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Implementation of Smart Parking Management System

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ABSTRACT: ***In order to achieve quicker, simpler, and denser parking while utilizing the least amount of fuel, time, and space, smart parking uses a combination of technical advancements and human innovation. With the growth of the Internet of Things, the concept of innovative smart cities has gained a lot of popularity lately. Urban infrastructure must be effective and enhance productivity and reliability, and ongoing IoT operations are being carried out. IoT is utilized to address problems including traffic congestion, a shortage of parking spots, and road safety. The author presents an IoT-based virtualized intelligent system in this study. The installation of an IoT module on the property is required for the proposed smart parking system in order to track and report on the performance of each parking spot. A software tool is furthermore made available, allowing users to keep track of both booked parking spaces and open spots. The last section of the study evaluates the functioning of the system as a use case to show the correctness of the recommended solution. The report also recommends having a high level grasp of system design.***

KEYWORDS: ***IoT, Smart Parking, Smart Cities, Technology, Technology.***

1. INTRODUCTION

The Internet of Things (IoT) enables data transmission across networks without requiring human engagement. Users may adopt reasonably priced wireless access thanks to IoT, which also facilitates data transmission over the same cloud. Consumers may update their transparency thanks to IoT. IoT was intended to link various devices by using objects to authenticate themselves. These devices may be seen online or with a computer [1]. IoT uses the phrases “Internet” and “Things”, which refer to various computer systems connected by a network. Information may be sent, received, or even linked to devices on the Internet [2]. Congestion is the outcome of the air parking issue. Finding a parking place in the current climate makes it challenging for someone to go about their everyday lives. A research on evaluation projects that by 2035, there will be over 1.6 billion automobiles on the road worldwide. Every day, around a million buckets of oil are burnt worldwide. Therefore, a smart parking system is crucial to lowering the amount of petroleum waste. Solutions to the problems under discussion. Adopting smart parking may significantly save the cost of petrol needed to locate parking spaces while increasing user efficiency and communication costs [3].

The necessary data is separated out during transmission, and part of it is sent to an Arduino device, which instantly incorporates the controlling data for the required devices. To send a signal to the servo motor, which also communicates and delivers instructions to the user, the Global System for Mobile Communication (GSM) module and Arduino operate in concert. As soon as the user enters the parking area, the radio frequency identification (RFID) card associated with the login and password is scanned while preserving the security of identity verification. The user may use it to learn about empty parking spaces and get alert messages on their registered name and phone

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number. The first portion, which is in the parking lot and has IR sensors and Arduino gadgets, is one of its three components [4] . The user may interact with the parking lot using all of these devices. The second section of the article discusses managed cloud services that serve as a mediator between the user and the parking garage. The cloud is created depending on the availability of parking, but the administrator has control over it even though users may check the cloud service to see if it is available. The user side is covered in the third section of the article. An SMS informing the consumers about the unavailability is sent through the GSM module. Both the parking lot and the cloud are accessible to the user. The block diagram in Figure 1 depicts the whole operation of the smart parking system. The operational amplifier (OP-Amp), power supply, and real-time clock module are all coupled to the microprocessor 8051. (RTC).

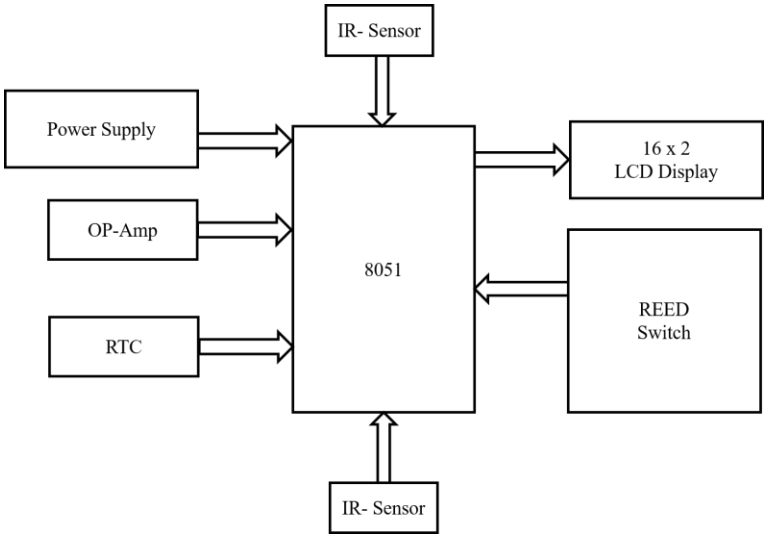

Figure 1: Illustrates the Block Diagram of the Smart Parking System.

1.1.System Architecture of Smart Parking System:

It is split into three sections. An IR sensor and Arduino gadgets are housed in the parking area's initial component. Figure 2 demonstrates how and why the user interacts with the parking lot using these devices. The user wouldn't be able to access the parking place without the aid of an RFID card. The second portion includes discusses virtualized web services that serve as a bridge between customers and parking lots.

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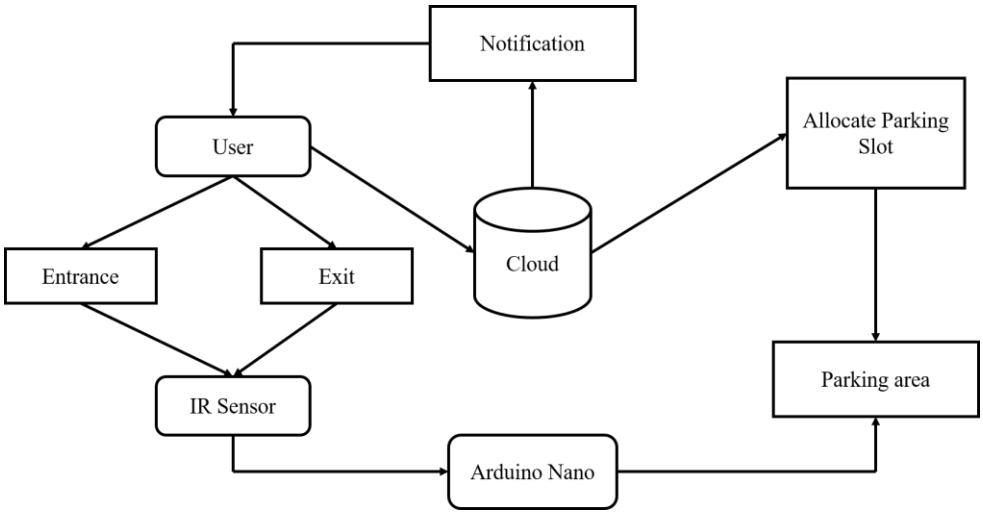

Figure 2: Illustrate the Block Diagram of the System Architecture of the Smart Parking System.

The arrays is modified based on whether parking is available. The administrator is in charge of controlling the cloud services, and the user may verify their access by checking the cloud services. The final component would be the user side. Depending on their availability, consumers get information through SMS using the GSM module.

1.2. Hardware Architecture:

The GMS modules, the RFID card, as well as the IR sensor are the three main technological components that have been used, as illustrated in Figure 3. Entry to the parking lot is restricted to individuals who already have an RFID card. Only the registered user's information is on the RFID card. The scanner applies knowledge of the login and password to the RFID tag as soon as the vehicle comes into the parking area. The user is informed by text message of the parking area's condition, but the information is subsequently sent to Aurdino to ascertain if there is surplus space available. The GSM module sends messages based on their availability. An IR sensor sends a signal indicating the presence or absence of the vehicle.

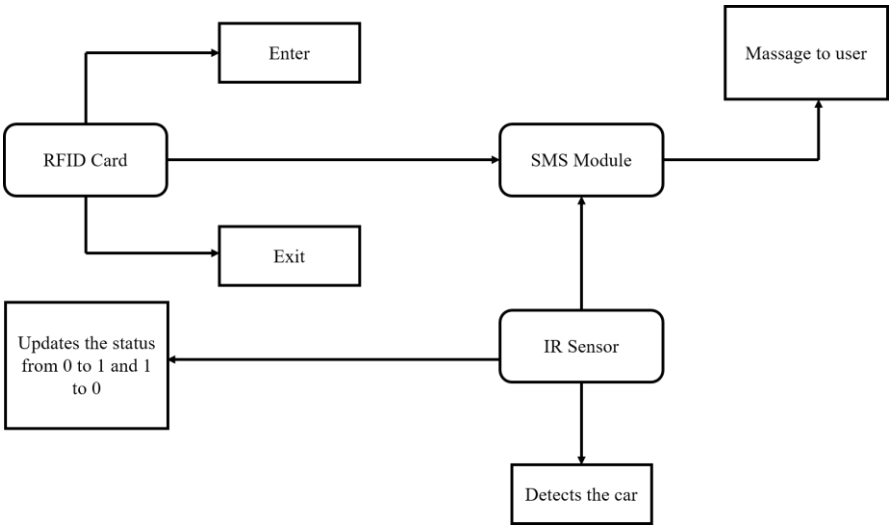

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Figure 3: Illustrates that the Block Diagram of the Hardware Architecture.

1.1.The infrastructure of the smart parking system:

The Smart Parking System has incorporated the PGI system's fundamental architecture. The framework of such a system also includes a Driver Request Processing Center (DRPC) and a Smart Parking Allotment Center. The Pavement Resource Management Center (PRMC) may gather and update all real-time parking data, after which it offers the final product online or by VMS. Applications for DRPC driver parking gather real-time information on vehicle locations, track the status of passenger distribution, and inform drivers of the outcomes of their assignments. Based on driver applications and parking resource needs, the Smart Parking Allocation Center allots and reserves parking space for autos [5]–[7]. The fundamental delivery procedure is described in the paragraphs that follow. A request is subject to two financial restrictions: a cap on parking fees and a limit on the walking distance between a parking place and the destination of the real driver. The driver's licence number, present location, kind of vehicle, and other fundamental information are also provided. SPAC gathers individual driver requests into the DPRC over a predetermined time period and establishes a thorough allocation across decision time points to satisfy driver-specific and system-wide objectives. The DRPC gives each driver an allocated parking space. If a driver is satisfied with the assignment, they may reserve a space. The driver still has an opportunity to locate a larger parking spot after scheduling an appointment, with the knowledge that it won't be much worse than the predicament they are in right now until additional space is filled. The PRMC checks that no other vehicle has the right to use that spot before changing the relevant car space's status from Available to Reserved. If the driver is not content with the appointment because of financial restrictions, his excessively stringent parking requirements, or for any other reason, he must remain until the next designated time.

Drivers who choose not to park may adapt to the circumstances of their appointment and fully alter their cost and walking distance preferences throughout the interval between the Center's allocation determinations. Of course, the motorist may never be given a parking garage if the parking system is often utilized. Four conditions seem to be crucial for developing such a smart parking system. The location of each automobile that makes a request as well as the issues with each parking spot must first be sent to the distribution center. The effectiveness of the Wi-Fi connection between the automobiles and the allocation center is another consideration. The third need is that the infrastructure should be able to make a reservation that guarantees the consumer a fixed parking place. An effective system for allocating parking spots should be set up to ensure the optimum reservation. Man will concentrate on the technicalities of satisfying these four requirements in the paragraphs that follow.

2. DISCUSSION

Smart parking systems have become more necessary since they allow customers to access accessible space quickly. The technology currently in use does not allow for making parking reservations and subsequently verifying the available spots. The previous generation of tracking systems relied on eyesight, and it took a lot of work to count the number of motors entering and exiting in order to estimate the number of cars nearby. A control system that used high-frequency sound waves to detect the presence of a car was another technology that was in use. Later, the concept of two-level parking which included unlawfully parking cars one on top of the other—

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emerged. The connection between the parking lot and the surrounding region is the paper's outcome, saving consumers time and money [8].

Reducing vehicle theft will be made easier by this study. The total quantity of gasoline used by a car is decreased by this essay. In typical systems, similar loop detectors are used at the entrance and exit points to track parking spaces. The new car tracking system has to be put in single-spaced stands on roadways in order to be used. As IoT technology develops, no official administrator is in charge of monitoring the growth and development of different alternatives and standards. The fact that there won't be many exceptions to any of these rules in next generations or even at the highest levels of heterogeneity has been underlined. The Internet of Things (IoT) issue includes a wide range of elements that cover a number of views and, as a consequence, contradict certain sectorial ideologies that believe that cosmos do not dispute one another. The instrument model employs several communication strategies to get around problems that are often brought on by system failures. Due to a problem like susceptibility to widespread genuine user attacks and unchecked hijacking circumstances, parking may become unavailable [9].

There are substantial challenges that expose sensitive information about drivers and their parking expertise that is recorded in the database due to privacy violations as well as the potential for damage. Massively linked computers impose the scaling restrictions and robust architecture necessary to adequately handle the aforementioned danger. Because there is no interface layer, smart parking systems can only do straightforward tasks. A web application should provide the real-time data that helps drivers to make wise judgments. The infrastructure must be somewhat small in order to manage massive volumes of information and provide services to many users. Establishing cloud-based services in the public or private sector is necessary to accomplish this. The data might reveal factors that need careful consideration and provide chances to customers nearby. The data may also be used to estimate capacity consumption and offer information about places in regions without sensors or with subpar connectivity coverage. In terms of business, this data technique may be useful for a service site that is congested with traffic at nearby places. Additionally, building companies may acquire knowledge from the analysis of data on different parking-related facilities, particularly when deciding where to develop extra parking lots and how to expand the number of parking spots accessible [10], [11].

3. CONCLUSION

Pervasive computing has also long been a goal for humanity. Over the last several years, significant progress has been achieved in the development of smart urban centers. With the development of IoT and cloud technologies, the need for more jobs in smart cities has become more apparent. Automated parking structures and technology for signaled intersections have always been the main priorities when building smart cities. This article describes the parking issue and offers an Internet of Things (IoT)-based cloud-based parking management solution. The method that the designers propose provides real-time data on the number of parking spaces that are available in the parking structure. Users in faraway locations might book a parking place using our free version. The many instances of its use that are currently being given demonstrate the effectiveness of parking management systems in decreasing traffic, particularly in metropolitan areas where there is traffic congestion and then there is a dearth of parking places. By informing clients and using parking spots more effectively, it does this. The analysis of all the biosensors used in finding trucks, one of the most crucial components of smart parking systems, allows for the examination of the

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benefits and drawbacks of each sensor technology. While adopting a visual-based method to vehicle recognition has certain limitations, they are by no means increased, as was already mentioned.

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