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Smart car parking system for smart cities using IoT

M. J. Aswin Jaya Surya,

Students of Computer Science and Engineering, K.S.Rangasamy College of Technology, Tiruchengode-637215, Namakkal District, TamilNadu, India

P. S. Kamalesh Karthick

Students of Computer Science and Engineering, K.S.Rangasamy College of Technology, Tiruchengode-637215, Namakkal District, TamilNadu, India

Dr. P. Senthil Raja

Assistant Professor in Computer Science and Engineering, K.S.Rangasamy College of Technology, Tiruchengode-637215, Namakkal District, TamilNadu, India

Abstract---Using internet of things technology, an effective and smart solution to automate the administration of the parking system that assigns an efficient parking spot. The Internet of Things gives wireless connectivity to the system, and the user may keep track of the parking area's availability. With a growth in the number of automobiles in metropolitan centres, road congestion is a big issue. The purpose of this study is to address this issue. The user frequently wastes time and effort looking for available parking spaces in a certain parking lot. The user receives parking information through notification. As a result, the user's waiting time for a parking place is reduced.

Keywords---car parking, sensor, time saving, LED.

Introduction

Due to the growing number of automobiles, large business districts such as malls, hospitals, city centres, and residential communities require huge parking lots. A multi-story parking system is a frequent option for such a system. Users of the multi-story parking must look for an available parking place, wasting time that may be spent usefully elsewhere. Users who have come to work in offices or to shop in malls must begin their day in the parking lot, being irritated by loud automobile honks and inhaling in dirty air. The repetition of such user annoyance

results in a worse quality of life. The entire entrance area is busy during peak hours. The rate of cars coming and exiting fluctuates, leaving just a few parking spaces completely empty. Multi-story parking garages need commodities such as lighting, air ventilation, and people to handle traffic at all times. This boosts the overall cost of power while also wasting energy. The expense of expanding parking spaces is relatively costly, which results in significant electricity usage. The lighting system consumes the most energy in a multi-level parking system since illumination is necessary during all working hours. Due to space limits and an increase in vehicle quantity, the need for intelligent parking services is fast expanding. The smart parking system is an environmentally friendly solution that saves users time and energy. The user is directed to an available parking place without the need for the user to search for one manually. The intelligent parking and management system offers precise placement, monitoring, and online control. This approach is both cost effective and user friendly.

Related Works

- The sensors employed in IoT-based smart parking systems store and retrieve data from remote places through the cloud; these aspects contribute to the cloud of things (COT). The nodes may be monitored and operated from any place. The system that we propose offers information about the availability of parking slots, and users from remote locations can reserve parking spaces using the mobile application.
- An algorithm and network architecture technologies are utilised to improve the efficiency of a cloud-based parking system. This algorithm is used to locate the cheapest parking place. Taking into account the quantity of available parking spaces as well as the distance between the parking spot and the user. The user may immediately access the cloud-based server and get the parking spot information. The user can also obtain this information by installing an application on their mobile phone. The user's waiting time for a parking place can be reduced with the aid of this algorithm. This document does not address security issues.
- To locate a parking place, a wireless sensor node and a smart phone application are employed. Because wireless technology is employed, the system is highly accurate and efficient. Onboard devices are utilised in this system to communicate with other cars. The customer parks his car in any of the available bays, and a mechanical lift lifts the vehicle out. The user is issued a ticket key and an id that is only known to the user and is used to retrieve the vehicle. Because an RFID card is provided, the user does not need to carry any paper tickets. The technique employed here is cost-effective.
- To preserve the user's privacy, security features must be upgraded.
- The survey's author categorised detection systems and vehicle sensors into two major categories: invasive sensors and non - intrusive sensors. By tunnelling beneath the road, intrusive sensors are implanted in holes in the road surface. Non-intrusive sensors have no effect on the road's surface and are simple to install and maintain. Smart parking systems aid in the resolution of traffic congestion issues while also lowering vehicle emissions.
- A study presents an effective method for addressing the issue of parking availability in real time and reducing time consumption.

- The data is delivered locally with devices that filter the data in this case. This signal is sent to the cloud for processing as well as assessment using machine learning techniques. This article employs a mobile phone application that provides the user with real-time traffic information via Google API. Thus, traffic congestion is avoided. This document does not include a reservation system for parking.
- Smart parking IoT technology assists in the design and development of a true smart parking system that gives information about unoccupied spots as well as assisting the user in locating the nearest availability. In order to improve security, this article use computer vision to recognise vehicle licence plates. Prior to entering the automobile, the user can pay for the parking place using mobile payment. As a result, the parking reservation is guaranteed. The user is advised of the parking location, the quantity of available spots, and any other pertinent information. For extracting licence plate text, the study employs efficient methods and methodologies. An algorithm detects the car entering the parking place using an ultrasonic sensor and determines the lowest cost for the user.
- The reservation-based smart parking system enables the reserve of an empty place (SPSR). This includes managing the host parking database, which gathers and saves information about the driver's identification and parking location. When the parking reservation time is about to expire, a message will be issued to the user using the web service offered by the admin. The biggest disadvantage is that another user may occupy a reserved parking place to prevent this. To overcome this, QR scanners are used to identify the user.
- The smart auto parking system offers a comprehensive parking solution for both the user and the parking area administrator. It features a reserved parking place and identifies the reserved user. Depending on the size of the car, the user may go to the nearest parking place.
- The user can reserve a parking space by the hour, day, week, or month. An algorithm is created to locate the closest parking based on size. The user's smartphone application is used to reserve and pay-as-you-go service.
- It enables us to provide a method for the customer to book a parking place by declaring the location and vehicle type via mobile applications. The booking data will be saved in the cloud, which will identify the quickest path from the user to the parking spot; the user's position will be updated in the cloud on a regular basis using GPS. When the user arrives at the car park, the Rfid is scanned and the user is authorised to park. The cloud server is in charge of billing. The biggest disadvantage is that the user must first register the automobile parking place in the smart parking system before using it.
- This study presents the installation of wireless sensor networks (WSN) in a vehicle parking system utilising an xbeezigbee server. The automobile parking system can identify vehicles parked in parking spaces. This project's goal is to make it both cost economical and user friendly. The parking system assists the user in retaining data with 90 percent accuracy.

System Architecture

Existing system

The current traffic system is very accurate yet inefficient in monitoring all cars on the road. To serve such a large population, the number of automobiles sold every day is skyrocketing. Congestion becomes more likely as the number of cars grows. The majority of the traffic we encounter on a daily basis is caused by automobiles parked in NO-Parking zones. We currently do not have technology in place to identify automobiles parked in no-parking zones.

Proposed system

The smart parking guiding system is also included in the planned system. The IR sensors are installed in the parking area. If a car is present in every parking space, it indicates PARKING FULL. Otherwise, it displays all slot information on the LCD screen as well as the Mobile App. This allows the user to detect parking details and avoid traffic congestion. Here is a project that deals with how to use such a little space to park all of their cars in a sequential sequence and signalling parking according to the numbering system. Actually, the goal here is to provide a parking space for the car, which will be identified by a number.

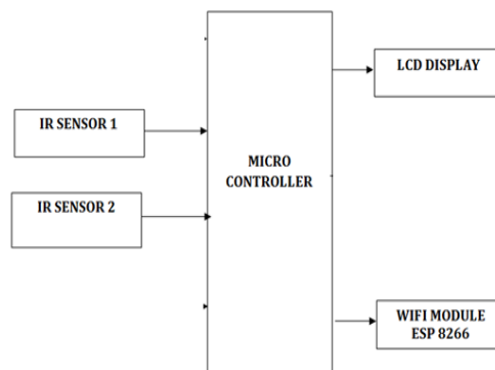
Hardware requirements

- Power supply
- IR Sensor
- D1 Mini V2 NodeMcu
- LCD DISPLAY

Software requirements

- KEIL C COMPLIER
- EMBEDDED C LANGUAGE

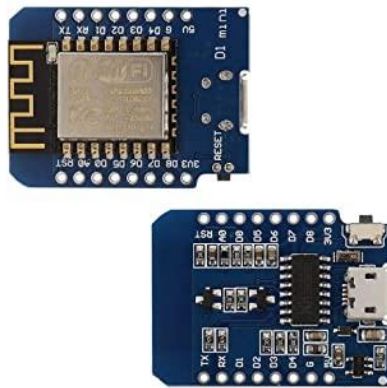
Block diagram



Details of the components

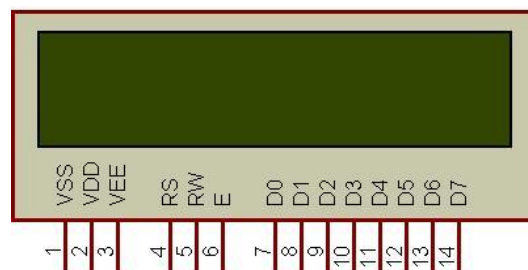
D1 MINI V2 NODEMCU

The D1 Mini is an excellent board for creating Wi-Fi-based IoT projects. This board serves as the main controller for the entire unit, processing data between various components. For its IoT activities, it employs the well-known ESP8266 Module. It is simple to program through USB and does not require any further programming. The board is based on the Arduino and includes an ESP8266WiFi Module. The ESP8266WiFi Module is a self-contained SoC with an inbuilt TCP/IP protocol stack that can provide Wi-Fi network connectivity (or the device can act as an access point). Support for OTA (over-the-air) programming is a valuable feature of the Uno Wi-Fi, which may be used to transmit Arduino sketches or Wi-Fi firmware.



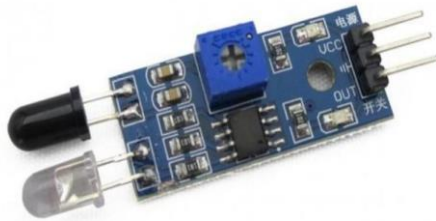
LCD display

LCD stands for liquid crystal, and it can refer to an output device having a narrow viewing angle. When compared to a 7-segment LED display, the choice of LCD as an output device was due to its low cost of usage and better performance with alphabets.



IR proximity sensor

A proximity sensor frequently creates an electromagnetic field or a beam of electromagnetic radiation and monitors the field or return signal for changes. The detected item is commonly referred to as the proximity sensor's target. Because there are no mechanical parts and no physical contact between the sensor and the perceived item, proximity sensors have a high reliability and extended working life.



Benefits of smart parking technology

Environment

One purpose of Smart Parking is to decrease the time and bother involved in finding a parking place. It has several environmental benefits to be able to precisely direct a car to an accessible place; it minimises CO2 emissions, noise, and other pollutants. Smart Parking may be used in conjunction with Smart Environment to monitor air quality and parking spot availability.

Convenience

Driving around town seeking for vacant parking places may be aggravating, especially during rush hour. Inability to locate a parking place may result in lost business or convince customers to buy elsewhere. The ability to rapidly locate a location for a buyer or guest lowers friction and enhances the entire experience. The convenience aspect is especially important in places designated for handicapped drivers, public service vehicles, or emergency vehicles.

Real-time data and insights

Smart Parking delivers comprehensive data sets that may be used to discover trends, peak hours, and other metrics that can be utilised in forecasting and reporting for local governments, car park operators, and businesses.

Reduced traffic

When a motorist knows exactly where they need to go, idle and wasteful driving are reduced, and traffic flows in congested locations are optimised.

New business models

Smart Parking enables the creation of new business models that would not be conceivable without the use of technology. Examples include reward programmes, app-based payments, and dynamic parking charges.

Reduced costs and overhead

Traditional on-street parking may have necessitated the purchase of parking metres or the hiring of parking inspectors. Smart Parking technology can help to decrease these costs by automating operations and delivering targeted enforcement.

Enforcement effectiveness

Target enforcement implies that your employees may be directed toward persons who have overstayed their welcome in order to take the required measures.

Safety

Reduced space seeking can prevent accidents by requiring drivers to retain their attention rather than searching for spaces or making reckless manoeuvres.

Integrated payments

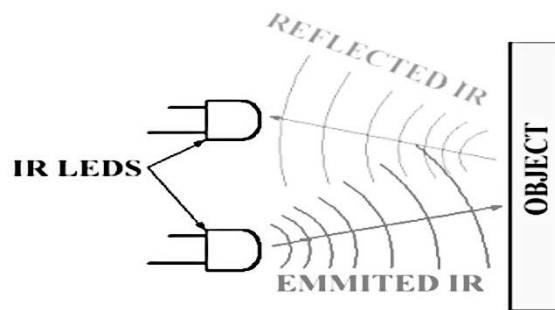
Real-time and electronic payment options through an app or a website can be included in smart parking systems. This greatly simplifies the parking experience and offers more organised data to income streams.

Smart city

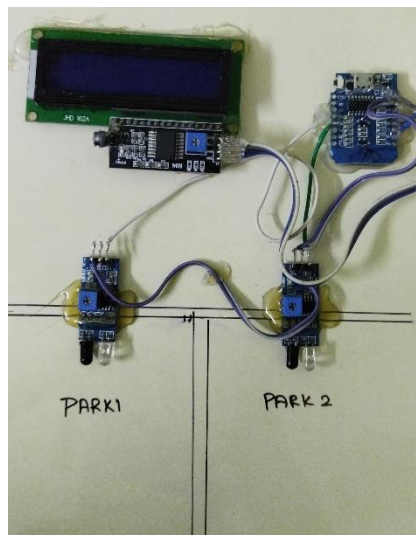
Smart Parking will soon become a requirement for any city or municipality interested in adopting Smart City technology or standards such as ISO 37122. Smart Parking standards are already being developed by the UK Government and others.

Working

The infrared proximity sensor is made up of two parts: the emitter and the detector. The emitter emits infrared light in the direction to be tested. Any item that is in the path of the produced light will reflect part of it back to the sensor. The detector captures the reflected light and calculates the object's distance from the sensor.



This section contains the implementation of the proposed system. IR sensor checks whether the parking space if free .If, there is no space available, It will display “PARK FULL” and also send notifications through Telegram bot.



Result and Discussion

The need for smart parking systems is rapidly expanding. This enables the user to have real-time access to the availability of parking spaces. In today's environment, the present system lacks the features of parking reservation and parking slot availability checker. The paper's conclusion is that the parking lot is now connected to the rest of the globe, which saves time and money for the user.

This study minimises the overall fuel energy required by the vehicle during the automobile search.

Conclusion

Smart city notions have long been a pipe dream. Over the last few years, progress has been made toward making the smart city concept a reality. The growth of internet of things and cloud technology has created new opportunities for smart cities. Smart parking facilities have long been at the heart of smart city development. The technology delivers real-time process and parking spot

information. This article improves the performance of saving customers time when looking for a suitable parking place. It contributes to resolving the rising issue of traffic congestion. Users can rent a parking place from a faraway location for future work.

References

1. J. Chinrungrueng, U. Sunantachaikul, and S. Triamlumlerd. "A vehicular monitoring system with power-efficient wireless sensor networks." In 6th International Conference on ITS Telecommunication Proceedings. IEEE Press, 2006.
2. Abhirup Khanna, Rishi Anand, "IoT based Smart Parking System", International Conference on Internet of Things and Applications (IOTA) Maharashtra Institute of Technology, Pune, 2016.
3. Hans, V., Sethi, P. S., & Kinra, J. (2015), "An approach to IoT based car parking and reservation system on Cloud", 2015 International Conference on Green Computing and Internet of Things (ICGCIoT).
4. Suresh, M., Saravana Kumar, P., & Sundararajan, T. V. P. (2015), "IoT Based Airport Parking System", 2015 International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS).
5. P. Sadhukhan, "An IoT-based E-parking system for smart cities," in 2017 International Conference on Advances in Computing, Communications and Informatics (ICACCI), 2017, pp. 1062-1066.
6. [6] H. Suryotrisongko, R. C. Kusuma, and R. V. H. Ginardi, "'FourHospitality: friendly smart city design for disability'," *Procedia Computer Science*, vol. 124, pp. 615-623, 2017/01/01/ 2017.
7. [7] E. Telles and P. Meduri, "SParkSys: a framework for smart parking systems," in 2017 International Conference on Computational Science and Computational Intelligence (CSCI), 2017, pp. 1396- 1399.
8. [8] M. Wang, H. Dong, X. Li, L. Song, and D. Pang, "A novel parking system designed for smart cities," in 2017 Chinese Automation Congress (CAC), 2017, pp. 3429-3434.
9. [9] Ahteshamul huq osmani, A. G. (2016). Research paper on Smart City Parking System. *IJARIIIE* , 3.
10. Asghar Ali Shah, G. M. (2019). Video Stitching with Localized 360o Model for Intelligent Car Parking Monitoring and Assistance System . *IJCSNS International Journal of Computer Science and Network Security* , 6.
11. Rajkumar, M., Rani, P. S., Yasin, S. M., Rakesh, K., & Vignesh, S. (2021). Mobile Anti-theft Software (MATS). *REVISTA GEINTEC-GESTAO INOVACAO E TECNOLOGIAS*, 11(2), 665-675.
12. Suryasa, I.W., Sudipa, I.N., Puspani, I.A.M., Netra, I.M. (2019). Translation procedure of happy emotion of english into indonesian in kṛṣṇa text. *Journal of Language Teaching and Research*, 10(4), 738–746
13. Suwija, N., Suarta, M., Suparsa, N., Alit Geria, A.A.G., Suryasa, W. (2019). Balinese speech system towards speaker social behavior. *Humanities & Social Sciences Reviews*, 7(5), 32-40. <https://doi.org/10.18510/hssr.2019.754>