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Smart Parking System with Real-Time Slot Detection

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ABSTRACT:

Modern cities have a lot of trouble finding parking spaces because more people are moving to cities and buying cars. Drivers often spend a lot of time looking for open parking spots, which makes traffic worse, uses more gas, and pollutes the environment. Traditional parking management systems depend on people to keep an eye on things and don't have real-time information about availability. This paper suggests a Smart Parking System with Real-Time Slot Detection that uses web-based technologies and cloud databases to make parking management easier. The proposed system lets users find open parking spaces, book them, and pay for them online all in one place. Finding parking spots in real time makes better use of space and makes things easier for users. The system also uses map services to track locations and help drivers find parking spots nearby. The suggested solution cuts down on traffic jams, saves time and gas, and gives a scalable and effective way to manage parking.

Keywords:

Real-time slot detection, smart parking, parking automation, a cloud database, the Internet of Things (IoT), digital payment, and a parking management system

Introduction:

The transportation network in urban areas is under increasing pressure because of the rapid growth of population and the number of vehicles. Parking management has emerged as one of the most prominent issues in urban areas. Car drivers spend a substantial amount of time looking for parking slots, particularly in business areas, shopping malls, and public parking places.

Conventional parking systems rely on human supervision or fixed parking slots, which lack real-time updates regarding the availability of slots. This results in inconvenience and waiting time for the user. Smart Parking Systems have been developed as an innovative solution to enhance parking management through technology.

The Smart Parking System with Real-Time Slot Detection offers a digital platform for users to monitor the availability of parking slots using web or mobile applications. The system combines real-time monitoring, slot booking, location-based parking search, and digital payment services.

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Literature Review:

There have been a few research studies on automated parking systems to enhance the efficiency of parking management. Smart parking systems using IoT sensors have been proposed to identify the availability of parking slots through ultrasonic or infrared sensors. The system sends real-time information to servers for monitoring.

Cloud-based parking management systems have also been designed to store parking information and allow remote access to users. The system allows users to book parking spaces using mobile applications. GPS-based navigation systems have also been integrated by researchers to direct users to nearby parking spots.

While existing systems offer basic automation, some of them lack integrated payment processing and user interaction. Some systems involve costly hardware installations, which are not scalable.

Problem Statement:

The parking management system in urban areas is challenged by the lack of real-time parking systems. This makes it difficult for drivers to find parking slots.

• Lack of information on parking availability

• Mechanical parking management systems

• Inefficient use of parking space

• Increased waiting time for drivers

• Lack of integrated payment systems

• Problem of finding parking space near the location

Objectives:

• Designing a real-time parking slot detection system

• Developing an online slot booking system

• Implementing location-based parking search using map services

• Implementing a secure user authentication system

• Developing a timer-based digital payment processing system

• Reducing traffic congestion and environmental pollution

• Improving parking space utilization

Proposed System:

The proposed Smart Parking System is an automated parking management system developed using web technologies and cloud databases. The system is capable of monitoring the availability of parking slots in real-time and updating the information in a centralized database.

The system allows users to access the system using a web application that shows available parking slots and parking locations near the user. The system enables users to reserve parking slots and make online payments according to the parking duration.

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System Architecture:

The system architecture is made up of three major layers:

Frontend Layer – This layer offers user interaction functionalities such as slot booking, login, and payment interface.

Backend Layer – This layer is responsible for user authentication, parking data processing, and booking validation.

Database Layer – This layer is responsible for storing user data, parking slot data, booking data, and payment data.

System Modules:

Home Module: This module gives a system overview and navigation functionality. Login Module: This module handles user login and registration.
Slot Booking Module: This module shows real-time parking slots and enables slot booking. Map Integration Module: This module shows parking spots using map services.
Payment Module: This module calculates parking fees and enables electronic payments.

Methodology:

The Smart Parking System is developed after analyzing the requirements, designing, implementation, and testing. The availability of parking slots is stored in a real-time database. The data is fetched from the database and displayed to the user. When a user chooses a parking slot, the system checks the availability of the slot and reserves it. A timer is used to calculate the parking charges.

Implementation:

The system is developed using modern web technologies such as HTML, CSS, JavaScript, and cloud database services. Real-time database listeners are used to ensure that there is instant synchronization of parking slot updates. Map services are integrated to provide parking slot locations and directions.

Future Scope:

The system can be improved by incorporating IoT sensors and camera-based vehicle detection for automatic slot monitoring. Artificial Intelligence can be used to predict parking slot availability based on historical data.

Conclusion:

The Smart Parking System with Real-Time Slot Detection is an effective solution to the parking problem faced by people in today's world. The system combines real-time monitoring, slot booking, map navigation, and payment functionality.

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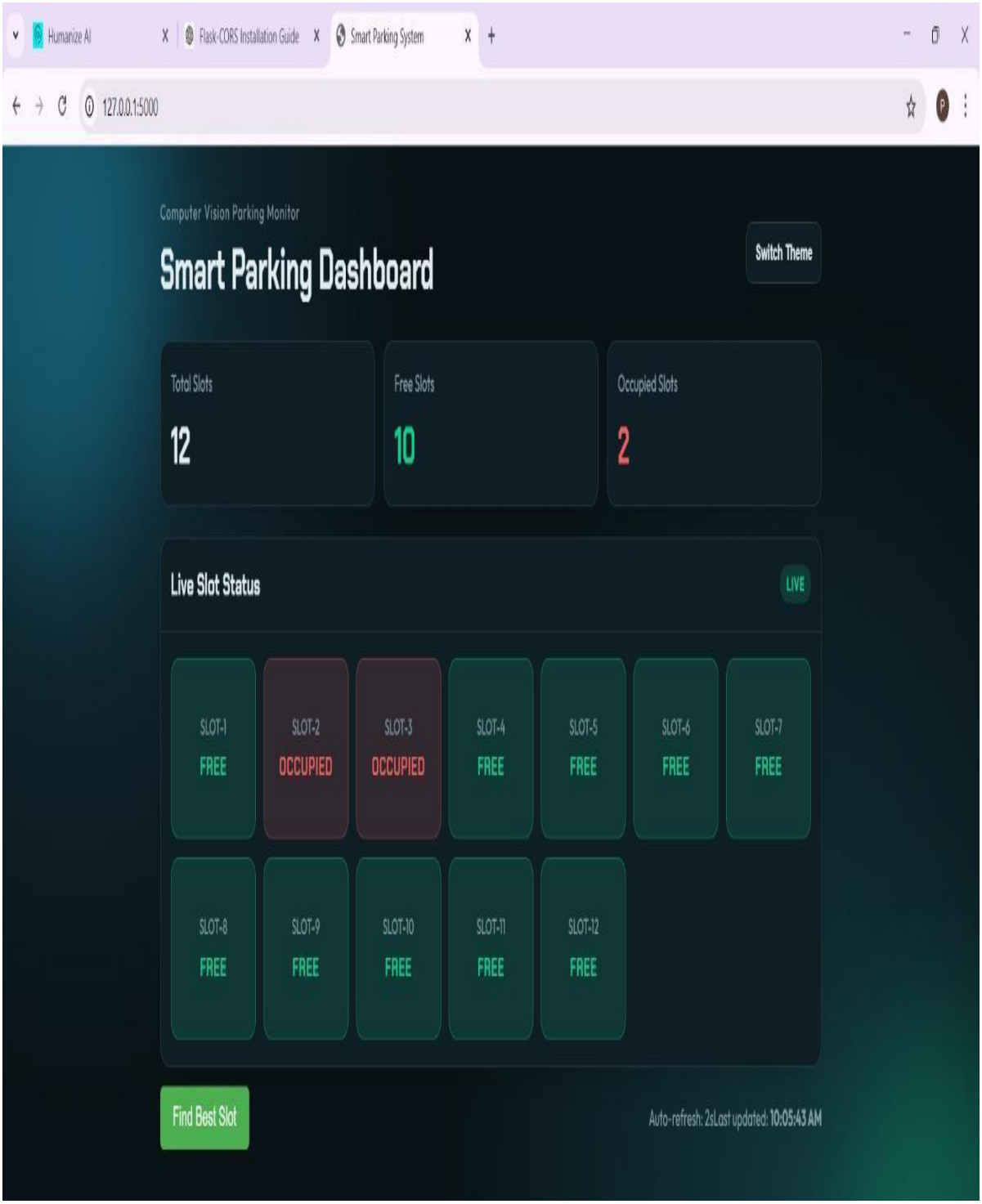

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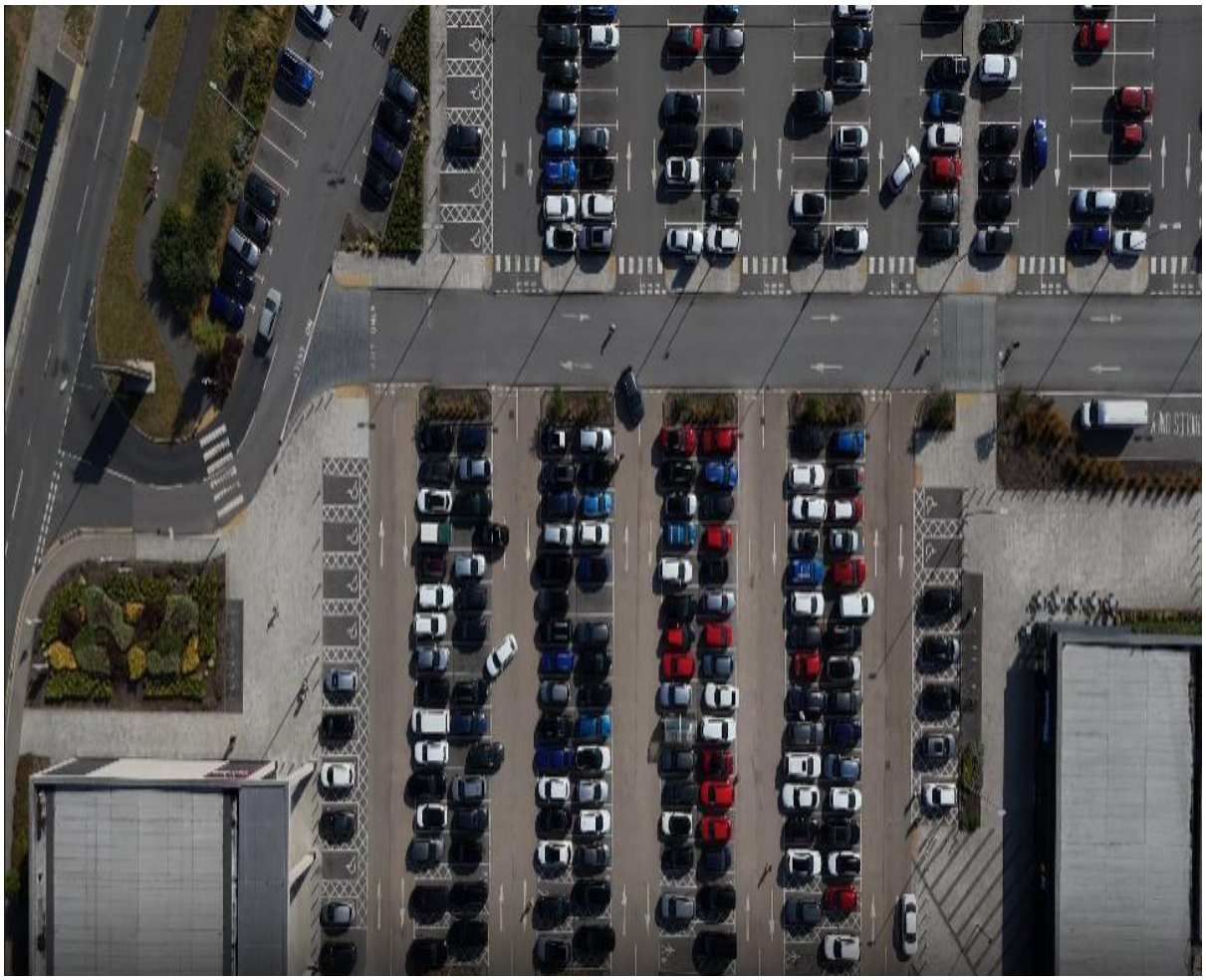

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