AUTOMATED NUMBER PLATE RECOGNITION

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ABSTRACT

Automatic vehicle identification is a type of number plate recognition. A number plate is a vehicle's unique identification. Real-time number plate recognition is critical for maintaining law enforcement and traffic rules. It has a wide range of applications, including toll plazas, parking lots, high-security zones, border crossings, and so on. Number plate recognition is intended to identify the number plate and then decide whether or not it is registered. There are two major components to automatic licence plate recognition: Optical Character Recognition, extraction of vehicle licence plates (OCR). Number plate extraction is the stage in which a vehicle's licence plate is detected and the text from the plate is extracted. The normalised segmented characters are fed into an OCR algorithm. Finally, the optical character data will be converted into encoded text. Template matching is used to identify the characters. The final output must be in the form of a character string.

INTRODUCTION

1.1 Introduction

Purchasing a car is no longer considered a luxury item. Having a car is more of a necessity than a luxury. As the economy improves, an increasing number of people are expanding their vehicle ownership. While this is going on, the complexities and conflicts associated with parking grow. Cooperation and coordination are essential for the smooth operation of parking lot areas. Automated car parking systems are ideal for attempting to deal with parking issues. Managing vehicle entry and exit in parking lots is a difficult task. It becomes even more difficult when one wishes to track them down using details such as date, time, and licence plate. A dedicated staff member is frequently required to check these details and enter data. Automatic number plate recognition will automate the entire process of managing a car number plate, including capturing its image, extracting the number from the licence plate, and storing it in a database. Vehicle parking is an essential component of any transportation system, as vehicles are frequently parked at destinations. With an increasing number of motor vehicles on the road, particularly in developing countries, a vehicle identification mechanism that is effective, affordable, and efficient is required. There are also increased security challenges, such as terrorism, that necessitate increased surveillance. The ongoing car park entry registration process for visitors and staff in most academic institutions and car parks. The Automated Number Plate Recognition

(ANPR) management system (ANPR) recognises the licence plate number using image processing for efficient management of vehicle parking and vehicle billing. It is a self-contained real-time system that reduces the number of people involved in parking areas. This system's primary goal is to automate payment collection. This (ANPR) system extracts and acknowledges licence plate numbers from vehicles, then processes the image and generates an electronic bill. In most parking lots, heavy labour is required. This system was used to lower costs while also improving APMS performance. This system consists of extracting vehicle licence plate numbers, character segmentation, and character recognition. Before extracting the licence plate, proper pre-processing is performed, and it also generates the vehicle's entry and exit times, as well as the electronic. Segmentation is the most important and fundamental step in image processing, computer vision, and pattern and pattern recognition algorithms. The first step is image segmentation, which has a wide range of applications in robotics, automation, satellite imaging, and licence plate recognition. Nowadays, licence plate recognition is widely used in traffic management to recognise a vehicle whose licensor violates traffic rules, and it also aids in the detection of stolen vehicles because it does not require any manual work. A number plate is a vehicle's unique identification. Real-time number plate recognition is critical for maintaining law enforcement and traffic rules. It has a wide range of applications, including toll plazas, parking lots, high-security zones, border crossings, and so on. Number plate recognition is intended to identify the number plate and then assess whether or not it is registered. There are two major components to automatic number plate recognition: vehicle number plate extraction and optical character recognition (OCR).

Algorithms for automatic number plate recognition (ANPR) are typically divided into four steps:

1 VEHICLE IMAGE CAPTURE: Number plate extraction is the stage in which a vehicle's licence plate is detected and the text from the plate is extracted. Capturing an image of a vehicle appears to be a simple task, but it is a difficult task because it is difficult to capture an image of a moving vehicle in such a way that none of the vehicle's components, particularly the number plate, are missed. Following number plate extraction, the segmented characters are normalised and passed to an OCR algorithm.

2. NUMBER PLATE DETECTION

Based on different techniques, the majority of number plate detection algorithms fall into more than one category. The following factors should be considered when detecting a licence plate: • Plate size: a plate can come in a variety of sizes. • Plate placement: A plate can be placed anywhere. • Plate background: Depending on the vehicle, a plate may have a different background colour. • Screw: a plate could have screws, which could be considered a character. Image segmentation methods can be used to extract a licence plate.

3. CHARACTER SEGMENTATION

Characters are examined for further processing after locating the number plate. The image is segmented in the following order: • Segmentation at the line level; segmentation at the word level; and segmentation at the character level. Character segmentation is a pre-processing step of character recognition that is very important in order to perform character recognition with a high level of accuracy. Character recognition is sometimes impossible due to errors in character segmentation.

4. CHARACTER RECOGNITION:

Character recognition aids in the identification and conversion of image text to edible text. Finally, the optical character data will be converted into encoded text. Template matching is used to identify the characters. For recognising fixed-size characters, template matching is useful. 14 The success of the fourth step is dependent on the ability of the second and third steps to locate and separate vehicle numbers. The final output will be a number plate with the date, time of entry and exit, and parking cost.

1.2 PROBLEM DEFINITION

In the current system, the task must be completed manually, which takes a significant amount of time and energy. • Each vehicle must be verified by writing down the licence plate number. It takes a long time to write down each licence plate. • When someone is in hurry or an emergency, noting down the number plate and calculating the bill may irritate the customer and cause inconvenience. The procedure is time-consuming, tedious, and inefficient. • People expect quick and efficient service in today's digitalized world. Manual parking billing systems, on the other hand, necessitate time and patience. • It is difficult to check all or the majority of vehicles using this method. • When there are a lot of vehicles in the parking lot, they must form a line and wait their turn. • Calculating the amount takes time. • Even a minor error in manually calculating the amount can cause major problems.

2. LITERATURE SURVEY

Much advancement in Digital Image Processing have been used in a variety of fields, as have advances in Optical Character Recognition Technology. In recent years, various techniques for utilising digital image processing have been developed. OCR was made available as a service (WebOCR) in the 2000s, as well as in cloud computing environments and mobile applications such as real-time translation of foreign-language signs on a smart phone. The best use of this technology would be to develop a reading machine for the blind, which would allow blind people to have a computer read text aloud to them. For the most common writing systems, such as Latin, Cyrillic, Arabic, Hebrew, Indic, Bengali (Bangla), and Devanagari, Tamil, Chinese, Japanese, and Korean characters, commercial and open source OCR systems are available. Tesseract OCR is the OCR engine used in this case. Tesseract is an optical character recognition engine that works with a variety of operating systems. It is open source software distributed

under the Apache License. Originally developed as proprietary software by Hewlett-Packard in the 1980s, it was released as open source in 2005 and has been sponsored by Google since 2006. Tesseract was regarded as one of the most accurate opensource OCR engines available in 2006. The Tesseract engine was created as proprietary software between 1985 and 1994 at Hewlett Packard labs in Bristol, England and Greeley, Colorado, with some changes made in 1996 to port to Windows and some migration from C to C++ in 1998. A large portion of the code was written in C, with the remainder written in C++. Since then, all of the code has been converted so that it can at least be compiled with a C++ compiler. In the decade that followed, very little work was completed. Hewlett Packard and the University of Nevada, Las Vegas then made it open source in 2005. (UNLV). Google has been funding the development of Tesseract since 2006. In 1995, Tesseract was one of the top three OCR engines in terms of character accuracy. It is compatible with Linux, Windows, and Mac OS X. Due to limited resources, however, it is only rigorously tested by developers on Windows and Ubuntu.

Anisha Goyal and Rekha Bhatia from the Department of CSE, Punjabi University Regional Centre for Information Technology and Management, Mohali, Punjab, India, proposed in one of their papers that until now, all LPR systems have been created using neural networks. They proposed running the system through the Gabor filter, OCR, and Vision Assistant to make it faster and more efficient. Different recognition strategies have been developed and number plate recognition systems are now used in a variety of movement and security applications, such as parking, access and border control, and the tracking of stolen vehicles.

In another paper, Amr Badr, Mohamed M. Abdelwahab, Ahmed M. Thabet, and Ahmed M. Abdelsadek proposed that automatic recognition of car licence plate number has become a very important in our daily life due to the unlimited increase of cars and transportation systems that make it impossible to be fully managed and monitored by humans, examples include traffic monitoring, tracking stolen vehicles, and many more. This paper primarily introduces an Automatic Number Plate Recognition (ANPR) system that employs Morphological operations, Histogram manipulation, and Edge detection Techniques for plate localization and character recognition.

In the third paper, Hamed Sanghaei proposes an automatic and mechanised licence and number plate recognition system that uses image processing algorithms to extract the licence plate number of a vehicle passing through a given location. The resulting data is compared to the records in a database. The experimental results show that the presented system detects and recognises the vehicle licence plate on real-world images. This system can also be used for traffic control and security.

In the fourth paper, Priyanka Beghad proposes one of the intelligent systems for car parking

using image processing. A brown rounded image of a parking slot is captured and processed in this system to detect a free parking slot.

3. OVERVIEW OF THE SYSTEM

3.1 Existing System

The task must be completed manually in the current system. Each vehicle must be verified by noting down the licence plate first, followed by the information I checked. The procedure is time-consuming, tedious, and inefficient. It is difficult to check all or the majority of vehicles using this method. As a result, a better system is required.

3.2 Proposed System

Purchasing a car is no longer considered a luxury item. Having a car is more of a necessity than a luxury. As the economy improves, an increasing number of people are increasing their vehicle ownership. While this is going on, the complexities and conflicts associated with parking grow. Cooperation and coordination are essential for the smooth operation of parking lot areas. Automated car parking systems are ideal for dealing with parking issues.

The proposed system detects the vehicle and then lets the admin capture an image of it. Image segmentation is used to extract the vehicle number plate region from an image. For character recognition, an optical character recognition technique is used. The resulting data is then used to save records to a database. This system will be quick and efficient, reducing manual labour, and can be widely used for security purposes. Registered users can proceed directly to billing, whereas new users must first register and then be billed. The vehicle will be able to be identified, recognised, and authenticated by the system. The system will be capable of storing and maintaining records. To store data in a database, SQL lite3 is used. It is a C library that provides a lightweight disk-based database without the need for a separate server process and allows access to the database via a nonstandard variant of the SQL query language. SQLite can be used by some applications to store internal data. SQLite can also be used to prototype an application before porting the code to a larger database such as PostgreSQL or Oracle.

The primary goal of this system is to automate payment collection. The need for an efficient billing system in parking lots that reduces time spent at the billing point is the primary motivation for developing this project. The project's goal is to reduce the number of workers and car owners in the parking lot. It can provide precise details quickly in an emergency. We'll be able to get the information we need. Automatic number plate recognition has two major components: vehicle number plate extraction and optical character recognition (OCR). The entire process of managing a car number plate, including capturing its image, extracting the number from the licence plate, and storing it in a database, will be automated by automatic number plate recognition. When a vehicle, such as a car, enters a parking lot, a digital camera with a sensor is installed, and a licence

plate recognition system recognises the car's licence plate number.

3.3 System Modules

3.3.1 Admin Module

Step 1: Start

Step 2: Admin captures image.

Step 3: Stop

3.3.2 Number Plate Detection Module

Step 1: Start

Step 2: Vehicle image is captured.

Step 3: The image is processed and number plate is detected and saved.

Step 4: The entry time is noted

Step 5: Stop

3.3.3 Bill Generation module

Step 1: Start

Step 2: The entry and exit time is used to evaluate the time duration.

Step 3: Bill is generated based on how much time the parking space was used.

Step 4: Stop

4. RESULTS

4.1 RESULTS SNAPSHOTS

Fig. 4.1: Admin Login

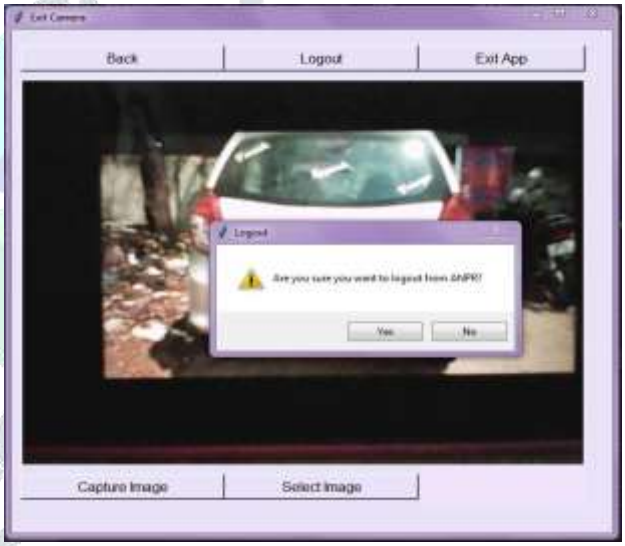

Fig 4.2: Option to select image for entry point

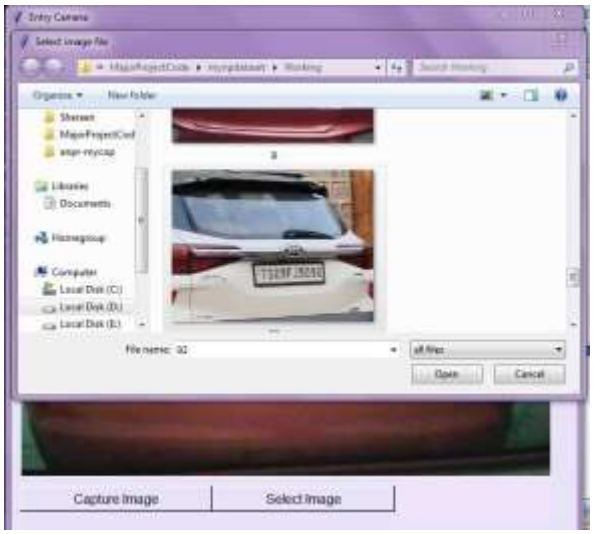

Fig 4.3: Admin logging out from the system

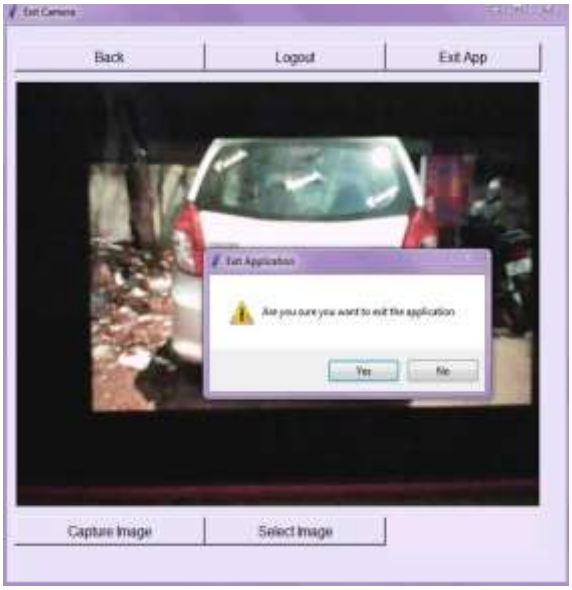

Fig 4.4: Exiting from the system

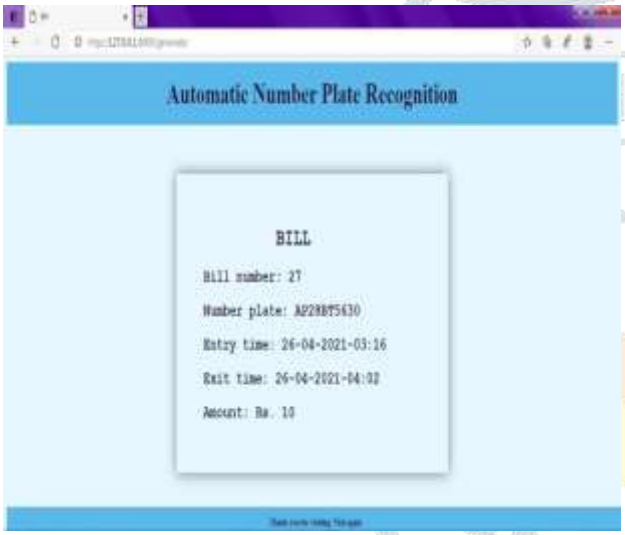

Fig 4.5: Bill displayed to the user

5. CONCLUSION

Any organization's security is enhanced by our system. It reduces the need for manual labour. It facilitates bill generation. It also records vehicle entry and exit times, which can be useful for security purposes. When human contact is not desired, our system efficiently avoids human interaction. While creating a life-size model, the model must be analysed. It shows how the planned automated number plate recognition parking system works. The problems and challenges associated with car park vehicle identification details served as the foundation for this study. The primary goal of this study was to create an automatic number plate recognition system for parking lot management using an Optic Character Reader (OCR).

FUTURE WORK

The system can be expanded by incorporating various hardware components to automate the entry and exit of vehicles within the premises. Payment gateways can be integrated to facilitate online bill payment. The allocation of parking spaces can also be incorporated into the system. We can also include various payment methods.

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