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Portable Smart Parking System Using Firebase

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Abstract: ***In those days with the growing influx of population into developed, industrially and technologically sound urban cities, the urgent need to make cities smart is becoming obsolete. Cities are being made intelligent through data sharing, artificial intelligence, machine learning, analytics and thousands of RFIDs. Tags and sensors. There are billions of motor vehicles in the world. Vehicles can only enter if the reader detects a valid RFID tag on the door. An account is kept in the central database for each valid RFID tag. It allows us to monitor and save the time of entry and exit of the vehicle. An Android app is provided to guide the user. This database can also be analyzed to find patterns of days when there was parking demand.***
Keywords: Smart parking, IOT, Nodemcu, Firebase, RFID module.

I. INTRODUCTION

Internet of Things (IOT) is a technology in which all intelligent nodes are connected with the help of the Internet. Access to remote sensing parameters became a reality thanks to IoT. These connected nodes generate a large amount of data. That is stored in the cloud. In this proposed design, we used the concept of IoT to reserve a free parking space. The main goal of our design is to provide the user with information about the available free parking spaces. .It will be more convenient for car owners to reduce the hassle of looking for free parking spaces within the city. We used an optimal architecture for the proposed design. In this layout, traffic congestion due to confirmed parking spaces is reduced. The pre-reservation option. Therefore you save fuel and thus CO2 footprint. Recently, the Indian government has launched a proposal called Smart City, in which the entire city will be developed to make life more comfortable for the people who live there. And flexible in such a conceptualization, the intelligent parking system plays a crucial role. In large commercial complexes, the vehicle owner often has trouble finding a parking space and ends up wasting much of their valuable time. To avoid such situations, we have now found a solution. Where all parking problems can be solved. This system also has a pre-reservation and cancellation option. We can reserve a parking space in advance and avoid traffic jams, which reduces the vehicle's fuel consumption. The user enters the intelligent parking server to be able to reserve the desired position without having to access the parking lot. Through the application, the user can know the free and available positions and parking spaces. The internal parking network is the process connection of all intelligent parking devices. When the server sends a signal to the cloud and the cloud role sends that signal to the display screen and from the display screen to the sensor and the sensor to the top of the post and vice versa, this communication occurs internally without the intervention of an employee or user.

II.METHODOLOGY

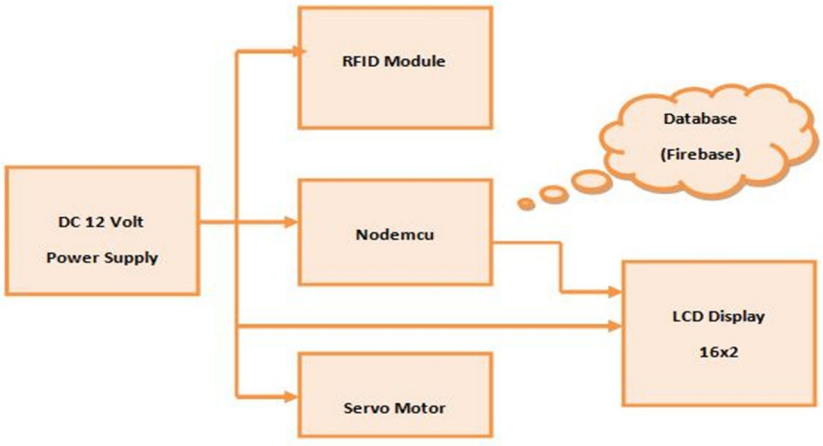


Fig. 1 Block diagram of smart parking system using firebase

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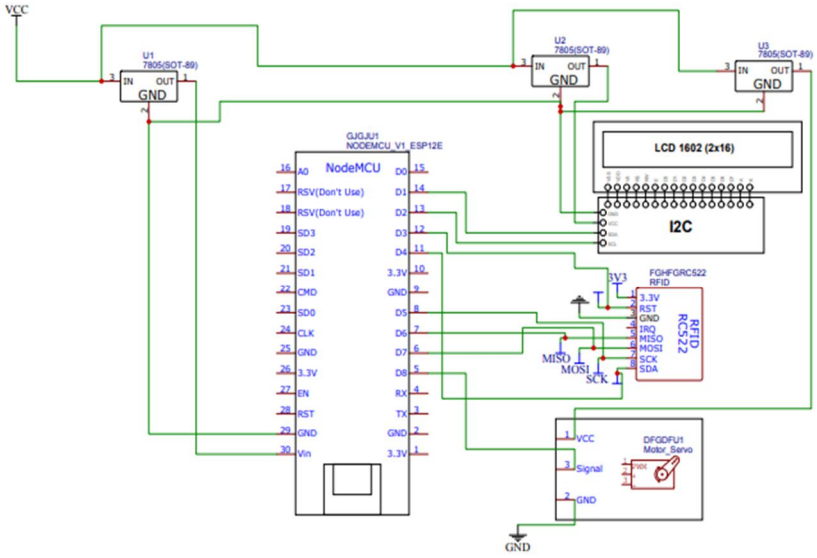


Fig. 2 Schematic of smart parking system.

A. Components Details

1) Nodemcu

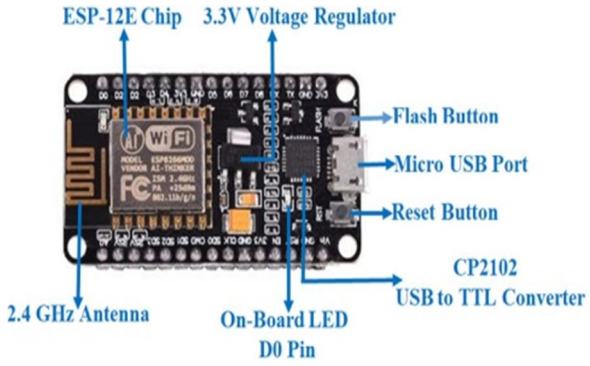


Fig. 3 Nodemcu.

The Nodemcu (Node Micro-Controller Unit) is ASCII text file software and hardware development atmosphere designed around a reasonable System-on-a-Chip (SoC) referred to as the ESP8266. This produces a wonderful alternative for the web of Things (IoT) comes of all kinds. The Nodemcu has feature to communicate with website using API, The Nodemcu is specifications are as follows,

a) Nodemcu has inbuilt microcontroller “Tensilica”, 32-bit RISC CPU Xtensa LX106.
b) The Nodemcu has Operating Voltage 3.3V.
c) Input Voltage: 7-12V.
d) Digital I/O Pins (DIO): 16.
e) It has only one Analog Input Pins (ADC.
f) UARTs: 1.
g) SPIs: 1.
h) I2Cs: 1.
i) Flash Memory: 4 MB.
j) SRAM: 64 KB.
k) Clock Speed: 80 MHz.

Table 1 Pin configuration of Nodemcu [7]

Pin	Code	Arduino alias
A0	A0	A0
D0	GPIO 16	16
D1	GPIO 5	5
D2	GPIO 4	4
D3	GPIO 0	0
D4	GPIO 2	2
D5	GPIO 14	14
D6	GPIO 12	12
D7	GPIO 13	13
D8	GPIO 15	15
SD2	GPIO 9	9
SD3	GPIO 10	10
RX	GPIO 3	3
TX	GPIO 1	1

2) Relay Module

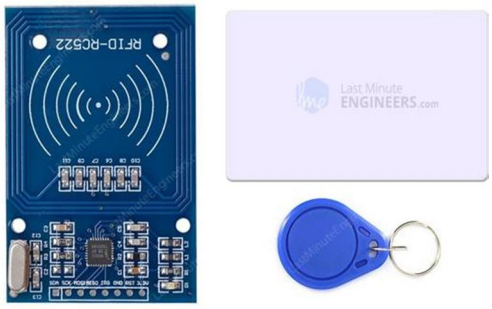


Fig. 4 RFID modules RC522

The RC522 RFID reader module is designed to generate an electromagnetic field of 13.56MHz, which it uses to communicate with RFID tags (ISO 14443A standard tags). "The reader can communicate with a Nodemcu via a 4-pin serial peripheral interface (SPI) at a maximum rate of 10 Mbit/s. It also supports communication via I^2C and UART protocols" [8].

Table 2 Feature of Rfid RC522 [6]

Frequency Range	13.56 MHz ISM Band
Host Interface	SPI / I2C / UART
Operating Supply Voltage	2.5 V to 3.3 V
Max. Operating Current	13-26mA
Min. Current(Power down)	10µA
Logic Inputs	5V Tolerant
Read Range	5 cm



Fig. 5 I2C module.

Due to the limited pin resources of a microcontroller/microprocessor, controlling an LCD panel can be tedious. Serial to parallel adapters such as I2C serial interface adapter module, PCF8574 chip, make it easy to work with only two pins. The serial interface adapter can be connected to a 16x2 LCD display and provides two signal output pins (SDA and SCL) that can be used to communicate with an MCU/MPU.

3) Adapter



Fig. 6 DC Adapter (12 Volt).

This project is required DC power supply therefore we are using 12 volt adapter which can be give the 12 volt 1.5 ampere supply.

4) Voltage Regulator IC 7805



Fig. 7 Regulator IC 7805

The above figure show the diagram of the regulator IC 7805 which can be used to give the output as 5 volt. This IC has 3 pins VIN, GND, Vout. In our project we are using all the components which work in 5 volt.

B. Software Platform

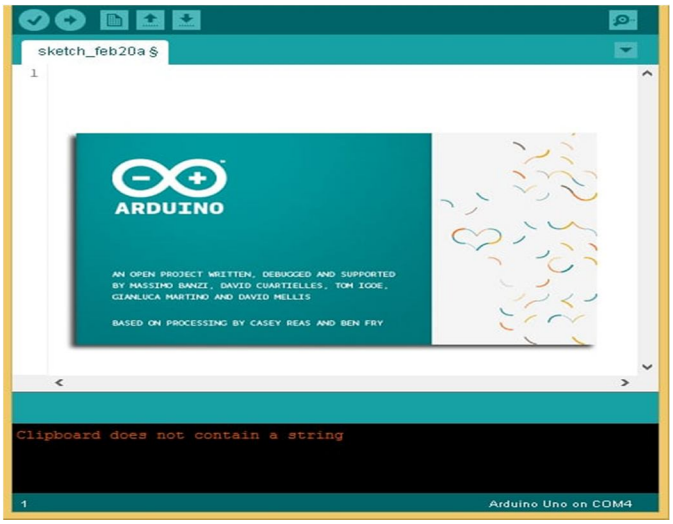


Fig.8 Arduino IDE.

The above figure show the platform of arduino IDE which is used to code the Nodemcu. This platform support few language i.e. C, C++. This software available open source. This platform providing us the different type boards which can be arduino UNO, Nano, Mega, Nodemcu, and many more.



Fig. 9 Firebase database

The Firebase is Google's mobile app development platform that includes many services for managing data from IOS, Android or web apps. You will create a Firebase project with a real-time database (RTDB) and learn how to use your ESP8266 board to store and read values from the database. You can use the ESP8266 to connect and interact with your Firebase project and you can create apps to control the ESP8266 from anywhere in the world via Firebase.

III. WORKING OF PROJECT

In this project we have make a smart parking system with user authentication using RFID. In this system we have used several components such Nodemcu, Rfid module, servo motor, LCD display and I2c module, and 12volt adapter. This overall project work on the 12 volt power supply. But the according to the component specification those are required the 5 volt dc supply therefore we have use here 7805 regulator IC. As shown in circuit diagram. Our fundamental goal is to make the smart parking system the payment as well the operation can be done online in this case we are used the firebase. The firebase is Real-time database which can provide the user to store his information. Also that can provide the authentication of user. It can also support the IOT devices such as Nodemcu and arduino. We are build up the project as like as when the user place the card on RFID module the .We are given the Rfid card to the customer which card as unique value which can be read by the Rfid module .He can place the tag on module and that can detect the unique code the pass the data toward the Nodemcu we are already store our user information in firebase (Database) we can fetch the user information by reference of Rfid and show the details on LCD display. If user card is valid then it can make the payment. When the payment is done we are use servo motor as entry gate. The servo motor can start rotating after few second it can start rotating in reverse direction. In this our project will work. We are given different cards for different users such as two wheeler, four wheeler. From the database admin can change the user information as well as the price or cost for all vehicle. In this way we can developed our county as smartest country and we are manage the proper traffic parking system. [2]

IV. ADVANTAGES

A. Our system is small in size.
B. This system smarter ability to perform tasks.
C. This system is costless.
D. Light weight to carry.
E. More portable.
F. Less complexity while using and setup.

V. APPLICATIONS

The applications are as follows.

1) Prototyping of IoT gadgets
2) Low power battery worked applications Network projects.
3) This project use in home as well as in offices.

VI. FUTURE SCOPE

In this parking system we will add the slot booking system from website, so that the user can book the parking slot before come to place. We can be giving the provision to all users and admin to see how many parking slot are available. We will add the provision for user to make payment online via Debit card, credit card, Google and phone pay.

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VII. CONCLUSION

We know that the parking for vehicle is must at every place. In our culture we are using very poor vehicle parking technique. To improve that we are designed this system. The system helps the person to park his/her vehicle at authenticated place and also make the payment securely from the valet. The firebase is employed to give this provision.

VIII. RESULT

We are designed the smart parking system which is based on firebase the experimental setup shown below.



Fig. 10 Experimental setup.

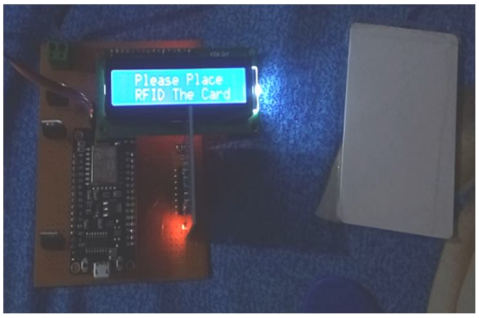


Fig. 11 Project working view.

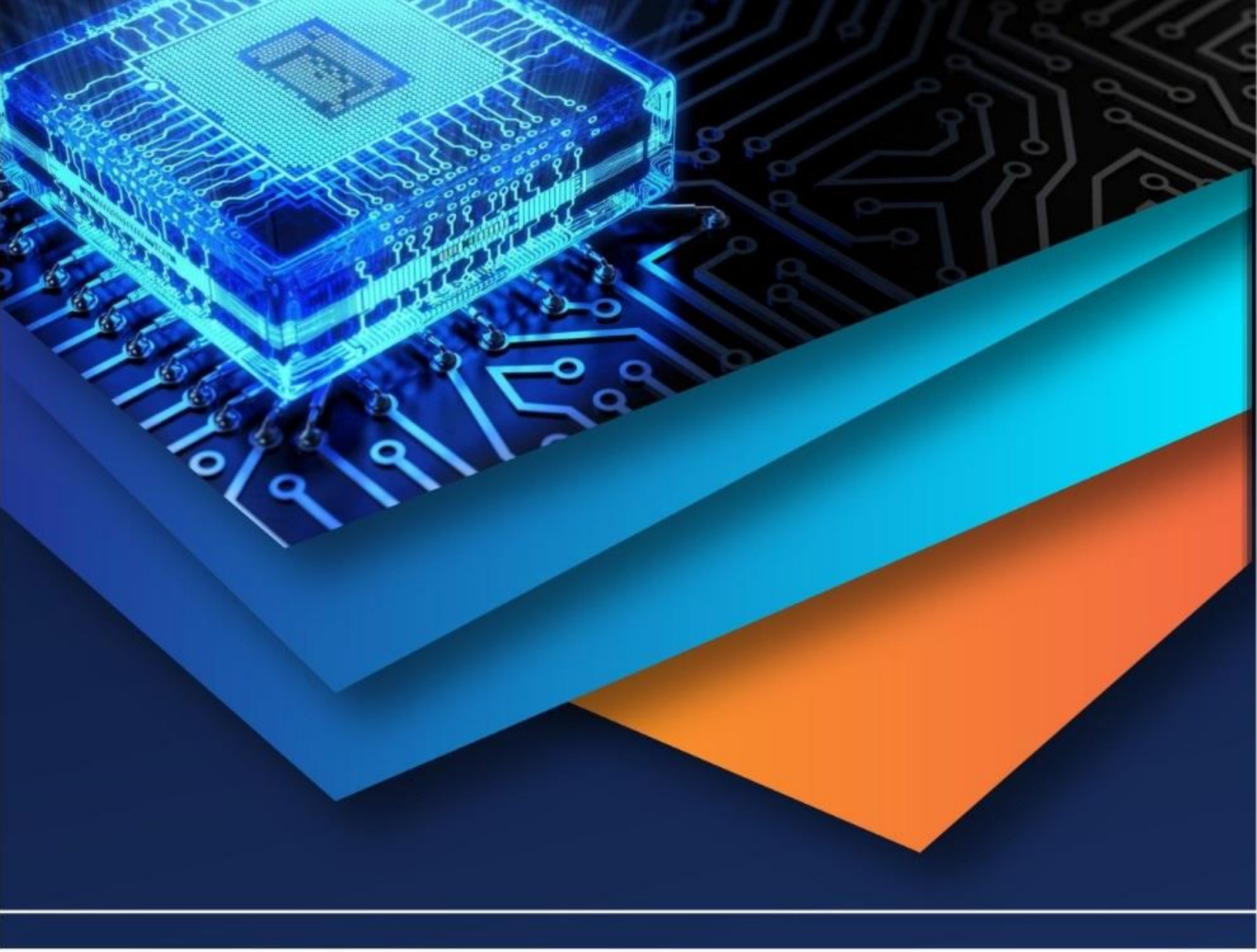


Fig. 12 Project model view.

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