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Efficient Parking Management: Real-Time CCTV Integration for Smart Car Parking with License Plate Recognition

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ABSTRACT

This article presents a picture-processing-based intelligent parking system that was created for open parking lots, multi-story parking complexes, and other uses. To determine if a parking spot in the captured video is occupied, the suggested system architecture makes use of the OpenCV library, Python's coordinate bound pixel, and combined edge detection portions. It also shows you how to turn pictures into text. Tesseract is used to extract text from the processed picture. Because there are differences in the amount of image processing, various images require different processing methods to get the best text results.

Keywords: OpenCV, coordinate bound pixel, Tesseract

1. INTRODUCTION

Globalization has continued to attract more people to metropolitan areas, causing major cities such as Bangalore to become overcrowded and congested. The growth in population implies an increase in human mobility. This effects the increase in the number of automobiles, which affects the parking situation. These days, a few people are getting automobiles regardless of whether or not they have no place to store them, and a few streets are, in any case, turning out to be parking spots, causing significant traffic. Regular parking lots are usually just empty spaces, so people have to physically look for an empty one. This parking method is not only incredibly time-consuming, but it is also ineffective, especially for multi-story buildings where cars must search every available space and navigate many floors to locate and confirm a place.

2. LITERATURE SURVEY

Ming-Yee Chiu et al. suggested a system for counting automobiles at checkpoints and calculating the number of available parking places [1]. The counting is carried by using induction loop sensors situated beneath the road's surface. While sensors were less expensive, they were more difficult to install and caused road damage; yet, they were also more precise and resistant to outside changes. In the case of a malfunction, servicing it was similarly difficult [2]. For a long time, the processing of images has been a popular research area with the potential for novel and innovative applications. Image processing is essential to all major growing and developed social areas, such as entertainment, media, engineering, security, and medical. Unique image pre-processing techniques, such as RGB to grey transformation, blurring, thresholding methods, and contouring, are critical for improving accuracy [3]. In certain situations, a large number of photos are required to access specific data. The Histogram approach is used to collect statistical data from images and rate them as great or bad [4]. It is also used for image equalization and normalization. A two-phase outline work of Histogram handling is utilized for sorting and removing undesirable small messages from an image [5]. The primary goal of license plate detection is text extraction; so, image processing becomes the most crucial step before image to text conversion. The corner focus approach is used in the methodology in [6] to extract text from document pictures. It is extremely fast and contains preset parameters designated for many types of images, such as handwritten, typewritten, skewed, etc. In paper [7], a method for identifying a license plate in an image captured at multiple angles and with variable lighting is proposed. It involves using wavelet modification and masking off possible license portions. Once processing is complete, the picture may be sent to the Tesseract OCR Machine, which uses a command line interface to convert the image to text [8].

3. SYSTEM ANALYSIS

A. EXISTING SYSTEM

Based on the abstract you supplied, it seems that you are searching for details about the current intelligent parking Using the Processing of Images solution. Unfortunately, I am unable to share the precise current system without knowing specifics or code. Nonetheless, I can provide you with a comprehensive understanding of the essential elements and procedures in the current system based on the abstract:

Multi-story Parking and Open Parking Lots: The system is designed to work in both multi-story parking garages and open parking lots, indicating its adaptability to different environments.

Image Processing using Python and OpenCV: The core of the system involves image processing using Python programming language and the OpenCV library. OpenCV is likely used for tasks such as image acquisition, preprocessing, and analysis.

Edge Detection and Coordinate Bound Pixel Sections: The system determines if a parking space is filled or unoccupied by using edge detection algorithms and analyzing coordinate-bound pixel regions in the pictures. This is essential for determining the condition of every parking spot in the video.

Text Extraction using Tesseract: Tesseract, an optical character recognition (OCR) engine, is used for extracting text from the processed images. This could be relevant for capturing information such as license plate numbers or other text present in the images.

Variable Level of Image Processing: To guarantee that various pictures receive varying degrees of processing, the system includes a configurable amount of image processing. This adaptive method most likely aims to maximize text extraction outcomes according to each image's unique properties.

Image to Text Conversion: The system involves converting images to text, and the abstract mentions the implementation of image-to-text conversion. This conversion is likely essential for obtaining meaningful information from the images processed by the system.

DISADVANTAGES OF THE EXISTING SYSTEM

Dependency on Image Quality:

Limitation: The system's effectiveness might be influenced by the quality of the input images. Poor lighting conditions, low-resolution images, or other image quality issues could affect the accuracy of parking spot occupancy detection.

Sensitivity to Environmental Changes:

Limitation: External factors such as weather conditions, varying light levels, and changes in the environment (e.g., presence of shadows) could impact the system's ability to accurately

identify parking space occupancy, leading to potential false positives or negatives.

Processing Speed:

Limitation: Image processing tasks, especially in real-time scenarios, may require significant computational resources. Depending on the hardware specifications and the complexity of the algorithms used, the system might face limitations in processing speed, potentially causing delays in providing real-time parking status information.

Adaptability to Diverse Parking Environments:

Limitation: While the abstract mentions applicability to both multi-storey parking garages and open parking lots, the system's performance may vary based on the specific characteristics of different parking environments. The system might face challenges in adapting to diverse layouts and configurations.

Text Extraction Accuracy:

Limitation: The accuracy of text extraction using Tesseract can be affected by factors such as font styles, orientation, and the presence of noise in the images. The variability in image processing levels for different images may result in suboptimal text extraction results in certain cases.

B. PROPOSED SYSTEM

The automobile is inspected to make sure there are no vacant spots as it pulls into the parking lot. In the event that there are any, the first camera reads the license plate of the car, stores it in the cloud, and opens the parking lot by showing open spaces. If there are no open spots that are free, the same will be shown. When the automobile leaves, the second webcam scans the registration number again, and the results have been compared to the entrance time. Based on how long the car is left, a fee is calculated.

ADVANTAGES OF THE PROPOSED SYSTEM

Real-Time Parking Availability Information:

Advantage: The system provides real-time information about parking space availability, allowing users to quickly identify and navigate to vacant parking spots. This can significantly reduce the time spent searching for parking, improving overall efficiency.

Optimized Space Utilization:

Advantage: By accurately detecting occupied and vacant parking spaces, the system facilitates optimized space utilization within parking facilities. This can lead to increased overall parking capacity and better organization of vehicles.

Resource Efficiency:

Advantage: The system can contribute to resource efficiency by minimizing the time vehicles spend idling and circling in search of parking. This can lead to reduced fuel consumption, lower emissions, and a positive environmental impact.

Enhanced Security and Monitoring:

Advantage: The system, by continuously monitoring parking spaces, contributes to enhanced security in parking facilities. Any unusual or unauthorized activities can be detected, providing an additional layer of surveillance and safety for both vehicles and users.

4. SYSTEM DESIGN

SYSTEM ARCHITECTURE

Below diagram depicts the whole system architecture.

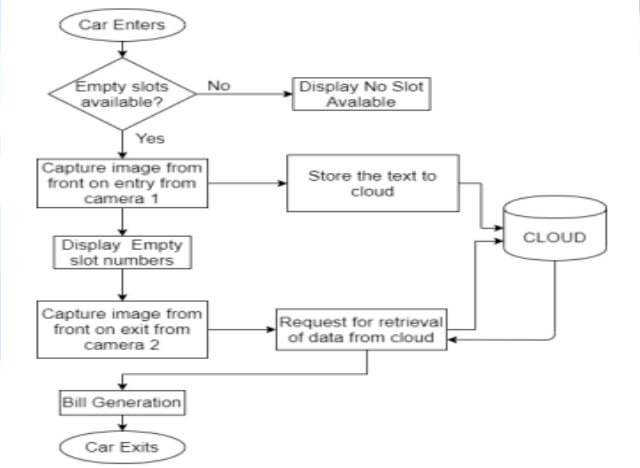

Fig 1. Methodology followed for proposed model

5. SYSTEM IMPLEMENTATION

MODULES

For a Smart Parking System using Image Processing, the system can be broken down into several modules to organize and manage different functionalities. Here are five potential modules:

Image Acquisition and Preprocessing:

This module is responsible for capturing images or video streams from cameras installed in the parking facility. It includes preprocessing tasks such as image enhancement, normalization, and filtering to improve the quality of input data for subsequent analysis.

Parking Spot Detection:

The parking spot detection module utilizes image processing techniques, including edge detection and coordinate analysis, to determine the occupancy status of each parking space in the acquired images. It identifies vacant and occupied spots based on predefined criteria.

Text Extraction and Recognition:

In this module, optical character recognition (OCR) tools like Tesseract are employed to extract relevant text information from the images. This could include reading license plate numbers or any other textual data associated with the vehicles parked in the spaces.

Data Storage and Management:

This module handles the storage and management of the processed data, including the status of each parking spot, time stamps, and any extracted text information. It may involve database systems to efficiently organize and retrieve historical parking data.

User Interface and Communication:

The user interface module is responsible for presenting real-time parking availability information to users. It could be implemented as a mobile application, a web portal, or even physical displays within the parking facility. This module also manages communication between the system and users, allowing for features like spot reservation or navigation assistance.

6. RESULTS AND DISCUSSION

This experiment aims to demonstrate the decrease in Make time spent on the program running, and the exactness with which the Vacant slot detection method determines whether a parking space is occupied or not. Coloured rectangles are used to disguise the building's and parking structure's conditions in Figures 4 and 5.

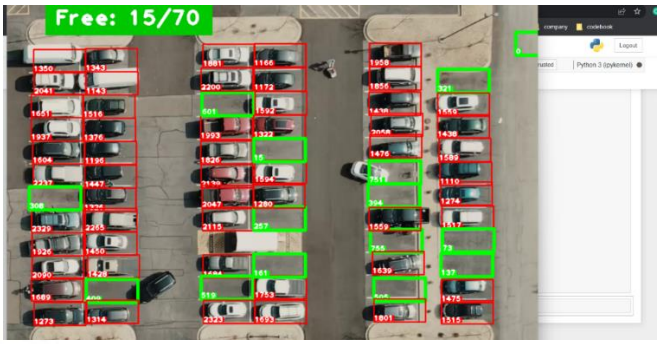

Fig 2. **Upload an image for Image Cartoonization**

Fig 3. **Number plate was recognized upon leaving, along with the bill provided.**

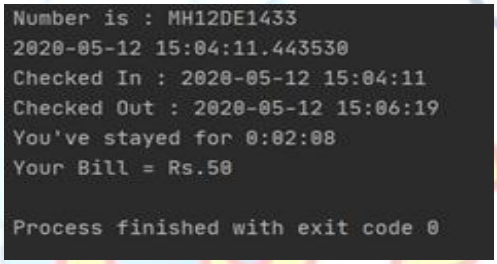

fig 4. Number plate identified upon exit, together with the bill produced

7. CONCLUSION AD FUTURE WORK

Understanding image processing is essential to obtaining any kind of information from a picture. In this study, a few movies from indoor parking garages were used to successfully test and implement a suggested image-processing-based smart parking system design. When a car is inside or using a parking space, the system accurately determines whether or not the spaces are occupied by displaying a red outline; when a space is empty, the outline changes to green. We used Tesseract software to extract text from the photos after first applying image processing methods to the images used in the number plate recognition. Different photos require varying degrees of digital image processing procedures since they contain unique text styles, lengths, widths, and fonts. The best picture from each of these image outcomes for a single image is then used to use Tesseract to extract the text from the image. Consequently, after processing the image digitally, we were able to provide outputs that were superior and almost flawless.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

REFERENCES

[1] Ming-Yee Chiu; Depommier, R.; Spindler, T.; , "An embedded realtime vision system for 24-hour indoor/outdoor car-counting applications," Pattern Recognition, 2004.

[2] Zhang Bin; Jiang Dalin; Wang Fang; Wan Tingting; , "A design of parking space detector based on video image," Electronic Measurement & Instruments, 2009.

[3] F. Zhou, and Q. Li, "Parking guidance system based on ZigBee and geomagnetic sensor technology," 13th International Symposium on Distributed Computing and Applications to Business Engineering and Science (DCABES) 2014, pp. 268-271.

[4] Y. Zheng, S. Rajasegarar, and C. Leckie, "Parking availability prediction for sensor-enabled car parks in smart cities," IEEE 10th International Conference on Intelligent Sensors Sensor Networks and Information Processing (ISSNIP) 2015, pp. 1-6.

[5] A. Khanna, and R. Anand, "IoT based smart parking system," 2016 International Conference on Internet-ofThings and Applications (IOTA), Pune, 2016, pp. 266-270.

[6] Z. Ji, I. Ganchev, M. O'droma, and X. Zhang, "A cloud-based intelligent car parking services for smart cities," General Assembly and Scientific Symposium (URSI GASS) 2014 XXXIth URSI, pp. 1-4.

[7] K. Cheng, "Indoor Parking DAHUA," 2018. [Online]. Available: https://www.youtube.com [Accessed 2018].

[8] KETOSI, "[KETOSI] Audi R8 V10 Parking Lot Accident CCTV," 2013. [Online]. Available: https://www.youtube.com [Accessed 2018]