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Smart Parking System Based on Image Processing

Pranita Rankhamb[1], Aniket Kangaonkar[2], Vishal Jawale[3], Maheshkumar Jadhav[4], Prof. Dewendra Bharambe[5]
U.G. Student Department of Computer Engineering, ABMSP's Anantrao Pawar College Of Engineering And Research, Pune

Abstract: ***Successful implementation of smart parking systems can effectively reduce a lot of problems related to traffic congestion in urban areas. Wastage of fuel and time in search of a vacant parking space will be significantly reduced and the complete utilization of the available parking areas can make our cities really smart. Parking slot detection and user notification are the two major sections of a smart parking system. The empty parking space detection was initially done by deploying a number of sensors in the parking lot. It is highly expensive and complicated to install. But the advancement of image processing has enabled us to use images of the parking area to find out empty spaces. In this paper, a comparative study of the various parking space identification techniques has been done. Also, image processing-based system models have been presented as a replacement for sensor-based systems. A very efficient and simple technique for parking slot identification based on optical character recognition (OCR) has been introduced in this paper. The camera installed in the parking lot captures the image of the parking area with specially numbered parking spaces. The OCR system recognizes numbers that are not hidden by a vehicle parked over it and this information is used for identifying the empty spaces.***

Keywords: TensorFlow, CNN, machine learning, OpenCV, Python, Anaconda Navigator, etc.

I. INTRODUCTION

It's still common that individuals have difficulties to parking their cars. For instance, it's troublesome for drivers to search out timely vacant parking areas, and navigation help isn't accessible once the world's Global Positioning System (GPS) doesn't work well. As a consequence, parking difficulties end in unessential driving around the eye to merely search for an automobile parking space. Thus, on the one hand, causes additional dioxide emissions and deteriorates the setting of the town scheme. This is often very true once many of us are at the same time searching for parking places in a very downtown space at peak rush hours.

Parking areas are found to be quite masses in some places and really rare to find in others. Valuation policies had competed for a vital role within the overall parking handiness for many years. Here comes the necessary question: can we get to have additional parking areas or we would like higher parking management? We tend to believe it's the latter and so the motivation behind this work is regarding higher parking management with honest and profitable valuation policies. Consistent with historical knowledge, the costs are inflated and reduced proportionally to the expected utilization. Though dynamically dynamic parking costs shall balance the provision and demand for parking and increase overall utilization, it's supported by historical knowledge and statistics which cannot be correct enough to possess the right result.

II. LITRATURE SURVEY

Reference[1]: A Multi-storey Garage Smart Parking System based on Image Processing. Chyn Ira C. Crisostomo, Royce Val C. Malalis, Romel S. Saysay, and Renann G. Baldovino. In this study, an image-processing-based smart parking system was developed for multi-story parking garages. Car drivers spend a considerably long amount of time finding an available parking space where slots are spread throughout multiple stories which causes longer queues and traffic congestion.

Reference[2]: On-Street Parking Spot Detection for Smart Cities**.**Sezer Goren1 , Dilan Fatma O ncevarlık2, Kemal Doruk Yıldız3 and Taha Zahit Hakyemez4.Car parking in crowded cities is a big problem. Drivers have to do a blind search to find a free on-street parking spot. Blind searching not only causes traffic congestion but also fuel and time consumption.

Reference[3]: Car Detection in Roadside Parking for Smart Parking System Based on Image Processing.

Deni Kristin Manase, Zahir Zainuddin, Syafruddin Syarif, Arsan Kumala Jaya. This study aims to detect vehicles that are on the side of the parking lot so that they can be used as a smart parking system for parking management and find out information on the availability of parking spaces.

Reference[4]: Smart Parking System Based On Optical Character Recognition. Athira A. [1], Lekshmi S. [2], Pooja Vijayan [3] , Boby Kurian [4]. Successful implementation of smart parking systems can effectively reduce a lot of problems related to traffic congestion in urban areas.

Reference[5]: An autonomous parking space planning system based on a pattern searching algorithm.1st Xinxin Huang,2nd Yingguo Gao,3rd Xiaohui Duan. In the field of static traffic, parking space planning and moving line planning are currently carried out manually over a period of more than one week, which is inefficient and cannot be optimized automatically

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III. SYSTEM ARCHITECTURE

The proposed system is used to build a " smart parking system based on optical Image Processing". The smart parking system is a software application The image processing-based empty parking lot identification has made the system simple as well as cheap. Here, We need only to use images captured by the surveillance camera in the parking lot for empty slot detection .using suitable image processing algorithms the accuracy of detection can be improved. In this system, we use Convolution Neural Network(CNN) algorithm. The system consists of various steps which are image prepossessing, feature extraction, CNN algorithm working, and parking slot detection.

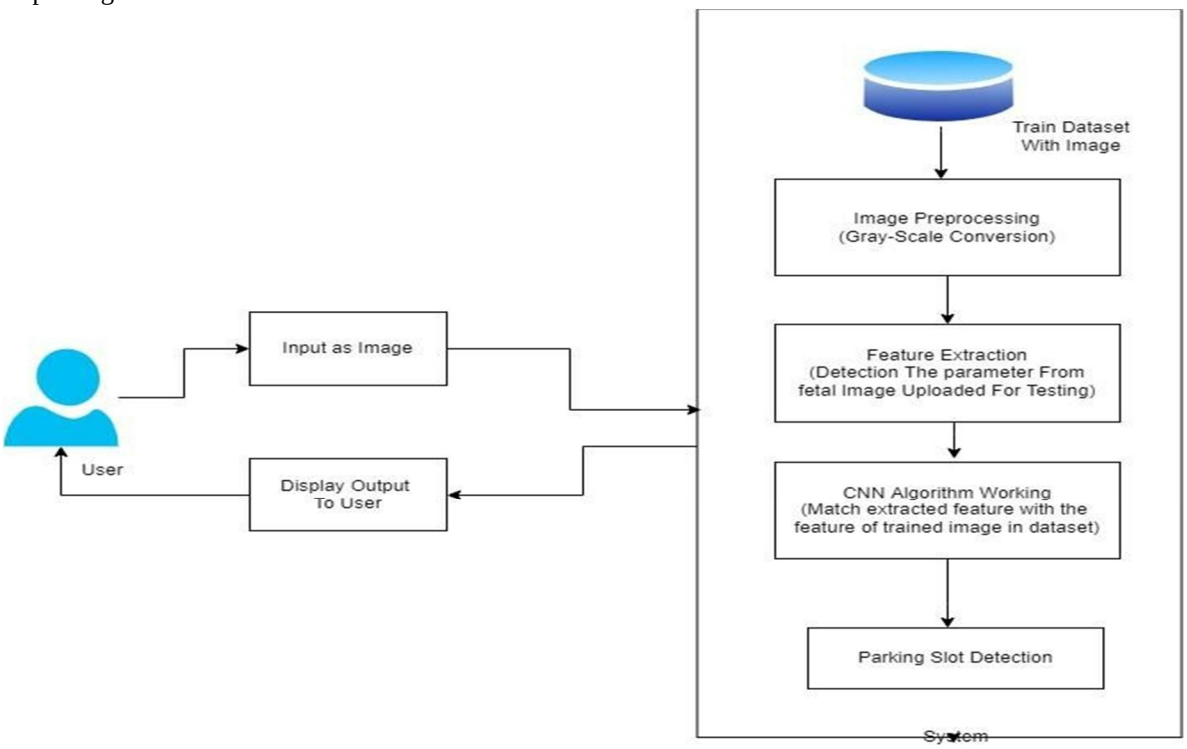


Fig-1: Architecture Diagram

IV. METHODOLOGIES

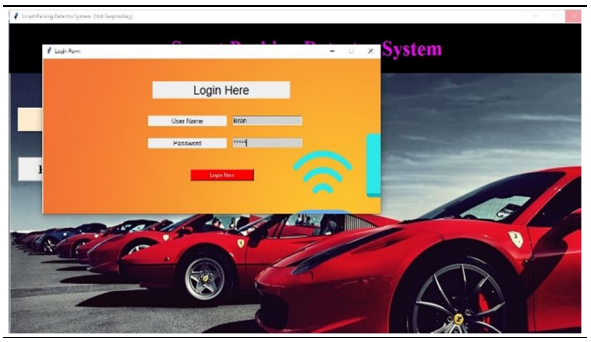
We are using the waterfall model for our project.

1) *Requirement Gathering and Analysis:* In this step of the waterfall we identify what various requirements are needed for our project such are software and hardware required, database, and interfaces.
2) *System Design:* In this system design phase we design a system that is easily understood by end users i.e. user friendly. We design some UML diagrams and data flow diagrams to understand the system flow and system module and sequence of execution.
3) *Implementation:* In the implementation phase of our project we have implemented various modules required to successfully get the expected outcome at the different module levels. With inputs from system design, the system is first developed in small programs called units, which are integrated into the next 10 phase
4) *Testing:* Different test cases are performed to test whether the project module is giving the expected outcome in the assumed time. All the units developed in the implementation phase are integrated into a system after testing each unit. Post integration the entire system is tested for any faults and failures.
5) *Deployment of System:* Once the functional and non-functional testing is done, the product is deployed in the customer environment or released into the market.
6) *Maintenance:* There are some issues that come up in the client environment. To fix those issues patches are released. Also to enhance the product some better versions are released. Maintenance is done to deliver these changes in the customer environment. All these phases are cascaded to each other in which progress is seen as flowing steadily downwards like a waterfall through the phases. The next phase is started only after the defined set of goals are achieved for the previous phase and it is signed off, so the name Waterfall Model. In this model, phases do not overlap.

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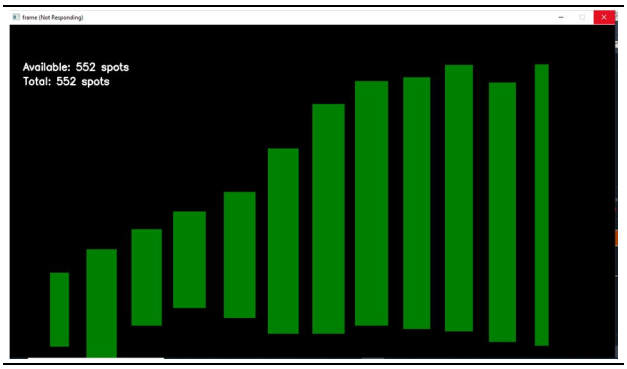
V. RESULTS











VI. ACKNOWLEDGMENT

It gives us great pleasure in presenting the preliminary project report on “Smart Parking System Based On Image Processing”. We would like to take this opportunity to thank our internal guide Prof. Dewendra Bharambe for giving us all the help and guidance we needed. We are grateful to him for his kind support. Their valuable suggestions were very helpful. We would like to express our deepest appreciation toward principal Dr. Sunil Thakare, ABMSP's Anantrao Pawar College of Engineering Research, and we are grateful of Prof. Rama Gaikwad, project head, ABMSP's Anantrao Pawar College of Engineering & Research, for their indispensable support, suggestions and for providing us the infrastructure for our project. We sincerely thank the entire team of staff members, our college, the company, and those who knowingly and unknowingly have contributed in their own way to the completion of our project.

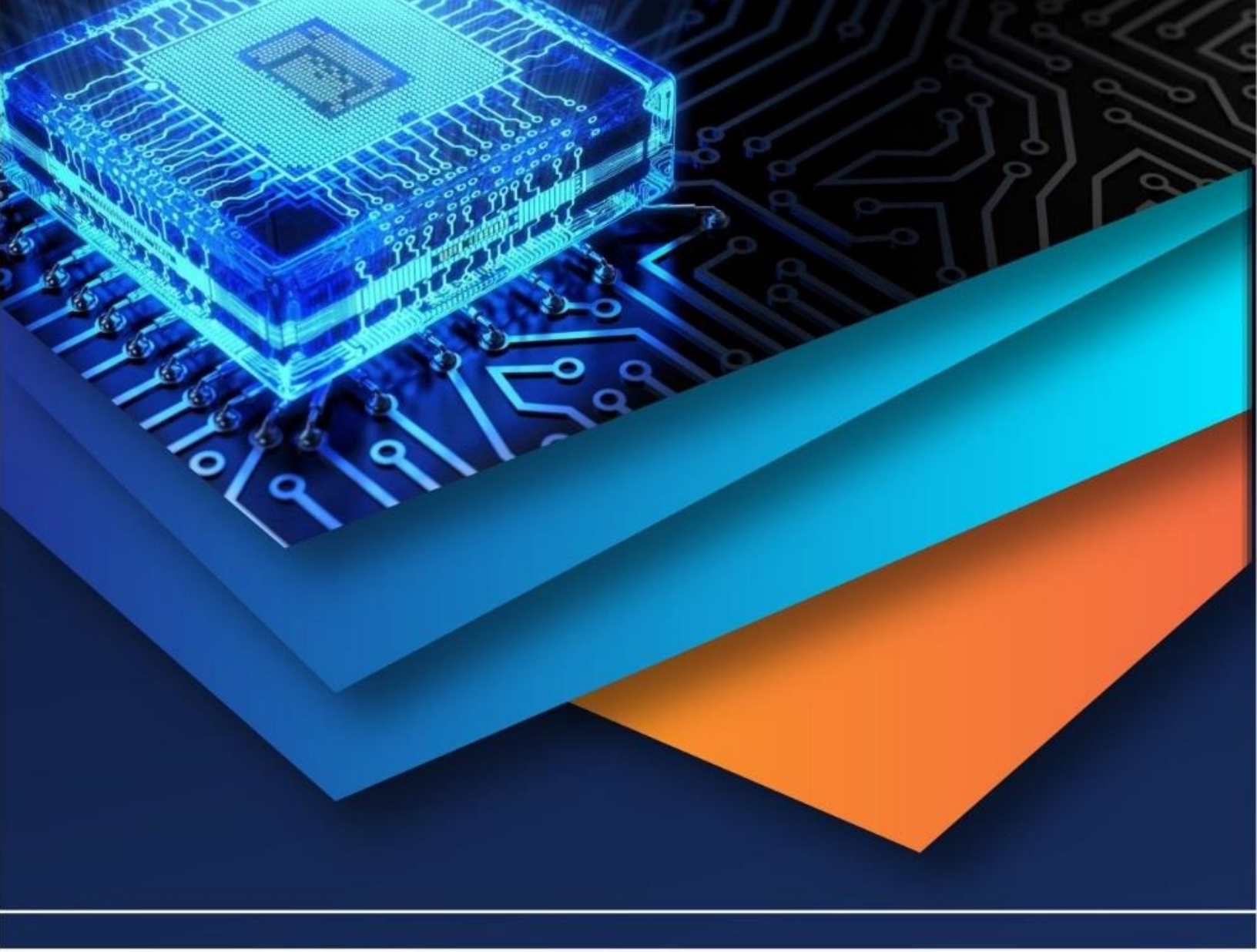
VII. CONCLUSION

Our project is very useful in the day to day life. The first section of the smart parking system is parking slot detection. This can be done using sensors placed at different locations in the parking lot. But this is a very costly system with a lot of drawbacks. The image processing-based empty parking lot identification has made the system simple as well as cheap. OCR-based solutions will be an integral part of future smart parking systems. Using suitable image processing algorithms the accuracy of detection can be improved.

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