



VEHICLE MANAGEMENT IN PARKING THROUGH IOT WITH AUTHENTICATION AND SECURITY SYSTEM

Dr P S Raghavendran¹, S Jeevananth², M V
Priyaa³, N Vijayalahmi⁴, R Poornachandran⁵
Associate professor,
Department of EEE,
Kongu Engineering College,
Erode, India.

Abstract — Car parking facilities and traffic control systems are two of the most pressing challenges in smart cities. The Internet of Things (IoT) establishes a connection between the Internet and the items in the environment, allowing those objects to be accessed from any location. One of the elements that make human life easier is the effective deployment of IoT technology. Our solution harnesses the potential of IoT by streamlining the most outdated parking system and integrating it with the most cutting-edge electrical sensors and computers, allowing users to reserve a parking spot via mobile from a remote location application. For the advantage of the valid user, a valid booking permission is attached. The system is built on low-cost IR sensors, an Atmega microcontroller, and an e-parking mobile application that collects data in real time. The use of QR code technology to create a new parking system design will allow consumers to receive the information they need.

Keywords: IoT Technology, Sensors, QR code

I. INTRODUCTION

Nowadays, technology is advancing. People's lives are improved by the application of superior science and technology. The Internet of Objects (IoT) is one of them, and it plays a vital role in smart things. Our proposed system enhances the power of IoT by streamlining the oldest parking system and embedding it with the latest innovations in electronic sensors and computers, allowing the user to make a reservation parking slot using a mobile from a remote location application with low-cost IR sensors, Atmega microcontroller, e-parking mobile, real-time data collection application with QR code technologies. In an IoT-based system, QR codes play an important function. With the use of mobile devices, Quick Response is utilized to read and understand the message. The Atmega microcontroller is utilized to control the overall operation, calibrate whether or not the slot is available, and display the result on the LCD. When the car is parked and also left in that place, a buzzer is used to alert the user. The IR sensor is an electronic device that is connected to the Arduino and is used to detect the presence of an object. The Arduino sends a command to the Wi-Fi module after the car is parked in a parking lot, and the Wi-Fi module provides information to the application.

**Fig.1. Car parking area**

II. LITERATURE SURVEY

Magnani et al. (2018) presented a proposal called "Smart parking system based on Internet of Things," which proposed that users book parking spaces for their vehicles based on IoT guidance. It intends to develop a smarter and more effective parking Poonam guiding mechanism that will considerably minimize the difficulties of the current parking system.

The work "Design and implementation of a smart parking system using IoT Technology" by Narayana swamy J C et al (2018) tried to propose a low-cost solution to this problem by establishing a smart parking spot using IoT technology. They devised a mechanism that may be used to address a variety of issues such as traffic congestion and excessive fuel usage, among others.

Mahurin Hossain Nushra et al. (2014) presented a paper on "Smart automobile parking with the assistance of line following robot," in which they created a robot to solve difficulties in the existing indoor car parking system, providing an efficient alternative for users. These robots are usually self-moving and are quite inexpensive and simple to construct. This robot's job is to transport automated equipment over great distances in industries.

Parminder Singh Sethi et al. (2015) presented a paper titled "An Approach to IoT based auto parking and reservation system on cloud," in which they developed a system that makes car parking facilities hassle-free, time-saving, and convenient for clients. They recommended cloud-based storage and mobile applications to provide mobile customers with a pleasant parking experience. In addition, the data collected by sensors is used to derive insights by storing it in a cloud foundry and analyzing it with Hadoop.

Ayad Alqahtani et al. (2012) exhibited a topic on "Smart parking system for monitoring cars and incorrect parking," which is used to identify any problems in the car parking area. If the automobile is parked incorrectly, the display will show us a green car, whereas a vacant lot will show us a black car and a properly parked lot will show us a green car. This technology provides real-time information on parking space availability in a parking lot. The work presented here is a study that aims to improve a city's parking facilities and, as a result, its people's quality of life. This study presents an IoT based smart parking system that interfaces with mobile applications, as demonstrated by J. Cynthia et al. (2018) in their demonstration topic on "IoT based smart parking management system." It offers both the user and the owner of the parking space a comprehensive parking solution. On a daily, weekly, and monthly basis, features are offered for reserving a parking space, verifying a reserved user, and determining the nearest free space based on the size of the information.

A. Existing Methods

In the past, manual registration was used, which made the procedure more cumbersome, and payment added to the delay. For general parking, reservations and VIP area allocation are not available, making access a little more difficult. Because no protection is accessible in any car, it is easy to inflict damage or theft, putting it in a difficult situation.

III. PROPOSED METHODOLOGY

We have adopted QR Code (Quick Response) technology for Quick Registration and Secure Authentication to reduce the time spent waiting. We added a thermal printer to get a receipt of the cost, time, and automobile information for reference, and all of the information is posted to a server via IoT connection. An authentication mechanism is

Dr P S Raghavendran¹, S Jeevananth², M V Priya³, N Vijayalaxmi⁴, R Poornachandran⁵



introduced to prevent theft by an acknowledgment from the owner, and any undesired movements while parking will result in an alarm message being shown.

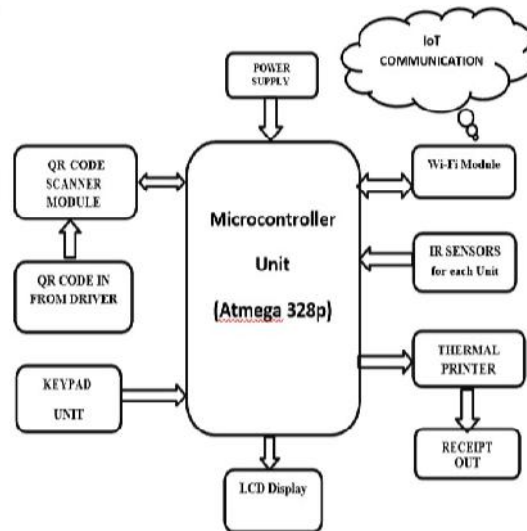


Fig.2. Block diagram

B. Circuit Diagram

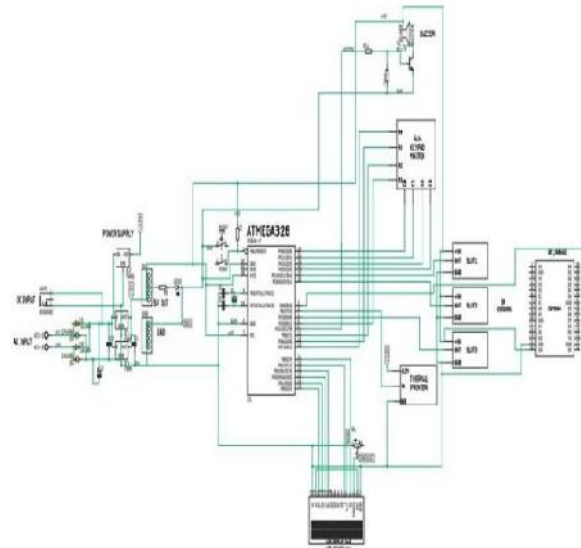


Fig.3. Circuit Diagram

In the above circuit diagram when the ac input supply is given it converts into dc supply using an adapter and supply is given to each component. We are using a QR code scanner to scan the registered QR code of each user. IR sensor detects the motion of the object and sends the signal to the ATMEGA 328 Microcontroller and the details of the owner will be displayed in LCD with available slots. Keypad unit is used to give time selection of each slot. Then the billing system is generated in thermal printer in the right side generates receipt as output. In that receipt slot number and car details are generated we can take the receipt out for our reference. This is the general concept of the project.

C. Quick Response Code

A matrix barcode is a sort of Quick Response code. It was created in Japan for the automotive industry. A barcode is an optical label that provides information about the item to which it is attached and can be read by machines. In actuality, QR codes

Dr P S Raghavendran¹, S Jeevananth², M V Priya³, N Vijayalaxmi⁴, R Poornachandran⁵



frequently include information for a locator, identifier, or tracker that directs users to a website or application. To store data efficiently, a QR code uses four defined encoding modes: numeric, alphanumeric, byte/binary, and kanji; extensions may optionally be utilized. It now has a crucial function to perform. The QR code has a square shape and is made up of black squares in a square grid on a white background. It can be read by a camera and processed using Reed–Solomon error correction until the image can be properly comprehended. The essential information is taken from the square grid, which can be found in both horizontal and vertical components of the picture. It's a machine-scannable image that can be read in a matter of seconds with a Smartphone camera. Every QR code has a number of black squares and a dot that represent data. When our smartphone scans a code, it converts it into a human readable format.



Fig.4. QRcode

D. Keypad unit

A keypad is a collection of digits, symbols, or alphabetical letters placed on a pad that can be used as an efficient input device. A completely numeric keypad, which is featured on most computer keyboards, allows a user to quickly enter numeric values into a computer. It is primarily utilized by persons who frequently use a software calculator to make computations or deal with numbers. Vending machines, Point of Sale devices, calculators, digital door locks, push-button telephones, and combination locks all have numeric keypads. On the upper side of a computer keyboard, there is a row of number keys, as well as a separate numerical pad on the right side for quick data entry. Phone keypads, which are usually alphanumeric, make it easier to recall phone numbers. The user can type in text messages and names. Furthermore, because keypads are not included with all computer keyboards, such as laptops and notebooks, tiny PCs may require the purchase of an external plug-in keypad. A computer keyboard features additional number keys on the top, as well as a small numeric keypad on the side with buttons that are similar to those on a calculator. This numeric keypad makes it easier to enter numerical data. Because most individuals are right-handed, a numeric keypad is primarily found on the right side of the keyboard, which aids in efficient entry. Many devices, such as vending machines, ATMs, time clocks, Point of Sale payment systems, digital door locks, and combination locks, have keypads for entering PINs and selecting products.



Fig.5. Keypad Unit

E. ESP8266 Wi-Fi Module

Espressif Systems in Shanghai, China, produces the ESP8266, a low-cost Wi-Fi microprocessor with a full TCP/IP stack and microcontroller functionality. The ESP-01 module, created by a third-party producer Ai-Thinker, first brought the chip to the attention of Western makers in August 2014. Using Hayes-style commands, this little module allows microcontrollers to connect to a Wi-Fi network and make rudimentary TCP/IP communications. However, there was essentially no English-language documentation available at first for the chip and the commands it could receive. Many hackers were attracted to the module, the chip, and the software on it, as well as to translate the Chinese documentation, because of the low price and the fact that there were few external components on the module, which suggested that it may someday be extremely affordable in bulk. The ESP8285 is an ESP8266 with 1 MiB of built-in flash that can be used to create single-chip devices that can connect to Wi-Fi. The ESP32 family of devices, which includes the pin-compatible ESP32-C3, has replaced these microcontroller chips.

Dr P S Raghavendran¹, S Jeevananth², M V Priyaa³, N Vijayalaxmi⁴, R Poornachandran⁵

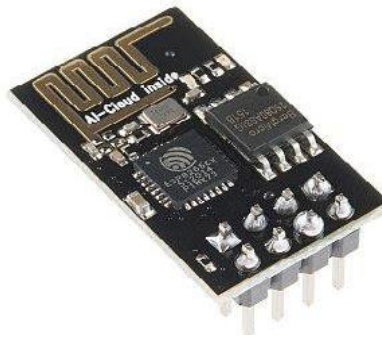


Fig.6.WiFiModule

F. LCDDisplay

Liquid crystal display is the abbreviation for liquid crystal display. It is a type of electronic display module that is utilized in a wide range of circuits and devices such as mobile phones, calculators, computers, television sets, and soon. Multi-segment light-emitting diodes and seven-segment displays are the most popular. The primary advantages of utilizing this module are its low cost, ease of programming, animations, and the fact that there are no restrictions on displaying unique characters, special and even animations, and soon.

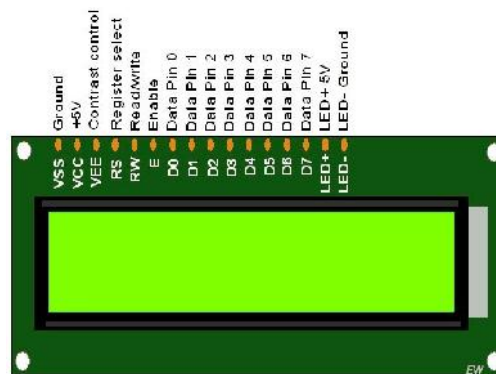


Fig.6.Schematic view of 16x2 LCD display

G. ATMEGA328Microcontroller

The ATmega328 is a single-chip microcontroller from Atmel that belongs to the mega AVR family of microcontrollers (later Microchip Technology acquired Atmel in 2016). It has an 8-bit RISC processing core based on Harvard architecture.



Fig.7.ATMEGA328Microcontroller

H. ThermalPrinter

A thermal printer is a printer that creates images on paper by heating the paper. It has grown in popularity as a result of improved print quality, speed, and technological advancements, and is now mostly utilized in the airline, banking, entertainment, retail, supermarket, and healthcare industries. Thermal printing, unlike many other types of printing, does not use ink or toner and instead relies heavily on thermal sheets to produce images. Printers of various sorts Impact printers and non-impact printers are the two primary types of printers. When tiny wire pins on the print head physically contact the paper, they strike the ink ribbon and form text and images. For example, a dot matrix printer or a Daisy wheel

Dr P S Raghavendran¹, S Jeevananth², M V Priyaa³, N Vijayalaxmi⁴, R Poornachandran⁵



printer. Text and graphics are printed on paper without actually striking the paper with an impact printer. For instance, a laser printer, an inkjet printer, or a thermal printer. Because of the rapidity with which they print, they are also quite popular for making labels. The printer's cable connections are made at the back. The cash drawer cable links one or two cash drawers to the printer. Make sure the USB cord is only connected to point A. (below). The communications circuitry may be permanently damaged if the USB cable is connected at point B. The printer is connected to the host computer through a communication wire. Connect the power supply cable last to avoid damaging the printer. The printer warranty, FCC, and CE Mark designation are all void if this equipment is used without shielded cords. Connect the printer's power cord to the printer's rear. When the printer is configured for USB and then native "Cable routing," route the cash drawer and power supply cable through the strain relief as illustrated on the next page. The power cords should be plugged into the power source, which should then be plugged into an outlet. The top cover's green light will turn on. This test creates a diagnostic form with a detailed list of printer settings and partially slices the paper (see sample on next page). Depending on the printer model, the test items may differ. When there is a problem, a service representative can use this printout. See the Troubleshooting section of this article if the test printing quality is poor (missing or fading text). The configuration menu allows you to modify the printer's current settings.



Fig.8. Thermal printer

1.1 Internet of things

The Internet of Things (IoT) is a network of physical objects—referred to as "things" or "objects"—embedded with sensors, software, and other technologies with the goal of connecting and exchanging data with other devices and systems over the internet. The integration of different technologies, period of time analytics, machine learning, trade product sensors, and embedded systems has allowed things to evolve. Embedded systems, wireless sensor element networks, management systems, automation (including home and building automation), and other domains all contribute to the net of things' success. IoT technology is most interchangeable with products related to the concept of the "smart home," such as devices and appliances (such as lighting, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems and can be controlled by devices related to that scheme, such as smart phones and smart speakers. The Internet of Things can also be used in attention systems. There are a slew of major concerns about the perils of IoT expansion, particularly in the areas of privacy and security, and therefore business and governmental actions to address these concerns.



Fig.9. IoT

i. IV RESULTS AND DISCUSSION

A. Hardware Setup

The electrical setup of four proposed works is shown in the figure 6.1. Thermal Printer, LCD Display, Keypad unit, IR Sensor, Wi-Fi module.

Dr P S Raghavendran¹, S Jeevananth², M V Priyaa³, N Vijayalaxmi⁴, R Poornachandran⁵

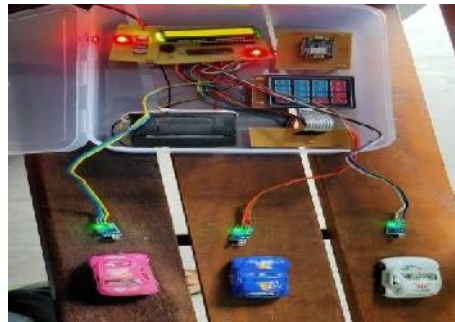


Fig.10.Hardware setup

Separate QR Code will be generated in mobile phone for each and every user when they entered their ID and their name in QR Code generator.

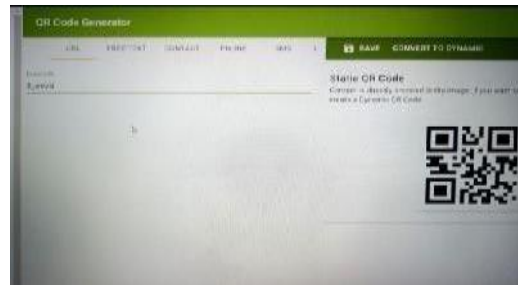


Fig.11.QR Code generator



Fig.12.Carparking app

Scanner application (app) is created for scanning the user's QR code whenever the car is entered in the parking area and the available slots will be shown for the user in the LCD display with an ID and the name of user.

B. Information's Displayed in LCD

LCD used to display the information like name of the user, available slots, time selection and slot clearance information





Fig.13.LCDdisplay

C. ReceiptGeneratedinThermalPrinter



Fig.14.Slot3parkingdetails



Fig.15.Slot2parkingdetails

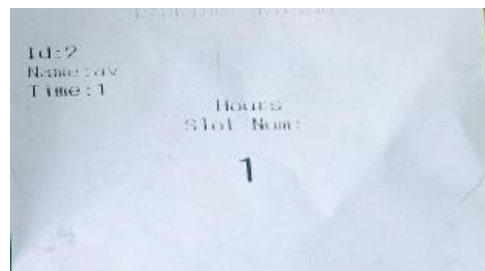


Fig.16..Slot1parking details



Fig.17.. shows no slot is available

Receipt is generated in thermal printer with all the information like name, id of user, time and slot number.

IV. CONCLUSION

This paper proposes an IoT-based smart parking system that integrates numerous physical devices to verify parking slot availability. The mobile app allows the user to find and reserve a parking place online. Navigation from the entrance gate to the available parking slot saves the driver time and effort. As a result of the integration of QR code technologies, a new parking system design capable of offering security and convenience to everyone who use it has been created. In today's parking system, the system demonstrates that the concept of inspection is legitimate in terms of providing security.

Dr P S Raghavendran¹, S Jeevananth², M V Priyaa³, N Vijayalahmi⁴, R Poornachandran⁵



V. REFERENCES

- [1] "Internet of Things Global Standards Initiative". ITU. Retrieved 26 June 2015.
- [2] <http://www.telegraph.co.uk/motoring/news/10082461/Motorists-spend-106-days-looking-for-parking-spots.html> .
- [3] "Cloud Foundry Foundation a Key Driver in PaaS Adoption".
- [4] Thusoo, A.; Sarma, J.S.; Jain, N.; Shao, Z.; Chakka, P.; Zhang, N.; Antony, S.; Liu, H.; Murthy, R. HIVE-A petabyte scale data warehouse using hadoop. Available online: <http://infolab.stanford.edu/~ragho/hive-icde2010.pdf> (accessed on 24 November 2014).
- [5] Dean, J.; Ghemawat, S. Mapreduce: A flexible data processing tool. *Commun. ACM* 2010, 53, 72–77.
- [6] Michal, B. Drools JBoss Rules 5.0 Developer's Guide; Packt Publishing Ltd.: Birmingham, UK, 2009
- [7] Z.Qadir, F.Al-Turjman, M.A.Khan and T. Nesimoglu, "ZigBee Based Time and EnergyEfficient Smart Parking System Using IoT." 2018 18th Mediterranean Microwave Sympos-ium (MMS), Istanbul,2018, pp.295-298.
- [8] P. Sadukhan, "An IoT-Based E-Parking system for smart cities." 2017 International Con-ference on Advance in Computation, Communication and Informatics (ICACCI). Udupi, 2017,pp. 1062-1066.
- [9] S.Kazi, S.Nuzhat, A.Nashra, Q.Rameeza, "Smart Parking System to Reduce TrafficCongestion", 2018 International Conference on Smart City and Emerging Technology(ICSCET), 2018, pp. 2-3.
- [10] Mr. Basavaraju S R, "Automatic Smart Parking System using Internet of Things(IOT)",*International Journal of Scientific and Research Publications (JSRP)*, Volume 5, Issue12, December 2015 Edition.