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SMART CAR PARKING SYSTEM USING IOT

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ABSTRACT

The concept of smart cities has recently received a lot of traction. The concept of a smart city today appears to be feasible, thanks to the advancement of the Internet of Things. Smart parking is a relatively recent concept that involves the use of sensors to offer information on the status of parking spaces. Sales of passenger automobiles climbed by 26.6 percent to 3.08 million units in 2021, compared to 2.43 million units in 2020. This will increase traffic congestion and slow down average travel speeds. While massive infrastructure improvements are planned to lower the number of cars on the road, this article presented a traffic space management approach to help speed up the process. Traffic congestion, limited automotive parking spots, and road safety are all concerns that the Internet of Things is tackling. We describe an IoT-based cloud-integrated smart parking system in this research. The Smart Parking system comprises an IoT module that is installed on-site and used to monitor and communicate the availability of each parking place. A mobile application is also available, allowing users to check parking spaces' availability. The study finishes with a use case that illustrates the accuracy of the proposed model.

***Key Words*:** Internet of Things; Cloud Computing; Smart Parking; Arduino; IR Sensor

1. INTRODUCTION

The Internet of Things (IoT) concept began with things with identification communication devices. Things with identity communication devices were the beginning of the Internet of Things (IoT) idea. Remote computers linked to the Internet could track, control, and monitor the gadgets. IoT refers to the use of the Internet to facilitate communication among gadgets and physical things, or 'Things'. The Internet of Things (IoT) is a network of devices and physical items that may gather data at remote places and communicate with units that manage, acquire, organize, and analysis the data in processes and services. It depicts a future in which objects (wearables, watches, alarm clocks, household devices, and surrounding objects) become smart and behave alive as a result of embedded small devices sensing, computing, and connecting with remote objects or people via connectivity.

With the rise of the Internet of Things, the dream of establishing a Smart City is becoming a reality. Car parking facilities and traffic management systems are two of the most important challenges in smart cities. Finding an available parking spot in today's cities is always challenging for drivers, and it is only getting harder as the number of private automobile users grows. This circumstance might be viewed as an opportunity for smart cities to take steps to improve the efficiency of their parking resources, resulting in shorter search times, reduced traffic congestion, and fewer road accidents. Parking and traffic congestion issues can be alleviated if drivers are advised ahead of time about the availability of parking spaces near their desired destination. Recent developments in building low-cost, low-power embedded systems are assisting developers in creating innovative Internet of Things applications. Following improvements in sensor technology, several modern cities have chosen to deploy various IoT-based smart sensors in and around their cities. The International Parking Institute recently conducted a poll that showed an upsurge in the number of innovative parking system designs. Currently, some parking systems promise to provide real-time information on available parking places to citizens. In order to acquire useful insights from data received from multiple sources, such systems require effective sensors to be put in parking spaces for monitoring occupancy and speedy data processing units.

PROBLEM STATEMENT

In the era of science and technology day to day the automobiles sector is increasing very rapidly and that means the number of vehicles is also increasing day by day in comparison to that the parking facilities are not there in cities, people park their vehicles anywhere on the roads and the parking areas which are there they are not efficiently used. Lots of the people do not know whether parking lots are vacant or occupied and they faced very problems parking their vehicles.

The main problem with the parking system is that people before going to the parking area cannot know the status of whether the parking lots are filled or not.

FIGURE: EXISTING PARKING SYSTEM

SOLUTION

To tackle the problem, each parking lot must be fitted with an IoT system that allows for the monitoring of the number of occupied and vacant spaces as well as the notification of possible parking lot users via mobile applications. Driver navigation to a parking lot with free parking spaces in an urban area and driver navigation to a free parking space in a parking lot should also be included in the systems, as well as tracking of parking lot occupancy during parking lot working hours for further analysis and parking lot security monitoring.

OBJECTIVE

- The goal of this project is to develop a smart parking system through which users can get complete information about the status of the parking slots whether they are vacant or filled.
- The IoT system will have the ability to be accessed through the mobile application from anywhere.
- The pollution level of the cities would also be decreased to a very much extent by the deployment of this project in thecities.
- It also saves the fuel consumption of the people which they waste while searching for a parking lot.
- Through this project deployment we would achieve a smart cities and road transportation concept and the unnecessaryjams problems would also resolve.

PROPOSED SYSTEM

To find parking zones we would use a mobile application form anywhere in this proposed system. We can request parking slot information status simply by creating an account bi id and password. As one can see from their mobile if there are vacant parking slots available or not. If available then the location of the vacant parking slot is also known on that application.

BLOCK DIAGRAM

The Block diagram of this IoT project consists of Arduino UNO, Node MCU, IR sensors, & a Mobile application on which one end user can see real-time parking status information on his mobile or desktop. Here Arduino UNO is used. Here one can write Arduino code in IDE & then uploads it to the microcontroller which executes the code & interacts the code with outputs such as sensors, LEDs, & Mobile application. Users can see output through Node MCU which is an open-source Wi-Fi module.

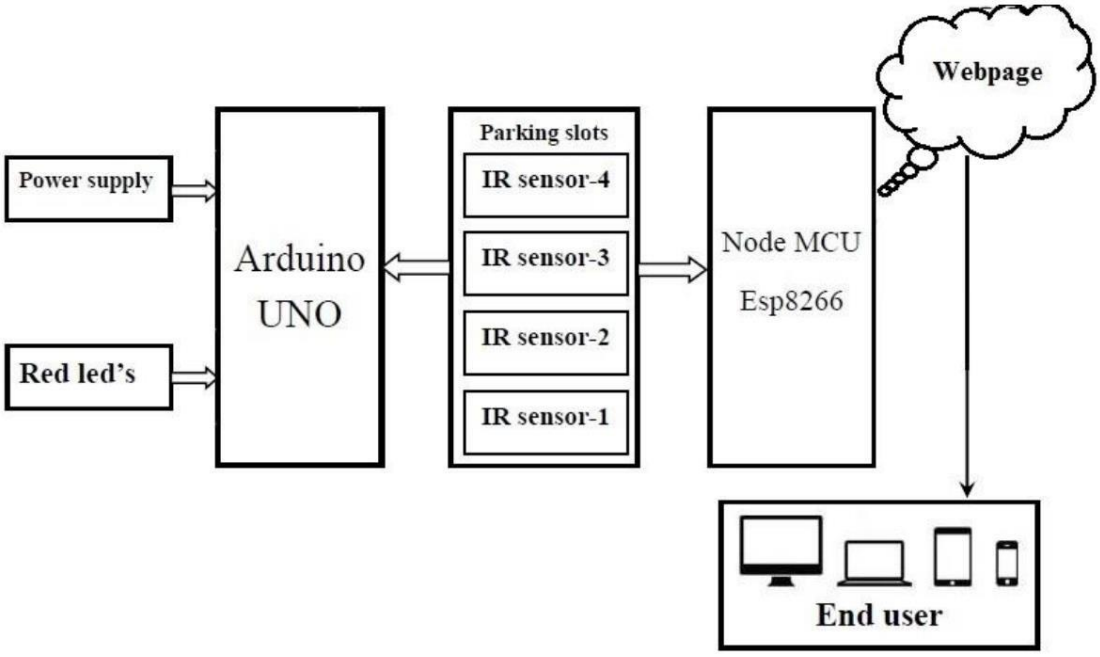

Figure: Block diagram of the proposed system

COMPONENTS USED FOR THE PROPOSED SMART PARKING SYSTEM

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- Arduino Uno
- Node MCU
- IR sensor
- Servo motors
- Jumper wires
- Cloud-based mobile application

The smart parking system figure shown below has two gates through which entry and exit are been controlled and then there are three parking slots are available in the vehicle is been parked while the system is been controlled by the microcontroller Arduino Uno and the Node MCU, all the gates and the parking slots are been equipped with IR sensors through which the detection of the vehicles are been performed, there are two gates entry & exit which also automatic gates through which vehicle is entering or exit from the parking and this information are been transferred to the user with the help of the mobile application.

CASE 1: ALL PARKING SLOTS ARE EMPTY

When all parking slots are empty or no vehicles are present in the parking slots then we can easily determine that thing in the mobile application screen that all the three slots are empty and there is not any vehicle present in the parking slots as shown in the below figure of the parking lot.

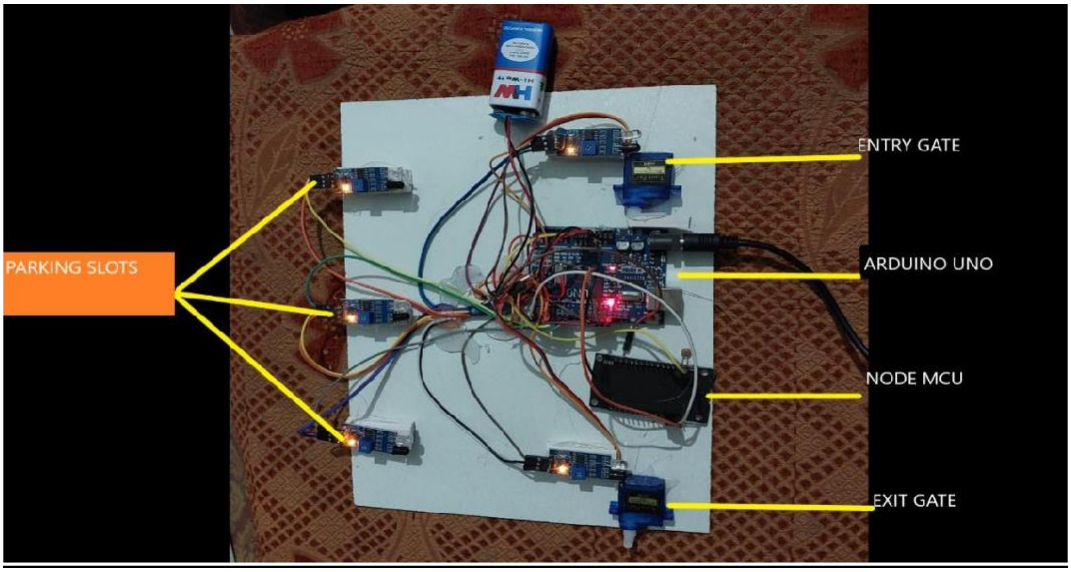

Figure: Smart Parking System

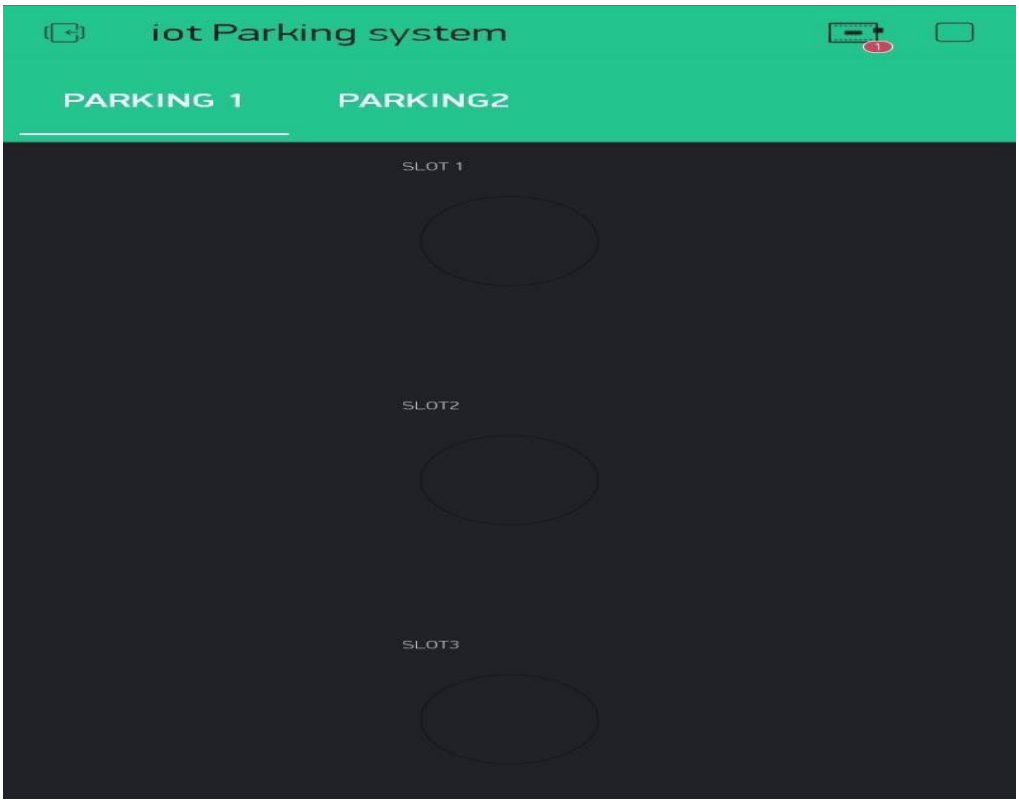

Figure: Mobile application screen

CASE 2: WHEN THE VEHICLE IS PARKED IN THE PARKING SLOT-1 AND THE OTHER IS EMPTY

In this case, when the vehicle is parked in the first then corresponding to that LED of that slot is the glow that shows that vehicle is been detected on that slot and other slot means the second and third slot is empty, user can easily see all the details on the mobile application screen in which it's visible that first slots are filled and two is empty in this case.

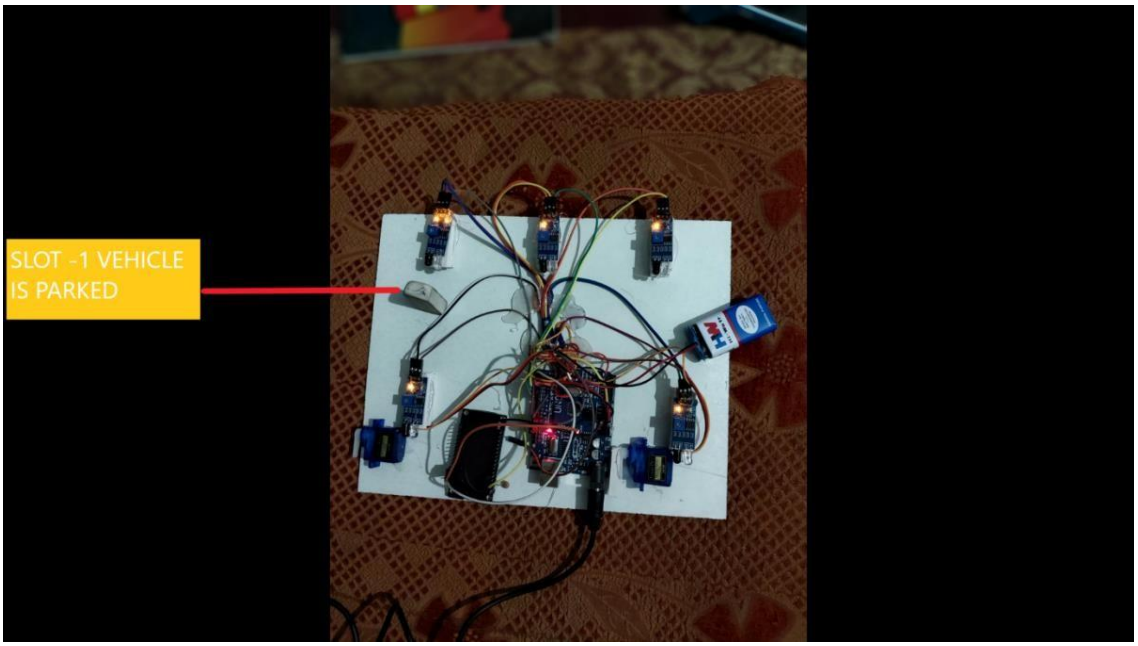

Figure: The vehicle is parked in the first slot and the other two empty

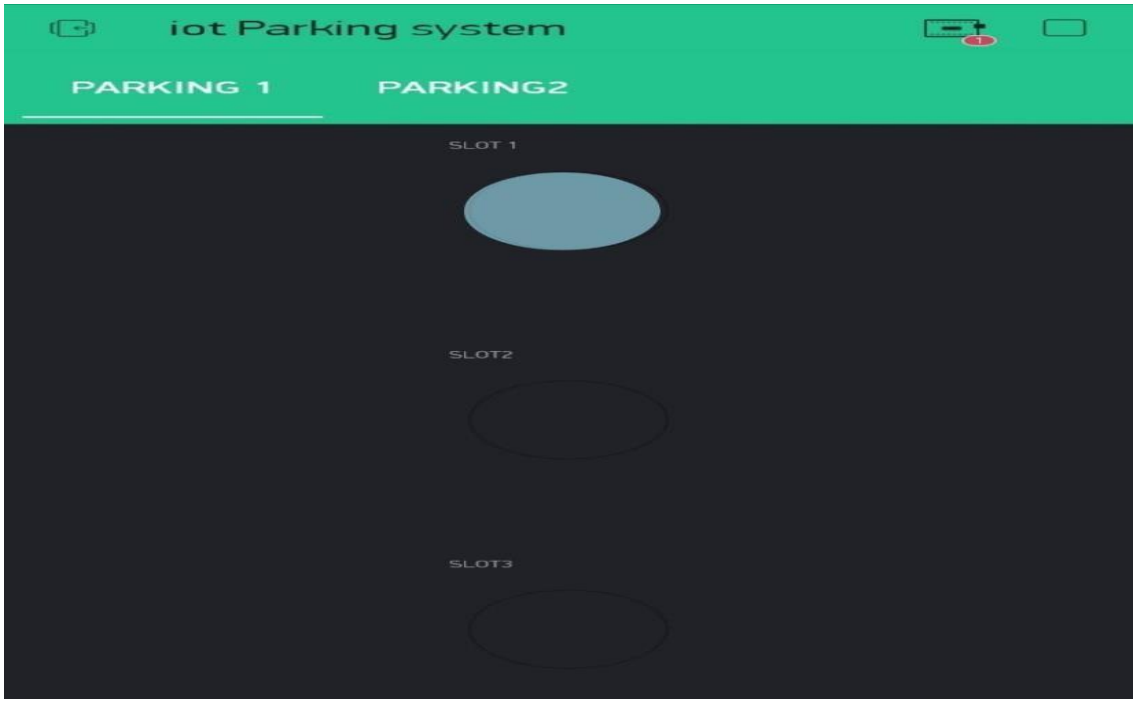

Figure: Mobile application screen

IMPROVEMENTS

- Application platform can be added with more features like its can be linked with the navigation maps through which user can easily find the parking area and parking slots.
- This system can also be integrated with the payment system through which the user when enters the parking slots the parking fees is also been deducted from the user account and the user also have to pay fees according to their total time duration of parking.
- This system can also be fully automatic in which the user has no intervention with the whole system the artificial intelligence is integrated with this system which can directly communicate with vehicles and vehicles automatically parked in the nearby vacant parking slots.

CONCLUSIONS

Smart Cities have long been an idealistic concept for humanity. within a previous couple of years, significant progress has been made toward making smart cities a reality. In terms of smart cities, the expansion of the Internet of Things and Cloud technology has displayed new possibilities. the development of smart cities has always included smart parking facilities and control systems. We address the matter of parking during this research and supply an IoT-based Cloud-integrated smart parking system. the answer we propose delivers real-time information on parking slot availability during a parking zone. Our smartphone application allowed users from remote areas to order an automobile parking space. The efforts undertaken during this paper are geared toward improving a city's parking facilities and then improving the standard of lifetime of its residents.

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