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Smart Parking System and Database Creation

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Abstract:

The idea of smart cities, especially when it comes to improving parking, has struggled to keep up with the challenges faced by growing populations in urban areas. As more people move to cities, the demand for cars increases, leading to a shortage of parking spaces. This often results in frustrating experiences for drivers during busy times, causing problems like pollution, traffic congestion, accidents, wasted time and fuel, and stress. To tackle these issues, intelligent parking systems have been developed, using sensors to detect available parking spots and guide drivers efficiently. However, current systems often rely on costly and inefficient sensors embedded in parking spaces. This paper examines existing intelligent parking methods, focusing on machine vision-based technologies. Additionally, it suggests using a database for parking management as a solution to the ongoing problem. By integrating a robust database infrastructure, the aim is to optimize parking resources and create cost-effective and adaptable intelligent parking systems. This research addresses the complexities of implementing machine vision-based technologies and designing databases in urban environments, ultimately contributing to better parking solutions. Keeping track of available parking spaces is crucial, and one way to do this is by using an IoT system combined with sensors. This paper looks into how an IoT-based car parking system can be used. It also examines different types of sensors that can be used in car parking systems.

Keywords:

Smart City Development, The urban parking challenge, Smart Parking Systems, Population growth, Parking requirements, Traffic rush hour, Technical Observation Devices, sensor-based parking, Database installation, Efficient parking solutions.

Introduction:

Population growth and economic prosperity have contributed significantly to the increase in the number of private vehicles on the roads. But the rapid development of parking and road infrastructure has not been able to keep pace with this massive growth, resulting in a severe shortage of parking spaces in modern cities The result is a challenge a intensity for motorists, especially during critical events or peak periods and breakdowns, contributing to increased carbon emissions and environmental damage.

Several studies confirm the seriousness of this issue. Paddy and others found that drivers spent between 3.5 and 14 minutes searching for parking, Enriquez et al. reported that the average search time was 20 minutes, accounting for 30% of traffic congestion. Ndayambaje and others found that more than 30% of drivers to traffic congested areas chased empty parking spaces. For Indonesia, the number of cars increased by 20% in 2022 due to favourable economic conditions and population growth, resulting in traffic congestion and lack of parking spaces in densely populated cities. Furthermore, Enrìquez et al. predicts that urban population growth will reach 66% by 2050, exacerbating the challenges of urban mobility and urban parking.

Acknowledging these challenges, this paper explores alternative solutions, with a particular focus on building databases for efficient parking management The integration of data-driven technologies and approaches aims to revolutionize urban mobility, improve parking efficiency and contribute to sustainability.

Litrature Survey:

The system mentioned used sensors, technologies, and interfaces to gather and show information immediately. This needed costly private infrastructure[2]. The smart parking system [3]provided users with information about available parking spots and how to access them using a Variable Message Sign (VMS) on the internet. It was divided into[4] off-road and on-road parking. The system used Google Maps, ultrasonic sensors, and data stored in the cloud. In [5], an Infrared sensor was set up to detect vacant parking spaces and open the entry and exit gates accordingly. Each individual was given an RFID tag to authorize their entry to the parking

area using a mobile application. Additionally, [6] introduced the ACO algorithm to figure out the shortest route between the user and an available parking spot by linking up with cloud services. All these systems need a way to figure out if a vehicle is in a parking spot. People can sign up for a parking spot to park their car. Each registered user gets a unique ID, and there's a time limit given. The system keeps track of when the vehicle enters and leaves the parking spot, and the cost is deducted from their account accordingly. The system described in reference [7] utilizes Arduino and Raspberry Pi to identify available parking spaces using an internet server and GPS for booking. Another system, proposed in [8], relies on Infrared sensors for detection. Verification is done through an RFID tag, and communication is facilitated using ZigBee technology. In [9], an Android application is used to gather customer details such as location, state, car number, entry and exit times, and parking preferences. This application also provides information about available parking slots and stores user details in a MYSQL database. Additionally, the system in [9] employs a camera to capture the car's number plate and analyzes the image to determine if the car is certified or not.

Scope:

The aim of this review paper is to provide a comprehensive overview of recent developments and advancements in intelligent parking systems. Attention has been paid to the collection of latest scientific papers from journals and conferences, in particular focusing on vision intelligent parking, imaging systems and systems using CCTV technology Literature the systematic gathering of relevant data ensures a thorough examination of the latest methods and technologies used in the project .Particular focus is on vision-based smart parking systems, which primarily use image processing techniques to classify and detect vacant parking spaces Notably, the study deliberately classifies spaces empty parking sensor-based systems have emerged, with an emphasis on research-focused vision- based approaches.

The collected papers which provides a concise overview of vision-based smart parking systems. A key feature of this project is the inclusion of databases to store information on vehicles parked in parking lots. This system integration increases the scope of the paper by emphasizing the importance of databases in intelligent parking systems.

Specifically, this research aims to reveal the challenges of vision-based smart parking systems, shedding light on their strategies, technologies and the role of databases in optimizing performance.

Current State of the Field:

Conducted comprehensive literature searches in journals and conferences to identify the most recent and relevant scientific papers on intelligent parking systems.

A paper specifically targeted at vision-based smart parking, smart parking systems using image processing, and incorporating CCTV technology.

Inclusions and exclusions:

Inclusion of papers on vision-based smart parking systems.

The excluded papers focused on vacant parking spaces using sensor-based systems to specifically target vision-based routes.

Smart parking systems use databases

1. **User profiles**: They store details about people who are registered users, like their contact information, details about their vehicles, and how they prefer to pay for parking.

2. **Parking spot availability**: These databases hold up-to-date information about which parking spots are empty or full, where they are located, and if any spots have special rules, like being reserved for specific people.

3. **Booking history**: They keep a record of all the times in the past when people reserved parking spots, including when they parked, how long they stayed, and when they left.

4. **Payment records**: These databases hold information about the money exchanged for parking, including how much was paid, how it was paid, and when the transaction took place.

5. **Analytics data**: They collect and analyze information about how parking spaces are used over time, like popular times for parking or which spots are used most often. This data helps improve the system and plan for the future.

Conclusion:

This paper investigates various vision-based intelligent parking methods with emphasis on the use of cameras as sensors for efficient detection of vacant parking spaces The findings unequivocally recommend the superiority of vision-based systems over their sensor-

based counterparts. Proven benefits including high accuracy, reliability, scalability and flexibility position vision-based smart parking systems as future parking management.

Notably, the flexibility of the vision-based system algorithm eliminates the need for sensor replacement, thus increasing the overall parking lot management efficiency according to Polycarpou et al. where a significant proportion of respondents have spent more than 10 minutes searching for legislation, smart parking with expansion of reduced office spending and governments a recommended but in experience occurring in the city also in cities. , for the packed car Database integration further helps to optimize infrastructure development, creating a more sustainable and efficient urban transportation environment.

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