



A Novel Parking System for Commercial Premises

V.Naga Siva Rama Murthy¹, Syed Arshiya², K Bhanu Prakash², K Harsha Vardhini², G Divya²

¹Assistant Professor, Department of Electrical and Electronics Engineering, Ramachandra College of Engineering, Vatluru, Eluru, Andhra Pradesh, India.

²Department of Electrical and Electronics Engineering, Ramachandra College of Engineering, Vatluru, Eluru, Andhra Pradesh, India

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ABSTRACT

In this paper, a novel parking system for commercial premises is proposed. The combined use of Arduino UNO and RFID sensor outperforms the traditional parking system.

Keywords: Arduino, Servo Motor Sg90, LCD Display, NodeMCU, IR Proximity sensor, Buzzer

1.INTRODUCTION

In the 21st century finding a free car parking slot has become a mind-numbing process, especially for people who travel in the morning to work or are following their daily routine, they find it highly difficult and challenging to get a parking slot for their cars[1]. Moreover, the parking slots are never user-friendly and provide no logical data about the availability of the spot unless the user visits it manually [2]. These kind of problems are faced regularly by every individual because the factor of uncertainty is very high and there are not many possible solutions in existence for solving the issue that may benefit the users by saving their time or keeping their mental state happy and carefree. In our ever populating cities and districts to find parking space is becoming increasingly difficult as traffic increases [3]. Drivers have to go back and forth desperately looking for parking spaces wasting their valuable time, fuel

consumption with increased likelihood of causing accidents [5]. With the help of wireless network technology we propose remote parking monitoring and automated guidance which will help save a lot of time [6]. In the existing system we can see that some supervision is required for the parking system and it not fully automated [7]. The driver has to make sure that the car is parked in a spot without disturbing the convenience of others [8]. In most cases the main problem is finding the spot and trying to secure the spot for parking which in turn leads to increased stress level for the person driving the car [9]. Moreover, the relative analysis of the data is structural to the implementation of the parking procedure. Nowadays, in this busy world it's really hard for a person to find a spot for parking . The current parking system doesn't give the user a specified parking slot inside the area. Parking in general is a long and time-consuming process and we hope to

provide a solution to alleviate the problem [10]. In this paper, section II describes the literature survey, section III briefs the proposed system, section IV showcases the results and discussions and section V concludes the paper.

2. LITERATURE SURVEY

Almagambetov. A, Velipasalar. S, and Casares. An important aspect of collision avoidance and driver assistance systems, as well as autonomous vehicles, is the tracking of vehicle taillights and the detection of alert signals

Jung. H.G, Cho. Y.H, Yoon. P.J, and Kim. Recently, customers have shown a growing interest in parking aid products. A parking aid system consists of target position designation, path planning, and parking guidance by user interface or path tracking by active steering.

Kaempchen .N, Franke U, and Ott R, The ability of generating and interpreting a three-dimensional representation of the environment in real-time is one of the key technologies for autonomous vehicles. reliable.

Sumalee, H.W. Emerging technologies toward a connected vehicle-infrastructure-pedestrian environment and big data have made it easier and cheaper to collect, store, analyse, use, and disseminate multi-source data.

3. PROPOSED SYSTEM

The block diagram of the proposed system is depicted in Figure 1.

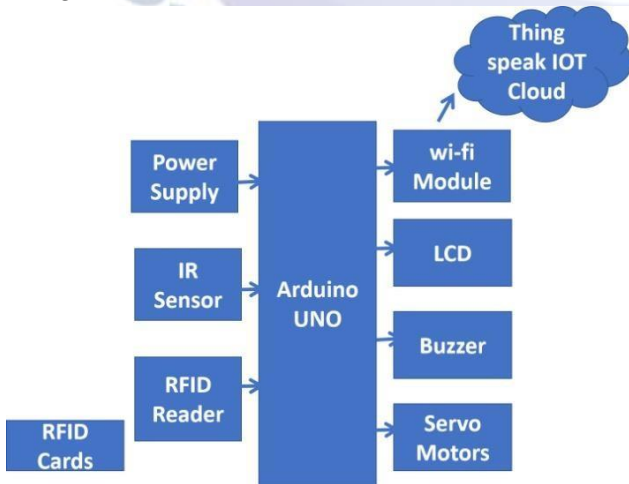


Figure 1: Block Diagram

The hardware kit of the proposed system is shown in

Figure 2.



Figure 2: Hardware Kit

The proposed Smart Parking System is designed to address the limitations of existing parking management methods by leveraging IoT technology, real-time data analytics, and user-friendly interfaces to optimize parking space utilization and enhance the overall parking experience for users. The system consists of several key components as given below. The components used in the proposed system is listed in Table 1

Table 1: Components Specifications

Components	Current rating	Voltage rating	Power rating
Arduino UNO	50 mA	5V	5v
Servo Motor Sg90	100mA	4.8V	1W
LCD	50mA	5V	5W
NodeMCU	70mA	4.5V	0.33W
IR Proximity sensor	20mA	3.5V	0.1W
Buzzer	20mA	5V	0.1W

ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.



Figure 3: Arduino UNO

The technical details of the Arduino UNO is listed in Table 2.

Table 2: Technical Specifications of Arduino UNO

COMPONENTS	RANGE
Microcontroller	ATmega328
Input Voltage	7-12V
Input Voltage (Limits)	6-20V
Digital I/O Pins 14	provide PWM output
Analog Input Pins	6
DC Current per I/O Pin	40mA
DC Current for 3.3V Pin	50mA
Flash Memory	32 KB
Boot loader	0.5 KB
SRAM	2 KB
EEPROM	1 KB
Clock Speed	16 MHz

A. LCD 16x2

The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc.

B. Buzzer

An audio signaling device like a beeper or buzzer may be electro-mechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

C. Servo Motor SG90

A Servo motor is a type of motor that is powered by a DC source, either from an external supply or by a controller. A small and lightweight servo motor with high output power is called a micro servo motor sg90. This means that the sg90 micro servo motor will only work as hard as is required to complete the task at hand. A wide range of applications ...

D. RC522 RFID Module

The RC522 is a 13.56 MHz RFID module that is based on the MFRC522 controller from NXP semiconductors. The module can support I2C, SPI and UART and normally is shipped with a RFID card and key fob. It is commonly used in attendance systems and other person/object identification applications.

E. NodeMCU ESP8266

Node MCU is an open-source Lua based firmware and development board specially targeted for IoT based

Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Expressive Systems, and hardware which is based on the ESP-12 module.

F. WIFI MODULE

It is an open-source firmware and development kit that helps you to prototype or build IoT products. It includes the hardware which is based on ESP8266 (NodeMCU) module. Here, it is used as an embedded controller that is programmed through Arduino, to handle analogue or digital data received from mobile application and to transmit over the Internet. At the same time, it accepts commands from the Web and accordingly actuates connected devices or actuators.

G. IR(INFRARED) PROXIMITY SENSOR

IR proximity sensor, also known as an infrared proximity sensor, is a device that detects the presence or absence of an object within a certain range using infrared light. It emits infrared radiation and measures the reflection or absorption of this radiation to determine the proximity of an object. These sensors are commonly used in various applications such as automatic doors, robotics, security systems, and touchless switches. They are preferred for their accuracy, reliability, and ability to work in different lighting conditions.

4. RESULTS AND DISCUSSIONS

There are three parking slots in this project, IR sensor placed at slot-1, 2, and 3 respectively as shown in Figure 4.



Figure 4: Parking position

Servo motor is used to operate the common entry and exit gate. The LCD display is placed near the entry gate. The system used IR sensors to detect whether the parking slot is empty or not and IR sensor-1, and 2 for detecting vehicles arriving or not at the gate. In the beginning, when all parking slots are empty, then the LCD display shows all slots are empty.

When a vehicle arrives at the gate of the parking area then the IR sensor-1 detects the vehicle and the system allowed to enter that vehicle by opening the servo barrier. After entering into the parking area when that vehicle occupies a slot then the LED display shows that the slot is full. In this way, this system automatically allows 3 vehicles. In case the parking is full, the system blocked the entrance gate by closing the servo barrier. And the LED display shows that slot-1, 2, and 3, all are full, as shown in Figure 5.



Figure 5: LCD Display showing the availability slots

When a vehicle leaves a slot and arrives at the gate of the parking area then the IR sensor-2 detects that vehicle and the system open the servo barrier. Then the LED display shows that the slot is empty. Again the system will allow entering a new vehicle.

Using Thing View's, and the accompanying graph, one can know how many slots are empty/ filled, as shown in Figure 6 to Figure 8.

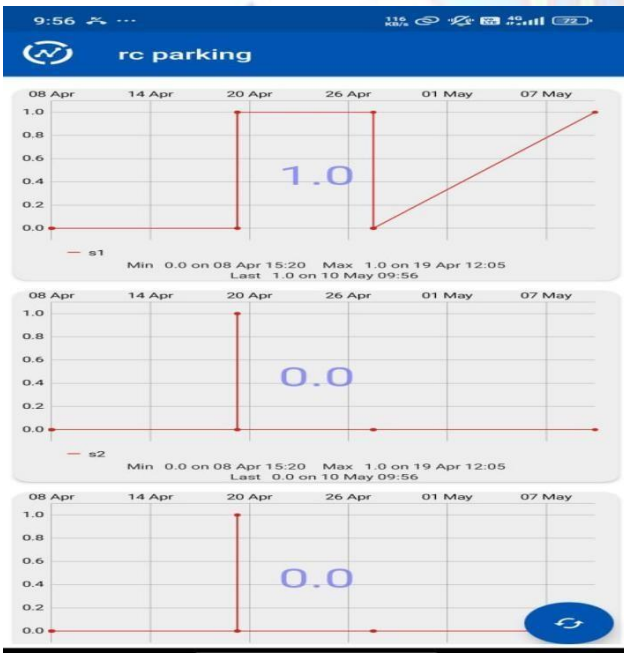


Figure 6: A1 slot is filled and remaining two slots are empty

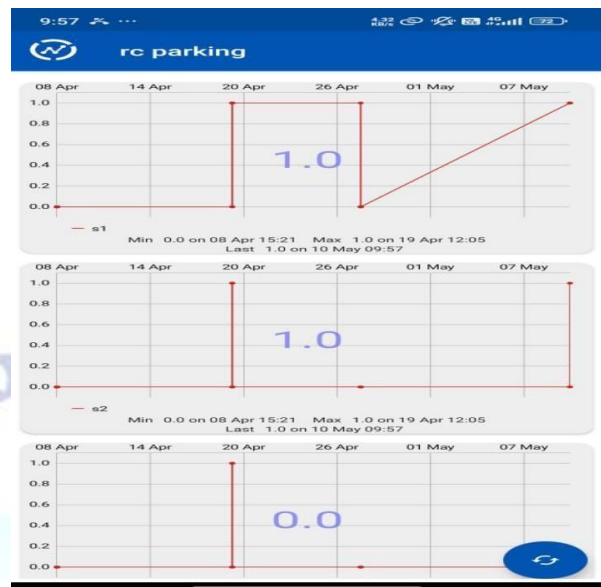


Figure 7: A1 & B1 slots are filled and remaining one slot is empty.

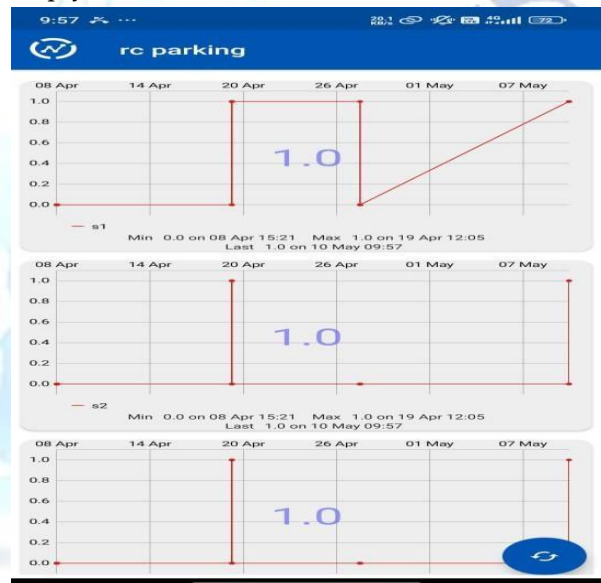


Figure 8: A1, B1 and C1 slots are filled and no slots are available for parking.

5. CONCLUSION

In conclusion, the Smart Parking System offers a comprehensive solution to address the challenges associated with parking congestion and inefficiencies in urban areas. By leveraging IoT technology, real-time data analytics, and user-friendly interfaces, the system optimizes parking space utilization, improves traffic flow, and enhances the overall parking experience for users.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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