"Helmet Detection and Number Plate Recognition using Machine Learning"

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Abstract- Motorcycles have always been the primary mode of transportation in developing countries. Motorcycle accidents have increased in recent years. One of the main reasons for fatalities in accidents is that a motorcyclist does not wear a protective helmet. The most common way to ensure that motorcyclists wear a helmet is by traffic police to manually monitor motorcyclists at road junctions or through CCTV footage and to penalize those without a helmet. But it requires human intervention and effort. So this system proposes an automated system for detecting motorcyclists who do not wear a helmet and retrieving their motorcycle number plates from CCTV video footage. First, the system classifies moving objects as motorcycling or non-motorcycling. In the case of a classified motorcyclist, the head portion is located and classified as a helmet or non-helmet. Finally, for the motorcyclist identified without a helmet, the number plate of the motorcycle is detected and the characters on it are extracted by using the OCR algorithm.

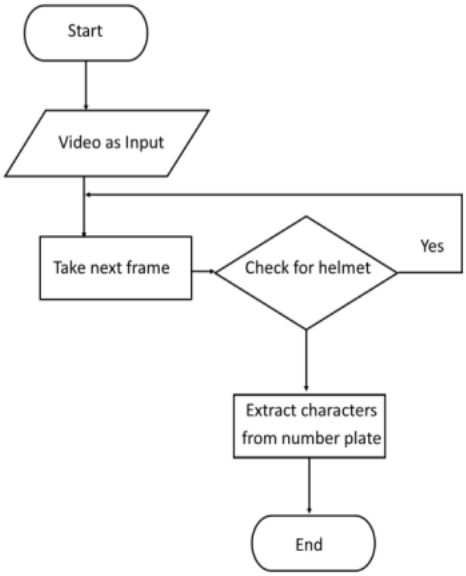
***Keywords*:** CCTV, IARC, OCR (Optical Character Recognition), IARC (International Agency of Research on Cancer), CNN (Conventional Neutral Network), CT (Commutate Tomography), YOLO

INTRODUCTION

scientific imaging strategies are used to photo the inner quantities of a human frame for medical analysis. And medical photo type is one of the most difficult & prosperous topics in the field of image Processing. clinical picture type problems, tumor detection or detection of cancer is the maximum outstanding one. The information approximately the demise charge from mind tumor recommends that it's miles one of the maximum alarming and essential cancer kinds in the Human body. As in keeping with the international agency of research on most cancers (IARC), extra than a million people are recognized with mind tumor consistent with yr around the arena, with ever growing fatality fee. it is the second most deadly reason of dying associated with most cancers in children and adults more youthful than 34 years [1]. in recent times, the physicians are following the advanced techniques to identify the tumor that's extra painful for the sufferers. To analyses the abnormalities in distinct components of the body, CT (Computed Tomography) experiment and MRI (medical Reasoning Imaging) are convenient methods. MRI-based totally scientific picture analysis for brain tumor research has been gaining attention these days due to an elevated want for green and objective evaluation of massive quantities of clinical statistics.

METHODOLOGY

A. Figures:



B. Phases of Development

1 Designing a module for functions to detect the helmet in the frame.

2 Designing a module to detect the number plate and extract the vehicle number from frame.

3 Connecting all the modules together and testing the integrity and accuracy of the system.

C. Implementation

1 Taking video or camera as input.

2 Taking single frame from that input.

3 Checking if that frame contains a helmet.

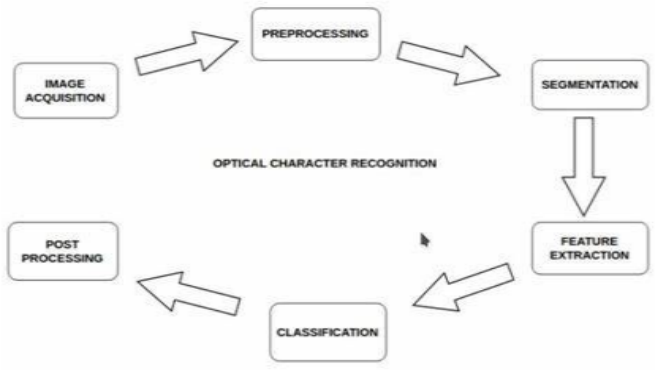
4 If the helmet is present then going back to 2nd stage.

5 If helmet is not present then giving this frame to the function which detects number plate and extracts characters from it.

6 Repeating this procedure till the input is not empty/null.

D. Implantation Using YOLOv3 The YOLOv3 algorithm first separates a fame into a grid. Each grid cell predicts some number of boundary boxes (sometimes referred to as anchor boxes) around objects that score highly with the predefined classes. Each boundary box has a respective confidence score of how accurate it assumes that prediction should be and detects only one object per bounding box. The boundary boxes are generated by clustering the dimensions of the ground truth boxes from the original dataset to find the most common shapes and sizes. The object detection problem is treated as a regression problem in the YOLO algorithm and the image is divided into an S × S grid. If the center of a target falls into a grid, the grid is responsible for detecting the target. Each grid will output a bounding box, confidence, and class probability map. Among them. The bounding box contains four values: x, y, w, h, (x, y) represents the center of the box. (W, h) defines the width and height of the box. Confidence indicates the probability of containing objects in this prediction box, which is the IoU value between the prediction box and the actual box. The class probability indicates the class probability of the object, and the YOLOv3 uses a two-class method.

E. OCR



Optical character recognition or optical character reader is that the electronic or mechanical conversion.

of pictures of

written, handwritten, or printed text into machine-encoded text, whether from a scanned document, a

photograph of a document, a scene photograph, or subtitle text superimposed on a picture.

1: Acquisition

Obtaining non-editable text content from scanned documents of all types, from flatbed scans of corporate archival material through to live surveillance footage and mobile imaging data.

2: Pre-processing

Cleaning up the source imagery at an aggregate level so that the text is easier to discern, and noise is reduced or eliminated. OCR software often "preprocess" images to boost the chances of recognition.

3: Segmentation and feature extraction

Scanning of the image content for groups of pixels that are likely to constitute single characters, and assignment of each of them to their own class. The machine learning framework will then attempt to derive features for the recurring pixel groups that it finds, based on generalized OCR templates or prior models. However, human verification will be needed later.

There are two main methods for extracting features in OCR:

In the first method, the algorithm for feature detection defines a character by evaluating its lines and strokes.

In the second method, pattern recognition works by identifying the entire character. We can recognize a line of text by searching for white pixel rows that have black pixels in between. Similarly, we can recognize where a character starts and finishes.

4: Training

Once all features are defined, the data can be processed in a neural network training session, where. a model will attempt to develop a generalized image>text mapping for the data.

5: Verification and re-training

After processing, humans examine the outcomes, with corrections fed returned into next schooling periods. At this point, data best may additionally need to be reviewed. facts cleansing is time-ingesting and high-priced, and at the same time as initial education runs will carry out de-skewing, excessive evaluation processing, and different helpful methods to achieve a great algorithm with minimum pre-processing, further exhausting refinement of the statistics may be necessary. OCR accuracy may be advanced if the output is confined through a lexicon (a list of words approved in a record). as an instance, this will be all of the words in English, or a more technical lexicon for a selected discipline. This approach can be much less green if the file incorporates phrases that aren't within the lexicon, like proper nouns. fortunately, to improve accuracy, there are OCR libraries to be had online for free. The Tesseract library is using its dictionary to control the segmentation of characters.

LITURATURE SURVEY

Paper Name: Helmet Detection on Motorcyclists Using Image Descriptors and Classifiers

Author: Meharchand Dasgupta, Oishila Bandyopadhyay, Sanjay Chatterjee, Computer Science Engineering IIIT Kalyani West Bengal, India

Description: Automated detection of traffic rule violators is an essential component of any smart traffic system. In a country like India with high density of population in all big cities, motorcycle is one of the main modes of transport. It is observed that most of the motorcyclists avoid the use of helmet within the city or even in highways. Use of helmet can reduce the risk of head and severe brain injury of the motorcyclists in most

of the motorcycle accident cases. Today violation of most of the traffic and safety rules is detected by analysing the traffic videos captured by surveillance camera. This paper proposes a framework for detection of single or multiple riders travel on a motorcycle without wearing helmets. In the proposed approach, at first stage, motorcycle riders are detected using YOLOv3 model which is an incremental version of YOLO model, the state-of-the-art method for object detection. In the second stage, Convolution Neural Network (CNN) based architecture has been proposed for helmet detection of motorcycle riders. The proposed model is evaluated on traffic videos and the obtained results are promising in comparison with other CNN based approaches. [Ref .1]

Paper Name: Helmet Wearing Detection in Thailand Using Haar Like Feature and Circle Hough Transform on Image Processing

Author: Fahad A Khan, Nitin Nagori, Dr. Ameya Naik, Department of Electronics Telecommunication K.J.Somaiya college of Engineering Mumbai, India

Description: In today's world, the increasing use of Motorcycles has prompted increment in road accidents and injuries. Helmet not used by the motorcycle rider is one of the major causes. Currently, one procedure is to physically check use of helmet at the pavement junction or through the CCTV footage video, which requires human intervention to detect motorcyclists without helmet. The proposed framework presents a computerization machine structure to distinguish the motorcycle rider with or without helmet from images. The system extracts objects class based on feature extracted. The system uses You Only Look Once (YOLO)-Dark net deep learning framework which consists of Convolution Neural Networks trained on Common Objects in Context (COCO) and combined with computer vision. YOLO's convolution layers are modified to detect specified three classes and it uses a sliding window process. The map (Mean Average Precision) on validation dataset achieved 81% by using training data. [Ref .2]

Paper Name: Safety helmet wearing detection based on image processing and machine learning

Author: Dikshant Manocha, Ankita Purkayastha, Yatin Chachra, Namit Rastogi, Varun Goel Department of Electronics and Communication Engineering Jaypee Institute of Information Technology Noida, India

Description: This paper is about detecting two-wheeler riders without helmet with the help of machine learning and provides them with a user interface to pay challan. The proposed approach first captures the real time image of road traffic and then differentiates the two wheelers from other vehicles in the road. It then processes to check whether the rider and pillion rider are wearing helmet or not using OpenCV. If any one of the riders and pillion rider found not wearing the helmet, their vehicle number plate is processed using optical character recognition (OCR). After extracting the vehicle registration number, a challan will be generated against respective vehicle and all the details of the challan will be sent via E-mail and SMS to the concerned person. A user interface (an app and a website) will also be provided to pay their challan. [Ref .3]

Paper Name: Automatic detection of bike-riders without helmet using surveillance videos in real-time.

Author: Y Mohana Roopa, Sri Harshini Popuri, Gottam Gowtam sai Sankar, Tejesh Chandra Kuppili, Computer Science and Engineering Institute of Aeronautical Engineering, Hyderabad, India

Description: Numerous reasons lead to dangerous accidents. Lack of helmet is one of the major reasons for death during accidents. People are negligent regarding helmet usage. This needs to be controlled by proper surveillance. The present traffic control system is mostly based on human power. A police officer cannot manage the whole traffic and look out for rule-breakers. It would be a very tough job and will need a lot of human power to cover all the areas. This can be solved through our new automated system where two-wheelers with no helmets will be recognized through yolov2 and the respective frames are taken from the video from which the number plate of the particular vehicle is extracted and the fine for disregarding traffic rules. This fine detail will be updated over the server and message is sent to the phone number registered along with number plate. This paper is about an automated system where traffic surveillance videos are scavenged for vehicles, where extraction of number plates of vehicles with no helmet and generation of electronic fine management system takes place. [Ref .4]

Paper Name: Detection of motorcyclists without helmet in videos using convolution neural network.

Author: Bhavin V Kakani, Divyang Gandhi, Sagar Jani, EC Engineering Department Institute of Technology Nirma University

Description: Significant research and development of algorithms in intelligent transportation has grabbed more attention in recent years. An automated, fast, accurate and robust vehicle plate recognition system has become need for traffic control and law enforcement of traffic regulations; and the solution is ANPR. This paper is dedicated on an improved technique of OCR based license plate recognition using neural network trained dataset of object features. A blended algorithm for recognition of license plate is proposed and is compared with existing methods for improves accuracy. The whole system can be categorized under three major modules, namely License Plate Localization, Plate Character Segmentation, and Plate Character Recognition. The system is simulated on 300 national and international motor vehicle LP images and results obtained justify the main requirement. [Ref .5]

AIM & OBJECTIVES

Currently, traffic police personnel issue fines to violators of traffic laws by hand. However, due to ignorance or other considerations, they are occasionally able to avoid paying a fee even after breaking a traffic rule. The automation of this procedure will reduce such instances and, as a result, raise the severity of actions taken against them.

The proposed approach first captures the real time image of road traffic and then differentiates the two wheelers from other vehicles in the road. It then processes to check whether the rider and pillion rider are wearing helmet or not. People wearing different kinds of helmet which are not safe and hence should be considered as violation of traffic rule. Rider wearing different kinds of caps which should also be considered as violation.

MOTIVATION

Motorcycle accidents have been rapidly growing throughout the years in many countries. The helmet is the main safety equipment of motorcyclists, however many drivers do not use it. The main goal of helmet is to protect the drivers head in case of accident. It is not possible for traffic police force to watch every motorcycle and detects the persons who are wearing helmet or not. So there a was needed to make automate system that's automatically monitor motorcycles and detects the persons wearing helmet or not and detect number plate to penalize those persons without a helmet.

SYSTEM ARCHITECTURE

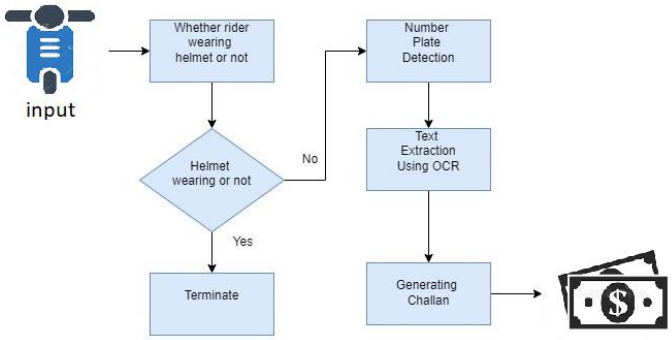


Fig -1: System Architecture Diagram

APPLICATION:

- **Road Signal**
- **RTO Office**

FUNCTIONAL & NON-FUNCTIONAL REQUIREMENTS

Functional Requirements

System Feature

In order to find a solution which can be used as a part of the RegSOC system, it is necessary to allow its integration with other modules. Research on helmet-based intrusion detection systems is the most often carried out on the pre-existing data sets or in laboratory environments in which simplification concerning infrastructure, data collection or services have been applied. Due to legal and technical limitations, our solution will detect threats through the analysis of Net Flow data and headers from network protocols. In addition, in the real environment it is not possible to obtain labelled teaching and validation datasets, which forces the introduction of adaptation mechanisms already at the deployment stage. In our approach we will try to prepare a suitably scaled model on the basis of the available datasets and then to adjust it in the following steps to the existing network. The models prepared and tuned this way will later become reference models during the implementation of the helmet, no plate and triple seat detection module in the subsequent networks.

Nonfunctional Requirements

Performance Requirements

In order to meet stringent performance requirements, system administrators must effectively detect undesirable performance behaviours, identify potential root causes, and take adequate corrective measures. The problem of uncovering and understanding performance helmet and number plate and their causes (bottlenecks) in different system and application domains is well studied. In order to assess progress, research trends, and identify open challenges, we have reviewed major contributions in the area and present our findings in this survey. Our approach provides an overview of helmet, number.

plate detection research as it relates to the performance of computing systems. By identifying fundamental elements of the problem, we are able to categorize existing solutions based on multiple factors such as the detection goals, nature of applications and systems, system observation, and detection methods.

Safety Requirements

Large tasks are practically infeasible in many applications. Therefore, an automated monitoring system is of both fundamental and practical interest. An intelligent solution that uses live camera images to detect motorcyclist who breach safety rules by not

wearing helmet.

Security Requirements

Helmet detection is the process of finding outliers in a given dataset. Outliers are the data objects that stand out amongst other objects in the dataset and do not conform to the normal behaviour in a dataset. Helmet detection is a data science application that combines multiple data science tasks like classification, regression, and clustering. The target variable to be predicted is whether a transaction is an outlier or not. Since clustering tasks identify outliers as a cluster, distance-based and density-based clustering techniques can be used in helmet and number plate detection tasks.

SYSTEM REQUIREMENTS

Hardware Requirements:

- System Processors: Core2Duo
- Speed: 2.4 GHz
- Hard Disk: 150 GB

Software Requirements:

- Operating system: 64 bit Windows 10 and on words
- Coding Language: Python
- IDE: Spyder, pycharm, Tkinter
- Database: Sqlite

CONCLUSION

In this project, we describe a framework for automat ic detection of helmetless cyclists from CCTV video s and automatic reissue of licenses for cyclists. The use of Convolutional Neural Networks (CNN) and tr ansfer learning helps to accurately detect helmetless cyclists. The actual result is 90.72%. However, the mere discovery of these drivers is not enough to jud ge them.
Therefore, the system can also recognize and store t he license card of their motorcycle. Border crossings can use the license repository to retrieve informatio n about drivers from their database of licensed vehic les. The driver will be penalized**.**

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