Identifying Vehicles for Parking Records: Image Processing and Data Mining

Name: ORNAB, SYED NAFIS AREFIN, ID: 19-40611-1, SECTION: C

Statement of Purpose- In recent years, advanced parking options have emerged. Our parking systems need human resources. As a result, time is squandered and labour is required on a continuous basis. Advanced technology is required to eliminate time waste and ongoing labour. The goal of this research is to develop an image processing and data mining technique for recognizing vehicle information so that parking records may be saved. The proposed method uses a circular image formed in a parking lot to provide information about available parking spots for automobiles. In this project, a camera is utilized as a sensor to picture vehicle parks to reflect their occupancy. A camera is used because it can identify the presence of many vehicles with a single picture. It is also possible to move the camera around to distinguish between different parking lots. This image might be used to locate unoccupied parking lots, and the processed data could then be used to direct a driver to an open parking place rather than wasting time looking for one. A software and hardware platform has been built for the proposed system. Both drivers employ an automatic parking system to make the parking process more efficient and less complicated. Image processing, particularly digital image processing, is one of today's fastest-growing technologies. The study examines image processing, with a special emphasis on recognizing objects in 2D picture frames collected by IP cameras, such as those used in automobiles. The practical phase involves determining the true occupancy of a large parking lot using vehicle recognition algorithms from the Open CV library. On the website, the % occupancy results of the parking charge are presented. This research focuses on a critical technology that leads to a cost-effective parking solution. The goal of this research is to demonstrate how image processing and data mining techniques may be combined to construct an intelligent parking place recognition system.

Introduction- A vehicle is a machine that transports people or goods from one location to another. [1] The detection of the vehicle needs the installation of a CCTV system, which serves as an automated way of traffic monitoring in a given region. [2] Image processing is a technique for improving the quality of photographs or extracting usable and crucial information from them. [3] The photographs obtained can give authorities and other public tracking organizations valuable clues, all of which might lead to proof of a crime or other unintended or undesirable occurrences. [2] Manual labor has always been proved to be slower and less effective due to human mistake and a range of other variables that impact live beings. [2] As a consequence of technological improvements in intelligent transportation systems, the use of such CCTV cameras to monitor traffic movement and accurately track moving cars has become popular in developed countries. [4] Using camera calibration data, the speed limit may be approximated. [8] A morphological technique can be used to characterize automobiles. Automobile categorization based on size or aspect is critical in transportation planning and flow control. [5] There is a useful feature called data mining that may be utilized to obtain information about the car. There is a strong tool called data mining that may be used to collect vehicle information. [6] GPS shadows may also be used to describe cars using data mining tools. [7] Vehicle detection and classification are critical in traffic control and administrative decision-making. [5] In this study, i look at how image processing and data mining technologies may be utilized to evaluate a car parking system at order to avoid car parking troubles in various institutes. In this study, an image processing system will be used to detect the vehicle's

classification and identity, and a data mining system will be used to identify information about the vehicle so that parking records such as entering, ejecting, parking duration, bills, and other information can be added to the vehicle's owner's account and made visible.

Literature review-

Research Objective:

On the basis of technological breakthroughs in intelligent transportation, the use of CCTV cameras to monitor traffic movement and properly track moving vehicles has become ubiquitous in developed nations. [4] Traffic difficulties, financial waste, and blockage on overpasses and over bridges may all be addressed by detecting cars utilizing different morphological processes-based image processing algorithms. [22] Vehicle identification by video surveillance is one of the most eagerly anticipated recent advancements in wireless big data collection and traffic improvement. [1] Surveillance camera systems are used to ensure the safety of people in dangerous situations. [4] The first is generation 1GSS, the second is generation (2GSS), and the third is generation (3GSS) (3GSS).

Main objective- The main objective of this research to identify the vehicle through video camera and propose a automated parking lot system. Behind the scene their image processing and machine learning was used. Image processing is used to capture the vehicle from real time video and extract the valuable information for identifying the vehicle. For differentiating the vehicle we used data mining.

> a) **Sub-objective 01**: Is to recommended to construct a unique approach for vehicle data identification and tracking be built using a Gaussian mixture model. Using a particular sort of camera capable of recording video footage in low light, a real-time vehicle recognition system in low light is undertaken. Some important issues,

such as the vehicle's form, location, and order, have been resolved when detecting the vehicle.

b) **Sub-objective 02**: Is to identify and count automobiles, Kota and Rao introduced the frame difference method to detect moving zones with variety of time occurrences. A Data Mining approach is used to categorize the automobiles, comparing classifiers built with various classification algorithms for two alternative forms of the class variable, each having three or two probable values. When the sets of data are large enough, machine learning on vehicle classification is successful, which is essentially connected to the disciplines of data mining and pattern recognition.

Research Questions:

This study's main purpose is to cut down on wasted labor and time. It will benefit both the institution with a car parking facility and the consumers with a vehicle that has to be parked for a specified amount of time.

"Identifying solutions to difficulties that develop in parking lots through technical improvements that satisfy both consumers and authorities," is the key focus of this inquiry.

Main question- What are the issues that arise in parking lots?

> a) **Sub-questions 01**: What technologies can be utilized in parking lots to detect vehicles and identify their details? - One of the most popular techniques for identifying parking occupancy information is sensors. Detection systems using Active Infrared Sensors would emit infrared energy and utilize the amount mirrored to recognize any object or automobile. Machine vision may be used to recognize license plates or determine parking lot occupancy using a visual camera for identifying their details.[26]

b) **Sub-questions 02:** How can technological advances be used to deal with the problem in a cost and time effective direction?

c) **Sub-questions 03:** How will the authorities and the customers conceive the modern innovation in this particular area?

d) Sub-questions 04: How does detecting vehicle impact society? - A huge number of individuals die in automobile accidents across the world. Building an autonomous traffic accident detection system and minimizing the time it takes for an accident to occur are two successful approaches for lowering road deaths. So, with automobile verification, we can quickly catch road accidents and other crimes in this project.[27]

e) **Sub-questions 05:** What is the overall objective of vehicle detection in our proposed system?

Research Methodology-

The computational technique is used in this research. This section goes into detail about the approach, what it is used for, and how it relates to our topic. Image Processing and Data Mining are two of the key algorithms employed in this research to identify the vehicle.

In this research, I explore at how image processing and data mining systems can be used to evaluate an automobile parking system in order to prevent the car parking issues in different institutes. In this study, the Image Processing system will be used to detect the vehicle's classification and the identity and then the data mining system will be used to identify the information regarding the vehicle so that the parking records such as entering, ejecting, parking duration, bills and other information can be added and visible to the vehicle's owner's account.

Image Processing:

Image processing analyse the video footage that is captured by CCTV cameras or any type of stable video capturing cameras. The video acquired is transfer back to the computer system which extracts the individual frames out of the video. The camera's frame rate in terms of fps is formerly known to the computer. In this approach the videotape frames Attained are pre-processed using a cross platform and open-source library known as OpenCV.[11] The vehicle that is present in the video footage needs to be extracted from the noisy background within a frame. Classifying a vehicle form the frame can be done by ascade classifier which is proposed in the paper by Paul Viola and Michael Jones.[10] By analysing a particular frame it can perform complex mathematical equation to find a relative pattern from it.[9]
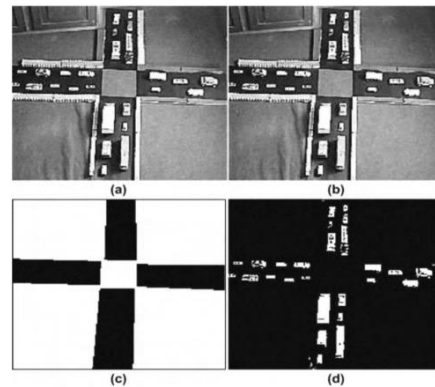

Figure: Image processing view (black and white image)

Data Mining:

From a huge amount of data that can be labelled or unlabeled, finding new information that is meaning full is the term Data Mining. According to the task that we are willing to establish there are different kind of classification. We need to choose the appropriate mining technique to get the accurate result. From meaning less data, the main goal of this technique is to identify the knowledge. In between there are some few steps like preparing data, data cleaning, finding the pattern etc. [12] Classifying images and videos of vehicle is significant in Intelligent Transportation System. In this research 4 types

of vehicles are going to be classified. WEKA is an open-source software to do classification problem like we are willing to do. For training WEKA, we must give it a training set, means some pre-processed data that are accurate. The images can be collected from google or any free source. The classification will identify the type of the car.[13]

Relevance of method:

The main goal of this research is to identify the vehicle from a parking and make the parking payment automated. These two techniques are perfect for identifying a vehicle. Image processing will identify the image of car by using the video footage from the CCTV cameras. After that using data mining approach we can classify the vehicle type. In our research it is exactly what we want to do. These two techniques will be sufficient to build an automated parking system.

By using image processing, we can easily identify the vehicle by analysing the pattern of frame which will be delivered by the CCTV cameras. Some open-source library will help to done this part. We may need to build a new software for this if there is no alternative to this process. After getting the images of vehicle we need to identify that what kind of vehicle this is. For this we need data mining which will classify the vehicle type. And after that we just need to calculate the time of parking of that vehicle. It can be done by software. We will be needing a moderate computer and CCTV cameras to implement this research. This is how we have designed the prototype.

By analysing all the information, my suggestion is to limit the parking places, but the principles of this approach can be applied to a variety of situations. We can utilize an autonomous traffic control system to manage traffic, that can be constructed on the very same ideas as the system we described. Traffic cameras will capture the vehicle movement and how much traffic are on the road. Based on that information the traffic lights will work. So here no manual input is needed for traffic light to work. Another example is human face recognition in shopping malls. Like this there are many other places where the

principle can be used by extending some of its features.

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