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RFID Based 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. One of the main concerns of smart cities today is the growing need to manage vehicles on the road and create enough well-managed parking spaces to avoid traffic congestion in urban areas. Autonomous system to guide the driver to a free parking space in the vicinity. In this article, a real-time prototype of the intelligent parking system (P-System) based on the Internet of Things (IoT). The proposed intelligent parking system works with an electronic device that detects the parking space availability status and helps drivers to find and select the desired parking space among the available parking spaces, effectively reducing the traffic problems and mismanagement in cities on a large scale.**

***Keywords*: Smart parking, IoT, Nodemcu, Relay board, IFTTT.**

1. Introduction

Traditional parking has involved into a parking system that helps the driver to know the occupied and available parking spaces through a screen that includes the number of available parking spaces and their location (Pham, Tsai, Nguyen, Dow, and Deng, 2015). The vacancy in a car cannot occupy that position, and if the car is not in position, it will glow bright green and display a screen update. The presence of a free position can stop any car in that position (Fraifer and Fernstrom, 2017), this system is used in many places and solves the problem of random parking and non-stopping in places unavailable for stopping (Pham et al., 2015). 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 role of the cloud sends this signal to the display screen and from the display screen to the sensor and the sensor to the top of the position and vice versa, and this communication it occurs internally without the intervention of an employee or user.

2. Methodology

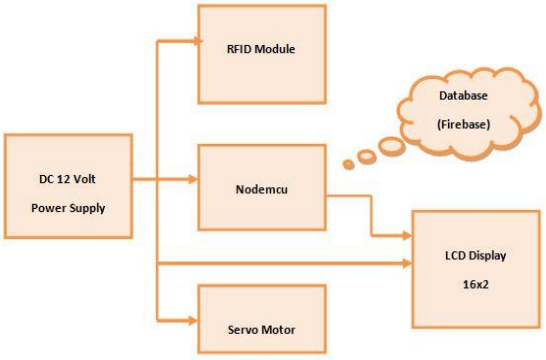

Fig. 1. Block diagram of smart parking system using firebase

A. Components Details

1) Nodemcu

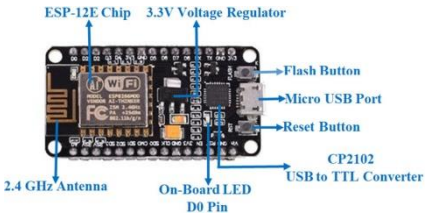

Fig. 2. Nodemcu

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. "The ESP8266 i.e., Nodemcu designed and fabricate by Espressif Systems. It contains the crucial parts of a computer: CPU, RAM, networking (WiFi), and even a contemporary software system and SDK". 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,

- Nodemcu has inbuilt microcontroller "Tensilica", 32-bit RISC CPU Xtensa LX106.
- Operating Voltage: 3.3V.
- Input Voltage: 7-12V.
- Digital I/O Pins (DIO): 16.
- Analog Input Pins (ADC): 1.
- UARTs: 1.

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- SPIs: 1.
- I2Cs: 1.
- Flash Memory: 4 MB.
- SRAM: 64 KB.
- 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. 3. 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

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.

Fig. 4. I2C module

3) Adapter

Fig. 5. 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

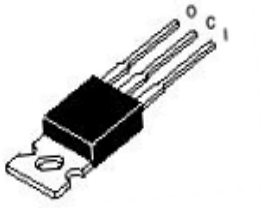

Fig. 6. Regulator IC 7805

The above figure shows the diagram of the regulator IC 7805 which can be used to give the output as 5 volts. This IC has 3 pins V_{IN}, GND, V_{out}. In our project we are using all the components which work in 5 volts.

B. Software Platform

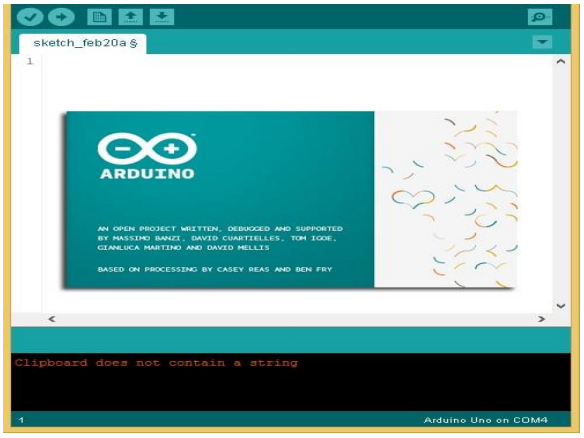

Fig. 7. Arduino IDE

The above figure shows the platform of Arduino IDE which is used to code the Nodemcu. This platform supports 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. 8. 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.

3. Working of the 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 built up the project as like as when the user places the card on RFID module. We have 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 managing the proper traffic parking system.

4. Advantages

- Our system is small in size.
- This system smarter ability to perform tasks.
- This system is costless.
- Light weight to carry.
- More portable.
- Less complexity while using and setup.

5. Applications

The applications are as follows.

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

6. Conclusion

In this paper we have discussed about how we can implement the smart parking system using Nodemcu and firebase. We are listed the components with help of those we can develop the smart parking system and store the user information in database.

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