

NATIONAL INSTITUTE OF TECHNOLOGY, CALICUT



AUTOMATIC NUMBER PLATE RECOGNITION

PROJECT WORK

Submitted By

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Project Summary:

The project proposed is intended to automate the detection and recognition of license plates of vehicles, expand the collection of relevant data, and expedite the tedious and time consuming process of manually comparing vehicle license plates with lists of stolen, or authorizing and other vehicles of interest. The project suggests to keep an eye on parking spots or entrance gates with the help of cameras and raspberry pi, and alert officers to vehicles who are recognised by the system.

Objectives of project:

Primarily we are focusing on Institutes especially NIT Calicut to provide a convenient and efficient way to monitor entered vehicles. ANPR systems function to automatically capture an image of the vehicle's license plate, transform that image into alphanumeric characters using optical character recognition, compare the plate number acquired to databases of vehicles of interest to law enforcement and other agencies, and to alert the officer when a vehicle of interest has been observed. We understand that we cannot replace human strength and intelligence but technologies are bound to make our lives easy.

Our project will help in:

- Authorizing selected vehicles for entrances.
- Collecting relevant data regarding a particular vehicle(entry-exit time, driver's name etc.).
- Monitoring lost and stolen vehicles.

Input required for project:

The project required the vehicle's license plate as input which will be captured via a high resolution photographic camera. For convenience, the input can be either a clicked image or live video stream as per the user's requirement. Apart from that, users need to append license numbers in a database for the vehicles of interest. We assume an uninterrupted power supply to the camera and raspberry pi as well.

Expected output and outcome of the proposal:

The project is more about utility rather than an application and so we are expected to get the alphanumeric characters printed over the license plate of vehicles then we will expand our project by utilizing the relevant data for more applicative purposes like the vehicle is stolen or not, vehicle is authorized for entrances, toll is applied or not, which region does the vehicle belongs, vehicle's owner name, visiting time of vehicle etc. This proposal will save time and energy of officers who have been contributing their time in monitoring vehicles manually.

The problem with monitoring manually is:

- Human eye can monitor one place at one time.
- Manually checking plate numbers in a traditional journal system is a very back-breaking task.

This problem can overcome by this project because:

- Cameras can monitor each part of their frame equally.
- Prove more helpful where time is the main factor.

In our project, license plates get identified and recognised by the system which were further processed to check if the vehicle is registered one or not. If the vehicle number is stored in the database file then monitor shows register otherwise not register along with that system produced an alert sound to indicate registration.

State of the Art:

Automated Number plate recognition (ANPR) is a subject area undergoing intense research and adoption in recent times. Various combinations of state of the art techniques and methodologies have been proposed to solve the problem end to end, with mixed results. These techniques include computer vision based mathematical notations and training based on Recurrent Neural Networks (RNNs) and Long Short-Term Memory networks (LSTMs) to aid in better OCR'ing of the text from the license plates themselves. And even more advanced ANPR systems use specialized neural network architectures to pre-process and clean images before they are OCR'd, thereby improving ANPR accuracy. At the moment the most powerful state of art deep learning technique for implementing ANPR is YOLO (You Only Look Once). YOLO algorithm is very fast compared to other algorithms and hence is suitable for the realtime use case of automatic number plate recognition with high accuracy.

Apart from the software side, computation of deep learning required a high performance hardware platform to run algorithms and a decent camera that can capture images in high resolution with more fps. State-of-the-art specification for hardware can be a multi-core processor with bigger ram size and an additional gpu for model training. Jetson nano could be considered as a better alternative as compared to raspberry pi in case of standalone setup for number plate recognition.

Origin of the Proposal:

The issue of security is very paramount in any organisation, especially such organisations as college institutions. Therefore we intend to aid in security of the institution by bringing up a hardware solution on ANPR (Automatic Number Plate Recognition) using Raspberry pi that involves individual's vehicle to get recognised by the system via their respected vehicle number that is further stored on database to check whether the vehicle is registered one or not. It is an embedded system which has numerous applications and challenges. The system does not require any user interaction rather it automatically captures the numbers written over the number plate through the camera module. From this project, we hope to build an alternative security system for institutes.

Scientific reasoning and validity of the proposed work:

The massive integration of information technologies, under different aspects of the modern world, has led to the treatment of vehicles as conceptual resources in information systems. Since an autonomous information system has no meaning without any data, there is a need to reform vehicle information between reality and the information system. This can be achieved by human agents or by special intelligent equipment that will allow identification of vehicles by their registration plates in real environments. Among intelligent equipment, mention is made of the system of detection and recognition of the number plates of vehicles. The system of vehicle number plate detection and recognition is used to detect the plates then make the recognition of the plate that is to extract the text from an image and all that thanks to the calculation modules that use location algorithms, segmentation plate and character recognition.

Methodology:

Proposed method highlights the five stages of implementation : image capturing, preprocessing, extraction of license plate from vehicle, character segmentation from license plate and optical character recognition. The image capturing part is done by camera while the other remaining part comes under the Raspberry Pi (version-3 model-B).

Input images of vehicles are actually frames of video live streams captured by a camera module. For this particular project we are using Logitech C930e Webcam which shoots the video in 1080p resolution at 30 frames per second.

Preprocessing plays an important role in number plate detection by converting the input images in suitable form for further parts of the algorithm. For processing images we have used some functions of openCV library like cvtcolor for grayscale conversion, bilateral filtering for smoothening images and reducing noise; while preserving edges, and canny for edge detection.

License Plate Extraction process includes different techniques on image to detect and extract license plates. This process is divided into two parts, license Plate Detection through Haar-like Features and License Plate Detection through Edge Detection.

Character segmentation is a part of Image processing that is done on the extracted license plate to remove unnecessary data. After character segmentation, the extracted license plate has only those characters that belong to the license number.

Optical Character Recognition is performed by Tesseract version 4 which has implemented a Long Short Term Memory (LSTM) based recognition engine. LSTM is a kind of Recurrent Neural Network (RNN). The selected blobs are sent to a Optical Character Recognition (OCR) Engine, which returns the ASCII of the license number.

Bibliography:

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