Smart Car Parking Device using Sensors Networks

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ABSTRACT

Efficient utilization of parking spaces in urban areas is a growing concern. This project introduces an "IoTbased Smart Car Parking System" employing infrared (IR) sensors, an LCD display, and Thing Speak for real-time monitoring. The system aims to optimize parking space usage by monitoring the occupancy of parking spaces using IR sensors. Information is displayed on an LCD, and real-time updates are sent to Thing Speak for remote monitoring. This integration of sensors, display, and a cloud platform offers an intelligent solution for smart and efficient car parking management.

Keywords: IR Sensors, LCD Display, ThingSpeak, Efficient parking management, Microcontroller Unit.

1. INTRODUCTION

As the development of technology and the economic growth, causes the transportations becomes really important in helping people undertake their activities. One of them is the fourwheels vehicles.The enhancement of the four-wheels transportation is really fast; even it surpasses the capacity. It causes so many problems. It is the main reason of a congestion . The recent problem of it is a lacking of parking area for large buildings such as mall, university, etc… An introduction to the innovative and efficient IoT-based smart car parking system, designed to revolutionize the parking experience for both car owners and parking management. The design methods of this Smart Parking are divided into 4 steps, namely: (i) identifiying needs; (ii) getting specified component; (iii) performing design; (iv) system works; (v) device testing. perfoming design is divided into two, hardware and software designer so that the device and system monitor work well.

2. LITERATURE REVIEW

Wireless Sensor Networks: The smart car parking system utilizes wireless sensor networks to monitor and manage parking space availability in real time.

DataCollection and Analysis: The sensors collect data on available parking spaces and send it to a central system for analysis, aiding in efficient parking management.

Data Collection and Analysis: The sensors collect data on available parking spaces and send it to a central system for analysis, aiding in efficient parking management.The IoT-based Smart Car Parking System utilizes IR sensors to detect the presence of vehicles in parking spaces. The occupancy status is displayed on an

LCD at the parking entrance, providing real-time information to drivers. Simultaneously, the data is sent to ThingSpeak for remote monitoring. This intelligent system enhances parking management by offering real-time information on space availability and facilitating a more organized and efficient use of parking areas.

3.COMPONENTS:.

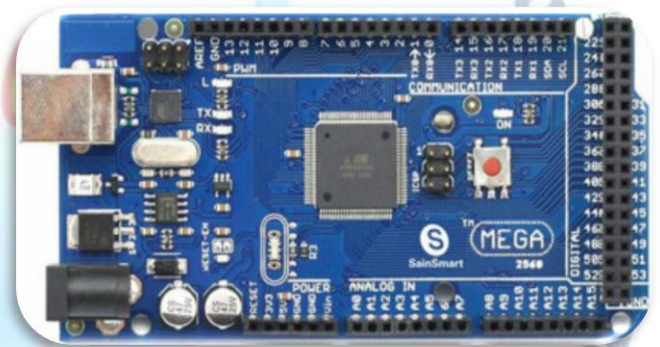IR Sensors: Detects the presence of vehicles in parking spaces for accurate occupancy monitoring.
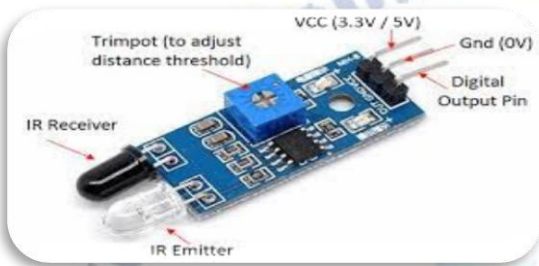
LCD Display: Displays real-time information on parking space availability at the entrance for drivers.
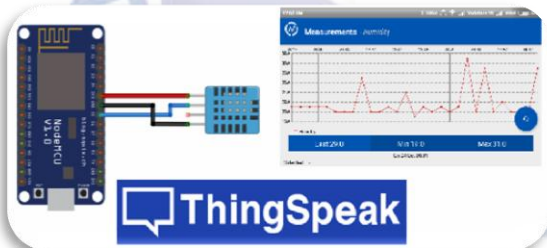

ThingSpeak Integration: Sends real-time updates to ThingSpeak for remote monitoring and analysis.

Efficient Parking Management : Facilitates optimized use of parking spaces, reducing congestion and enhancing user experience.

Software Tools for Smart Car Parking System MicrocontrollerProgramming:programsamicrocontroller to process data from IR sensors, control the LCD display and communicate with ThingSpeak
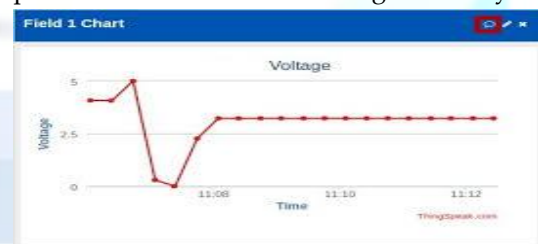

Hardware Tools for Smart Car Parking System IR Sensors: Utilizes IR sensors for accurate detection of vehicle presence in parking spaces. LCD Display : Integrates an LCD display at the parking entrance for real-time information. Microcontroller Unit: Utilizes a microcontroller for data processing and control.

Thing Speak Platform :Integrates with the Thing Speak platform for remote monitoring and analysis.

Working Principle of IoT Based Smart Car Parking System Parking systems are installed on the outside of buildings or inside of buildings. When a vehicle enters the space, sensors detect its presence and calculate available parking slots. This information is then sent to the driver's phone via an app. A smart parking system uses IoT devices and sensors to collect real-time data on parking lot occupancy and transmits this information to the cloud or local network. Sensor Detection , Data Processing ,User Notifications and Space Allocation. The computation process has Arduino-Mega, Node MCU,

and other modules. This system also requires a mobile network SIM which will be connected to GSM where the parking charges, duration of the halt are sent as a message to the client. The architecture of the system is mentioned.
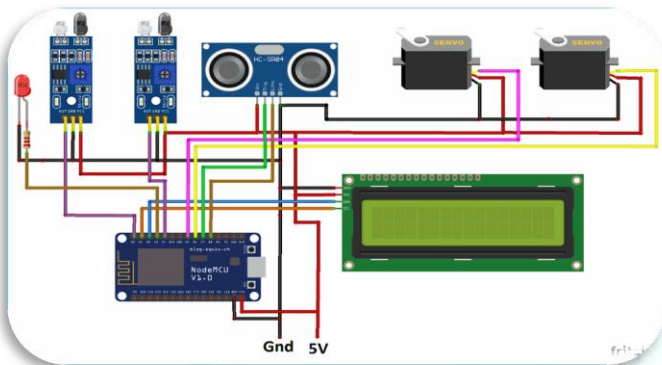
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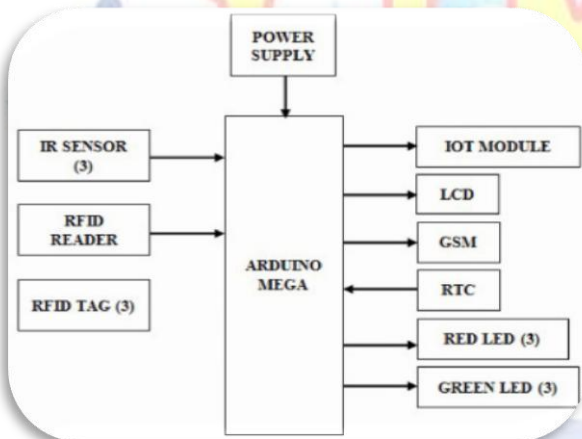
Intimation of Parking Slot: The infrared object capturing, fixed in the parking slot detects the vehicle in the slot and this information is updated on the webpage via the module.fig(1) Represents the login pages where the individuals log in to check their slots and the charges for the duration as well as for the availability of the parking slots and to lock the slot in advance.When the user is aware of the parking slot, he can directly reach it and park his/her vehicle. When the vehicle is parked in the lot, the information is updated in the database. The LEDs attached to the parking slot glow depending on the parking status. The RFID tag fixed with the car is used to count the billing time when it reaches the reader fixed in the parking slot.
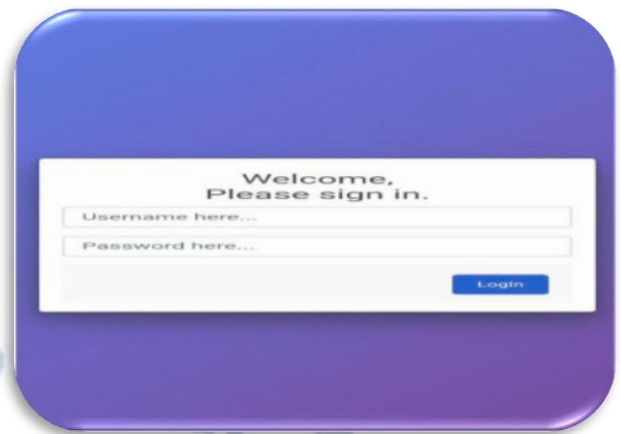
FIG(1) Login page for the user credentials.

Fig2,Fig3 refer to the displaying unit of the system where the individual can review and ensure the vacancy in the lot to follow a systematic procedure.

The RFID detects the car in the lot during the time of the entry the car is noted through an RTC module which is used to calculate the billing of the car till the exit. All this information and timings can be monitored through LCD Fig(4).

Billing :

FIG(2) Empty slot display in LCD.

FIG(3) Full slot display on LCD.

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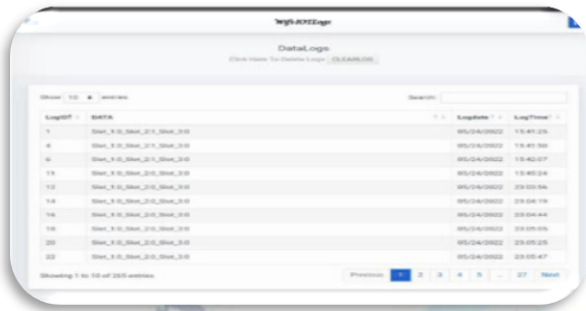
Notification:

FIG(4) Data-log on the website.

The notification about the parking is sent to the user and it is also updated in the IoT. The client-side representation where the individual receive the message or the notification from the data end which is noted as the vendor side for the individual based on the duration of the vehicle is been parked in the lot the tariff is been laid based on the slab scheme where the individual gets the minimal cost for 1 h based on the time extended the individual is been charged shown in the .Fig(5).
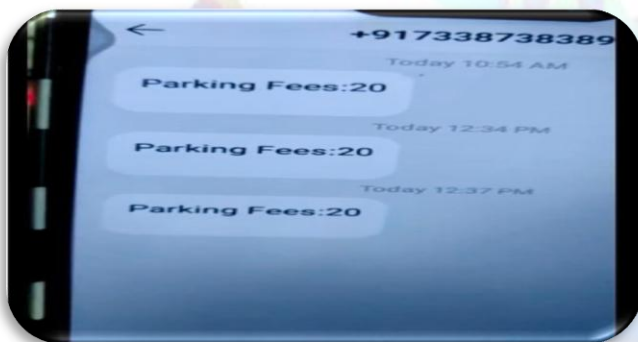
Fig(5) Parking charges through SMS.

Role of Sensor Networks in Smart Parking

Data Collection : Sensor networks collect real-time data on parking space occupancy.

Efficient Allocation : By analyzing the data, smart parking systems efficiently allocate parking spaces to incoming vehicles.

Monitoring: Constant monitoring helps in ensuring smooth parking operations.

Challenges in Implementing Smart Parking System

Integration Complexity : Integrating various sensors and systems into a unified parking management platform can be challenging.

Cost of Implementation: The initial investment for setting up a smart parking system could be a significant expense.

User Acceptance: Adoption and acceptance of new technology by users and operators can be a hurdle.

Future Scope of Smart Car Parking System

Smart parking systems have already made significant advancements in recent years, leveraging technologies such as sensors, data analytics, and wireless communications to improve parking efficiency and user experience.

AI Integration: Implementation of AI for predictive parking space availability and dynamic pricing.

Environment Impact: Green initiatives and electric vehicle charging facilities in smart parking systems.

Enhanced Security : Integrating advanced security features for better safety and protection of vehicles.

CONCLUSION

Internet of the things-based parking system can even more likely track the accessibility of parking spaces on a given area, making it simpler to find an accessible parking space. For instance, some utilize QR codes to distinguish accessible parking spaces, while others use sensors to recognize when a vehicle leaves a parking space. The advantages of an IoT-based smart parking system are that it is more innovative, productive, and helpful for the two drivers and proprietors of the parking area. This system can be implemented in crowded places so the user can easily locate the parking slots with the help of IoT. This can also reduce pollution as the user can directly reach their parking location. The automatic billing system attached to the parking slot makes it more convenient for the user .Using these technologies can be implemented in large cities and can be monitored from a single source and they can be implemented by governments in main shopping areas.

The implementation of a Smart Car Parking System using sensor networks offers a viable solution to the challenges posed by urbanization and increased vehicle density. The system's efficiency in providing accurate and real-time information contributes to

reduced congestion, improved parking space utilization, and enhanced overall user satisfaction.

As cities continue to evolve, adopting smart technologies for parking management becomes imperative for sustainable urban mobility.

Conflict of interest statement

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

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