence is very flexible and cost efficient. The project was mainly built to solve the problem of non-efficient traffic management. Hence at the end of it we can say that if deployed by any traffic management departments, it would make their job easier and more efficient. Future scope of this system is to decrease accidents numbers and providing useful emergency solutions as fast as possible. We will try to get accurate measurements of object and their response time. This system brings modernization to the existing technology in the current vehicles and also improves safety features.

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