SMART PARKING USING IOT

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ABSTRACT

With the rapid advancement in technology and the increasing demand for efficient urban infrastructure, the concept of smart parking systems has gained significant attention. This presents a comprehensive overview of a smart vehicle parking system empowered by IoT(Internet of Things) technologies, incorporating microcontrollers, ultrasonic sensors, GSM module, and cloud-based data storage. The ESP32 microcontroller acts as the main controller, orchestrating the operations of the system and facilitating communication between various components. The system utilizes ultrasonic sensors to detect the presence of vehicles within designated parking slots. These sensors are strategically placed to cover each parking space adequately. When a vehicle enters a parking slot, the ultrasonic sensor relays the information to the microcontroller, which processes the data and updates the parking status accordingly. A buzzer is employed to alert users in case of any anomalies or urgent notifications, ensuring prompt response and action when necessary. Furthermore, the integration of GSM technology enables the system to communicate with designated mobile numbers via SMS (Short Message Service). In case of any parking events such as a vehicle occupying a parking space, the system generates automatic alerts and sends them to predefined mobile numbers. This feature ensures that parking administrators and users remain informed about the availability of parking spaces in real-time and also the slots which are Filled and the slots which are Empty will be displayed on the LCD. Moreover, to enhance the user experience and provide additional functionalities, the system incorporates QR code technology integrated with ThingSpeak, a cloud-based IoT platform. Parking slots are assigned a unique QR code, which users can scan using their smartphones. By scanning the QR code, users can instantly access information about the availability of parking slots, making the parking process more convenient and efficient.

Key words: Smart Parking, Internet of Things (IOT), Short Message Service (SMS), QR code.

INTRODUCTION

IOT stands for Internet of Things, which is a network of physical devices that have sensors, software, and other technologies that allow them to connect and exchange data with other devices and systems over the internet. IOT devices can include computers, machinery, vehicles, appliances, and other objects. These devices can transfer data to each other without human intervention. In an era where urbanization is rapidly increasing, the demand for efficient parking solutions has become more pressing than ever. Smart Parking, leveraging the Internet of Things (IoT), offers a transformative approach to address the challenges of urban parking management. By integrating sensors, connectivity, and data analytics, Smart Parking systems provide real-time information about parking availability. It helps in efficient utilization of parking spaces by providing real-time information about available slots. This introduction explores the key components, benefits, and challenges of Smart Parking solutions powered by IoT technology.

LITERATURE SURVEY

[1]Woojae Kim.; Inbum Jung.; Smart Parking Lot Based on Edge Cluster Computing for Full Self-Driving Vehicles-IEEE Volume 10, 2022. One promising area that can be serviced by edge computing in real-time is autonomous driving. Fully self-driving vehicles can operate on roads and in buildings, such as indoor parking lots, using various sensors and communication. A smart parking lot consists of fixed edges and mobile edge vehicles and uses grid maps for parking lot management.

[2]Thanh Nam Pham.;Ming-Fong Tsai.;Duc Binh Nguyen.;Chyi-Ren Dow.;Der-Jiunn Deng.A Cloud-Based Smart-Parking System Based on Internet-of-Things Technologies-IEEE Volume 3,2015.This paper introduces a novel algorithm that increases the efficiency of the current cloud based smart parking system and develops a network architecture based on the Internet of Things technology. This paper proposed a system that helps users automatically find a free parking space at the least cost based on new performance metrics to calculate the user parking cost by considering the distance and the total number od free places in each car park.

[3]Claudio Badii.; Paolo Nesi.; Irene Paoli. Predicting Available Parking Slots on Critical and Regular Services by Exploiting a Range of Open Data- IEEE Volume 6,2018. Looking for available parking slots has become a serious issue in contemporary urban mobility. This paper presents a set of metrics and techniques to predict the number of available parking slots in city garages with gates. With this aim, we have considered three different predictive techniques, while comparing different approaches. The resulting solution has demonstrated that a Bayesian regularized neural network exploiting historical data, weather condition, and traffic flow data can offer a robust approach for the implementation of reliable and fast predictions of available slots in terms of flexibility and robustness to critical cases.

EXISTING METHOD

The schematic of the proposed Smart Parking using IOT is shown in figure. As shown in figure, it is composed of three Ultra Sonic Sensors, 16*2 LCD Display, ESP32, Buzzer, 5 Volt High Link with 2 Ampere and GSM Modem SIM900A.In this, the Ultra Sonic Sensors consists of four pins those are Ground, Echo, Trigger and VCC in which Trigger and Echo pins of the sensors are connected to ESP32 accordingly. So that the sensors detect the vehicles. GSM Modem SIM900A Receiver and Transmitter pins are connected to ESP32, VCC and Ground pins are also connected accordingly. From this GSM it sends SMS to pre-defined Phone numbers. Buzzer has two pins in which one pin is connected to ESP32 and the other pin is grounded. Buzzers typically provide an audible alert or notification.5 volt High Link with 2 Ampere has four pins in which IN- and OUT- are grounded and IN+ is connected to AC voltage source, OUT+ is connected to Vin pin of ESP32.This High Link is a plastic enclosed PCB mounted isolated, step-down power supply module. 16*2 LCD Display has four pins SCL, SDA, VCC, and GND. Clock signal and Data signal pins are connected to ESP32 and VCC, GND pins are also connected. The LCD displays the information about the slots. ESP32 is a chip that provides Wi-Fi and Bluetooth connectivity for embedded devices- in other words for IOT devices.

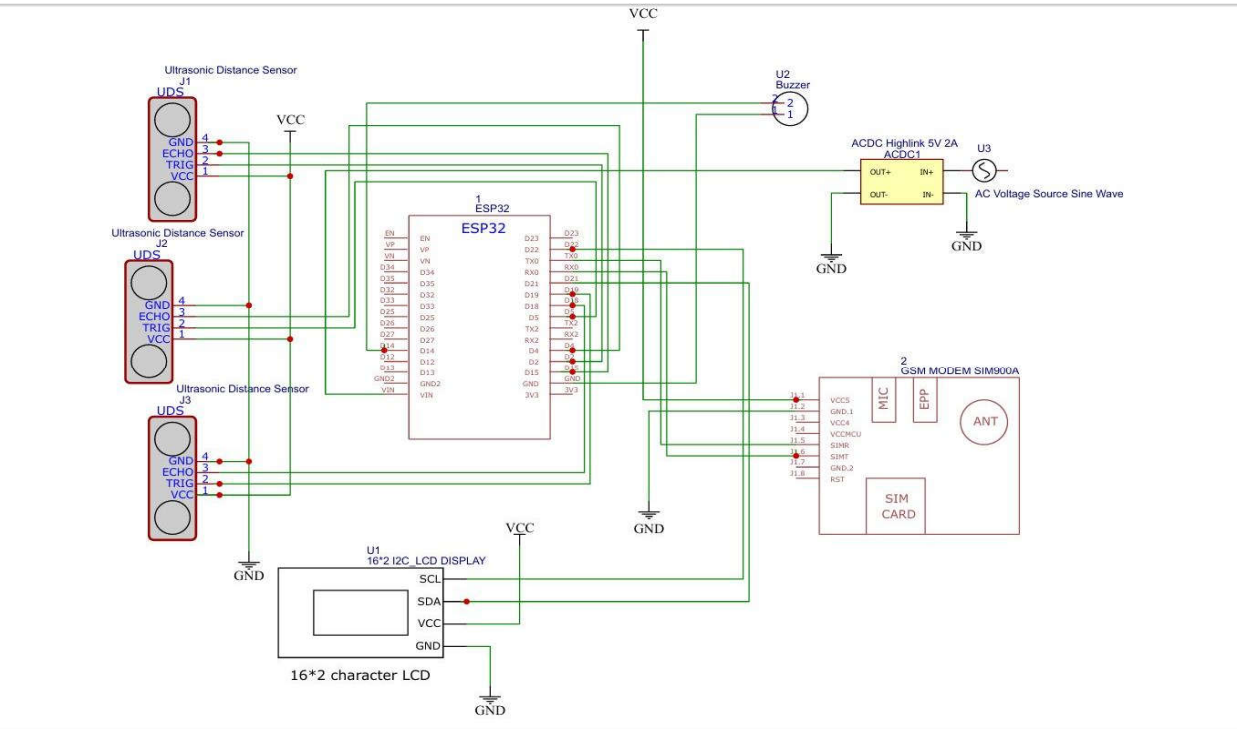

Figure.1. Schematic diagram for Proposed model

PROPOSED METHOD

Smart Parking system uses different methods to help drivers find parking easily and stay updated on spot availability. The sensors check if spots are free or taken and tell the brain (ESP32). The ESP32 decides what to do based on the sensor information and gives the commands to the LCD display to show right message. If a spot opens up or something goes wrong, the ESP32 sends a message to divers' mobile using GSM module. The Buzzer makes noise to let people know what's happening. Everything gets stored in the Thingspeak cloud platform. So we can check it later through scanning the available QR code.

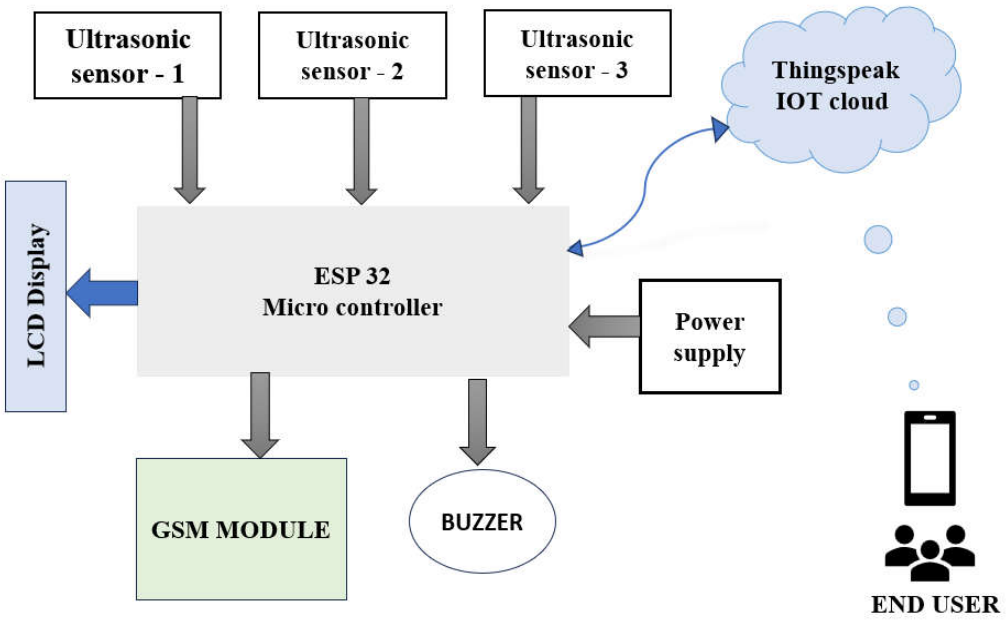

Figure.2. Block diagram

RESULT ANALYSIS

Figure.3. Parking System with Slots-1,2,3

Figure.3. LCD Displaying the information about slot 2 which is Filled

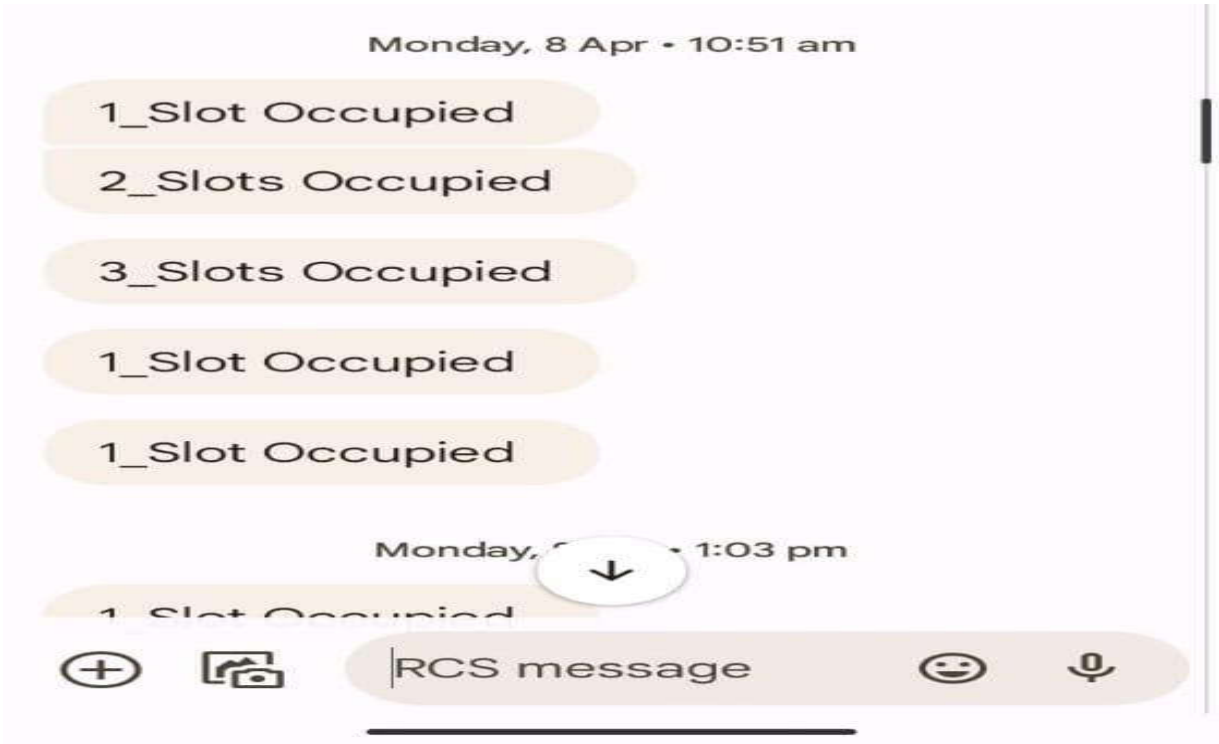

Figure.4. Message triggered to the pre-defined phone number when slots are filled

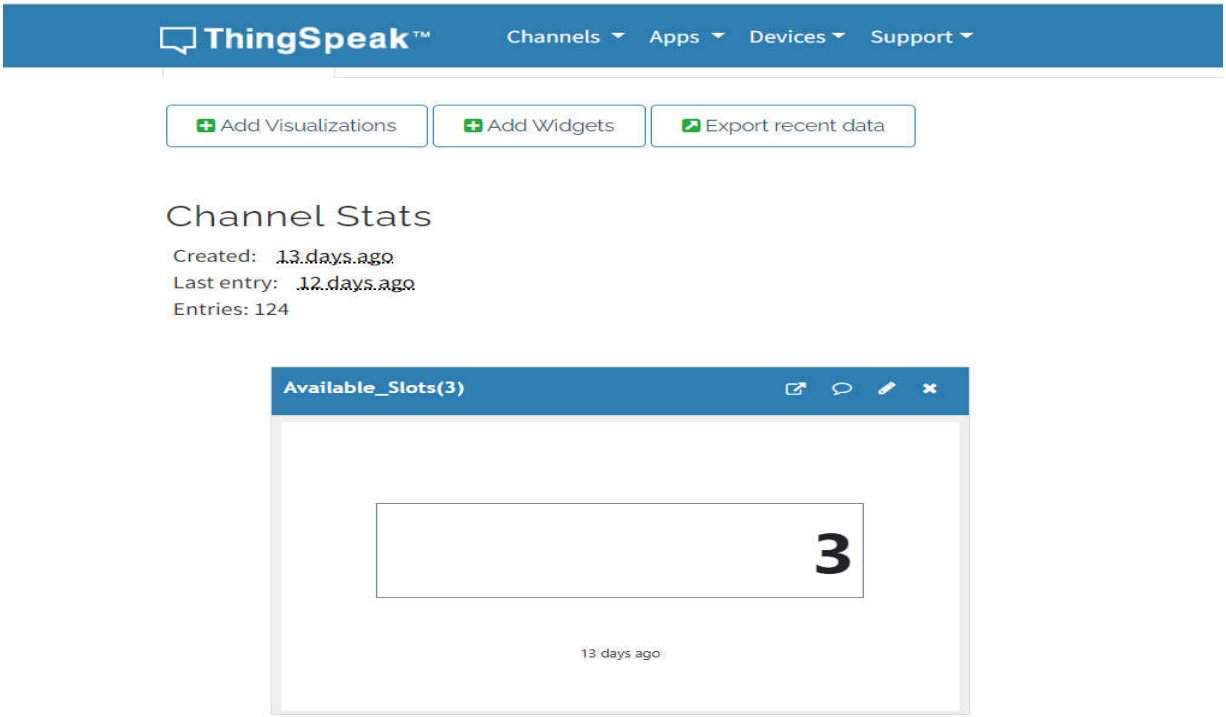

Figure.4. Designed view of availability of slots using ThingSpeak platform

Figure 5.Generating QR code to get the designed view of ThingSpeak software

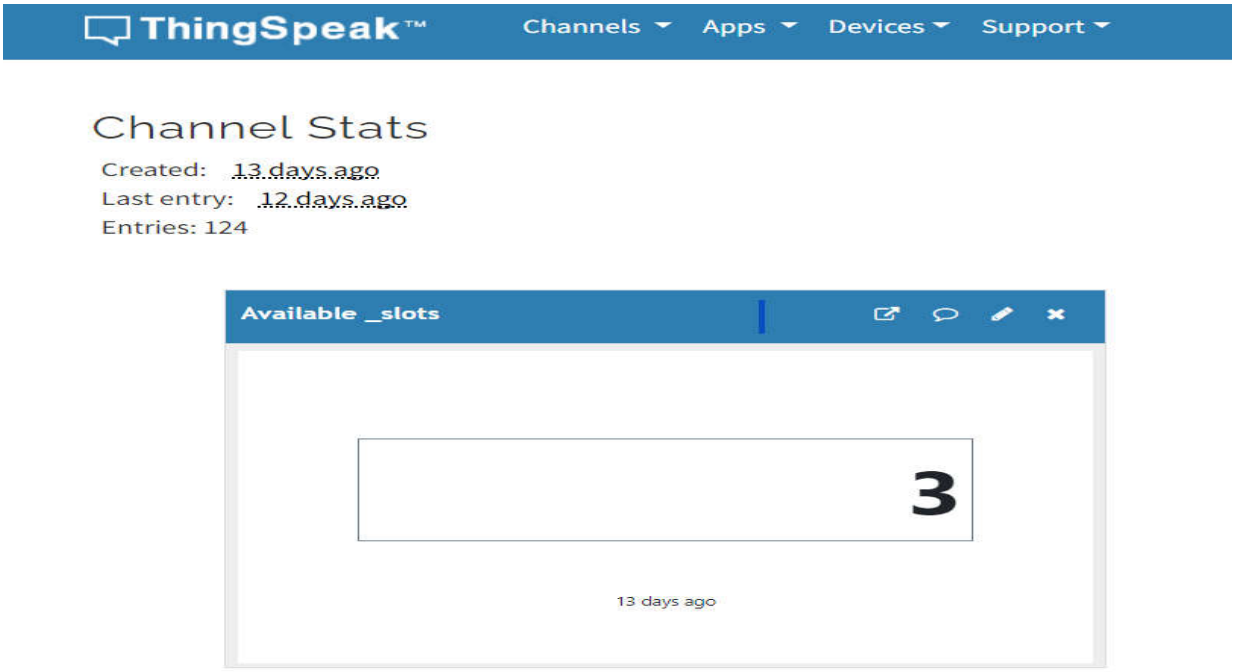

Figure.6. Final view of availability of slots for users to access information on parking slots

After designing the hardware setup, we need to upload code to the microcontroller so it gives the desired output based on how we designed. We are using Gsm module to delay message notifications to predefined users. We are using ThingSpeak software to update frequently, data of the project to the users.

CONCLUSION

The conclusion of a smart parking system using IOT cloud highlight the benefits such as optimized parking space utilization and improved user experience through real-time parking availability information. It may also discuss the potential for future enhancements, like integrating with autonomous vehicles or implementing predictive analytics for better resource allocation. Overall, it emphasizes how IOT technology can revolutionize parking management for smarter, more efficient urban environments.

REFERENCES

1. A. Verma, S. Prakash, V. Srivastava, A. Kumar, and S. C. Mukhopadhyay, "Sensing, controlling, and IoT infrastructure in smart building: A review," IEEE Sensors J., vol. 19, no. 20, pp. 9036–9046, Oct. 2019.
2. S. Dawaliby, A. Bradai, and Y. Pousset, "In depth performance evaluation of LTE-M for M2M communications," in Proc. IEEE 12th Int. Conf. Wireless Mobile Comput., Netw. Commun. (WiMob), Oct. 2016, pp. 1–8.
3. L. Babangida, T. Perumal, N. Mustapha, and R. Yaakob, "Internet of Things (IoT) based activity recognition strategies in smart homes: A review," IEEE Sensors J., vol. 22, no. 9, pp. 8327–8336, May 2022.
4. K. Cao et al., "On the ergodic secrecy capacity of intelligent reflecting surface aided wireless powered communication systems," IEEE Wireless Commun. Lett., vol. 11, no. 11, pp. 2275–2279, Nov. 2022.
5. L. Wang et al., "Channel prediction using ordinary differential equations for MIMO systems," IEEE Trans. Veh. Technol., vol. 72, no. 2, pp. 2111–2119, Feb. 2023.
6. W. Zhang et al., "A green paradigm for Internet of Things: Ambient backscatter communications," China Commun., vol. 16, no. 7, pp. 109–119, 2019.
7. D. Darsena, G. Gelli, and F. Verde, "Modeling and performance analysis of wireless networks with ambient backscatter devices," IEEE Trans. Commun., vol. 65, no. 4, pp. 1797–1814, Apr. 2017.
8. C. Yao, Y. Liu, X. Wei, G. Wang, and F. Gao, "Backscatter technologies and the future of Internet of Things: Challenges and opportunities," Intell. Converged Netw., vol. 1, no. 2, pp. 170–180, Sep. 2020.
9. Q. Wang and Y. Zhou, "Modeling and performance analysis of largescale backscatter communication networks with directional antennas," Sensors, vol. 22, no. 19, p. 7260, Sep. 2022.
10. F. Montori, L. Bedogni, M. Di Felice, and L. Bononi, "Machine-tomachine wireless communication technologies for the Internet of Things: Taxonomy, comparison and open issues," Pervasive Mobile Comput., vol. 50, pp. 56–81, Oct. 2018.