EasyChair Preprint

№ 3007

RFID Based Money Wallet for Parking Lots

Bachuwar Swetha, A. V. L. Prasuna and B. Meenakshi

March 22, 2020

RFID BASED MONEY WALLET FOR PARKING LOTS

B.Swetha[1] A.V.L.Prasuna[2] B.Meenakshi[3]

[1] Department of IT, MGIT, Hyderabad, swetha.adchalwar@gmail.com

[2] Department of IT, MGIT, Hyderabad, avlakshmiprasuna_it@mgit.ac.in

[3]Department of IT,MGIT, Hyderabad, bmeenakshi_it@mgit.ac.in

ABSTRACT

With the fast proliferation of motors availability and utilization in latest years, locating a vacant parking area is becoming more difficult, ensuing in some of realistic conflicts. This is about creating a reliable system that takes over the mission of figuring out unfastened slots in a parking location and maintaining the document of cars parked very correctly. This mission reduces human effort on the parking location to superb extent consisting of in case of looking of unfastened slots by means of driver and calculating the payment for every car using parking place with the aid of money wallet. The diverse steps concerned in this operation are vehicle identification, unfastened slot detection and fee calculation. Vehicle identity is carried out the usage of RFID, unfastened slot detection is finished using display and fee calculation is achieved on the premise of length of parking.Here we are connecting all the sensors to Raspberry pi to detect RFID Tag and deduct the fee from the money wallet.

Keywords: IoT, RFID, sensors, money wallet, Raspberry pi

1. Introduction

This is an advanced Ticketing System for the Parking slots, making it very easy to tag a vehicle by using RFID tracker to identify the user and deduct amount from his wallet. This system uses Web Application for the user. Here, the user can check the availability of lots by using the IP address of that particular area. The user scans the card at entry point and at exit point and it calculates the amount to be paid based on the time duration, if his wallet has the required amount, it will be deducted directly or he has to recharge.

The Objective of the Project is to make IOT based smart way of parking using RFID.

1. 1 Problem Definition

Now a days there is a problem with finding empty slots in malls or any other such places and also people find difficulty in paying amount at parking areas due to heavy traffic [11] in cities .This paper is aimed at doing so with the help of sensors using Raspberry pi. With the help of webpage the users can know the status of parking slots and the payment gateway is done through the RFID reader and Tag based on time duration.

1.2 Existing System

The current system uses manually done vehicle parking management, where the person is appointed at a gate who notes the car entry and exit times. Based on the time duration it is parked, the amount will be asked to the customer to pay. When the car enters the parking lot, the person enters all the details in a register. To access any information about vehicle or owner we have to go through the registers in which the required information is written. As this is a manual process[5] there may be chance of human error. Very time consuming task. This system is obviously not convenient and cannot be used extensively. It may result in traffic jam in case many vehicles enter the parking spot at a time. The information about the vehicle or owner that is maintained in a register may be lost[3].

In the existing system the accuracy of sensors for the detection of vehicle is very low[7].

1.3 Proposed System

This proposed system reduces much human efforts and it is completely based on a Raspberry Pi3 B+ Processor and uses a web application for the user. The user can check the availability of parking slots through the Web Application. Here, the slot detection is done by IR sensors and this data is send to Raspberry Pi.RFID Tag is attached to every vehicle for unique identification. The RFID reader which is fixed at the parking centers reads the RFID tag at entry point and at exit point and it calculates the amount to be paid based on the time duration, if his wallet has the required amount, It will be deducted automatically. The user can update his balance based on his requirement. The user can go cashless and the amount is automatically deducted from his wallet. Removes the use of manual labor thus eliminating any kind of manual error. Entry and Exit points will be handled in a fast manner without stopping the vehicles so that traffic jam problem can be avoided [2].

2.System Design

Circuit Design 1 (Connecting Raspberry Pi to EM-18 RFID Module)

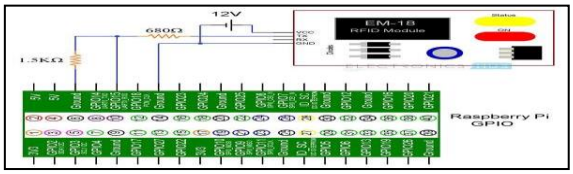


Figure 2.1.a Circuit Design1

Here, we will be integrating the EM-18 RFID Reader Module with Raspberry Pi and access information from a few RFID Cards through Python Script.RFID Module is a generic term that is used to describe a system that transmits the identity of an object or person wirelessly, using radio waves. Unlike ubiquitous UPC bar-code technology, RFID technology does not require contact or line of sight for communication.RFID or Radio Frequency Identification is a way of communication over electromagnetic wave (Radio Frequency Waves, to be specific). RFID Tags and RFID Cards are often used for authentication and access control.On RFID Reader the VCC (-nagative) is connected to Ground(pin no.6 in Raspberry Pi) and GND is connected to Ground i.e.,14th pin in Raspberry Pi.On Raspberry Pi, the GPIO14 and GPIO15 i.e. Physical Pins 8 and 10 are the UART TX and RX Pins respectively. As we have already enabled the Serial Port of the Raspberry Pi, you can connect these pins to the external peripherals.Raspberry Pi works on 3.3V Logic. Hence, the RX Pin of the Raspberry Pin must only be given with 3.3V Logic. In order to do that, we need to level convert the TX line of the RFID Reader to 3.3V using a simple Voltage Divider Network consisting to two resistors.The general purpose input & output has 40 pins.These are used in the raspberry pi to associate with the other electronic boards. These pins can accept input & output commands based on programming raspberry pi. The raspberry pi affords digital GPIO pins. These pins are used to connect other electronic components.

Circuit Design 2 (Connecting Raspberry Pi to IR sensor)

Here, we are integrating IR Sensor to Raspberry Pi.IR Sensor module has great adaptive capability of the ambient light, having a pair of infrared transmitter and the receiver tube The sensor module output port OUT can be directly connected with the microcontroller IO port can also be driven directly to a 5V relay; Connection: VCC-VCC; GND-GND; OUT-IO.3-5V DC power supply module can be used. When the power is turned on, the red power LED is lit.

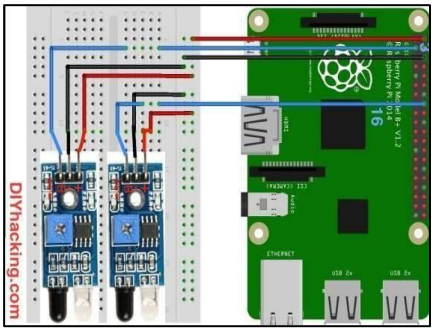


Figure 2.1.b Circuit Design2

3 .Proposed Algorithm

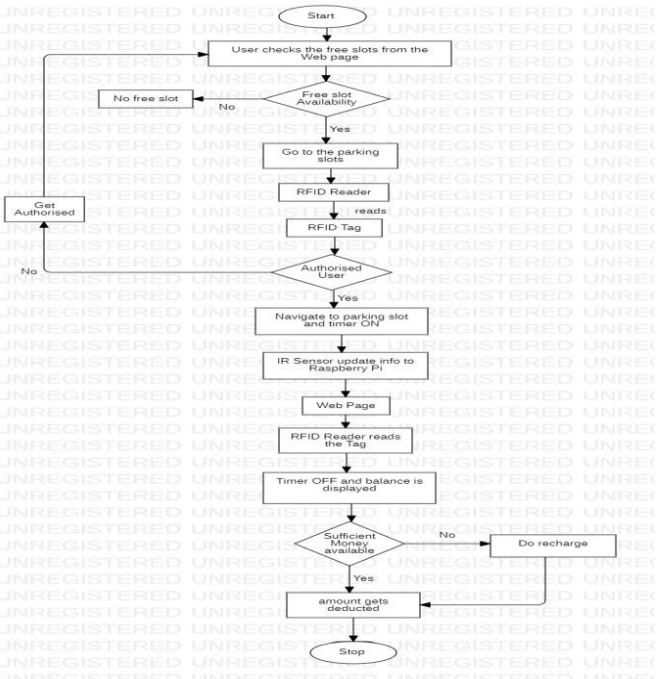
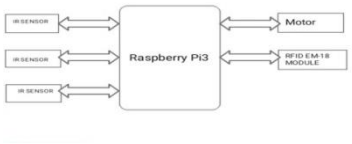


Figure 3.1.1 Flow Chart

First the user checks the status of parking lots[8]. If the slots are available he will navigate to parking slot where the RFID reader is fixed. Here, the RFID reader reads the Tag .If the user is authorized then it displays the user details that are contained in tag. Now, Timer is ON and the IR sensor updates the slot status and

send the data to Raspberry Pi so that web page gets updated. At exit time , the Tag is read by RFID reader again and the timer is OFF. Based on the time duration the money gets automatically deducted. If the user does not have sufficient money, he can recharge his wallet. Again when the slot becomes empty the IR sensor detects and report to raspberry pi. So by using this, the user can check the status of parking lots from anywhere at any time through the Web Page.

4. Implementation



In this paper we are going to use one Raspberry pi interfacing with RFID using IR sensor along with that a motor. We use Infrared Sensors for car detection in the parking zones. Each of the sensor nodes determines the availability status of a parking space without regard to the types of sensors involved. The sensor nodes should read sensor data at a relatively high sampling rate to tell whether a car is entering or leaving a parking space. The sensor node in a parking space measures the values of the AMR sensor periodically (e.g., 3 seconds) and wirelessly transmits the sensor values only when they show abrupt variations. The RFID tag proceedings a unique ID and fixed information..The tag is triggered when it approaches the RFID reader. The information recorded in the tag is transmit to the RFID reader. A RFID reader will pass the signal into the digital and computing content. In the proposed RFID Parking system the RFID reader is deployed at the gate. In addition ,the RFID tags are placed in the car. Considering the probability, the RFID System should overcome the accuracy affection of weather and sunshade-paster of car, and the RFID tag type. When an RFID Parking Management System user's car approaches the gate, the induction and communication between RFID tag inside the car and antenna of RFID System is automatically established. Then the reader of RFID System translates the signal information to the digital content.

The steps for the process

Firstly the user checks the availability of slots through the Web Page by giving the IP address of that particular area or mall. By checking the availability of parking slots, the user navigates to the parking slot where the RFID Readers[4] are fixed. The RFID Reader reads the RFID Tag attached to the vehicle. If the user is authorized then the details of the user are displayed. This Tag is given for unique identification[12][9] and it also serves as a wallet for payment purpose. This Tag is read both times at entry and at exit time, based on the duration the money will be automatically deducted. The user can also recharge his wallet based on his requirement.

Figure 4.2 Parking slots status

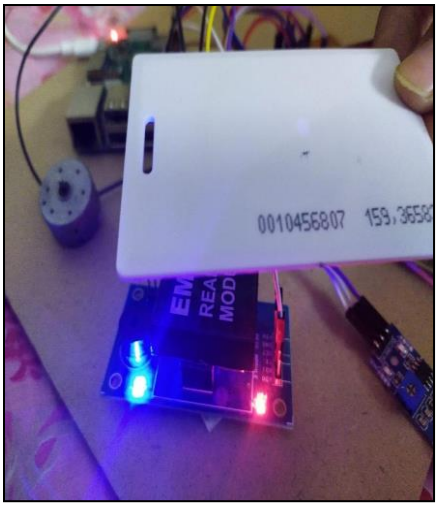


Figure 4.3 RFID Reader reading the Tag

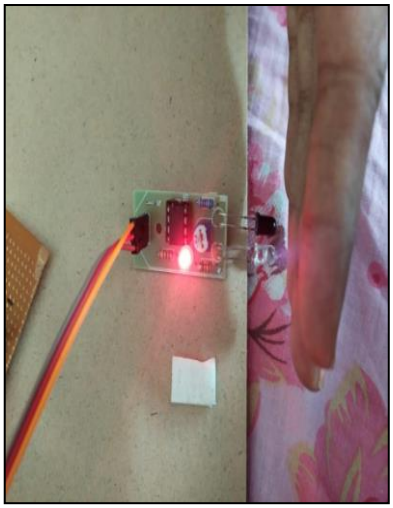


Figure 4.4 IR Sensor Object detection

After entering the parking slot, the IR sensor detects the vehicle and send that information to Raspberry Pi and from there to the Web page. Once the IR sensor detects the object RED LED is lit, it means that the slot is occupied. The money will be calculated based on the time duration as shown in the figure 4.5.

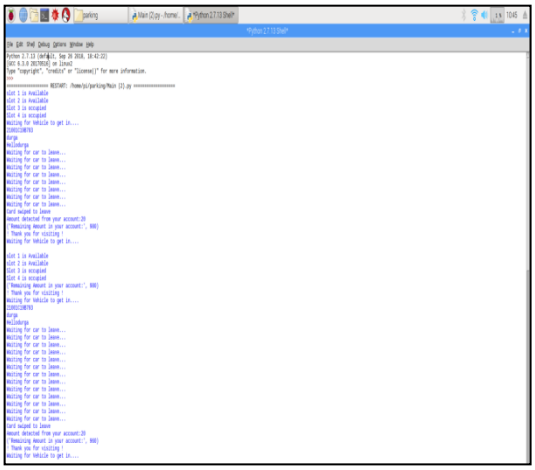


Figure 4.5 Money deduction based on the time duration

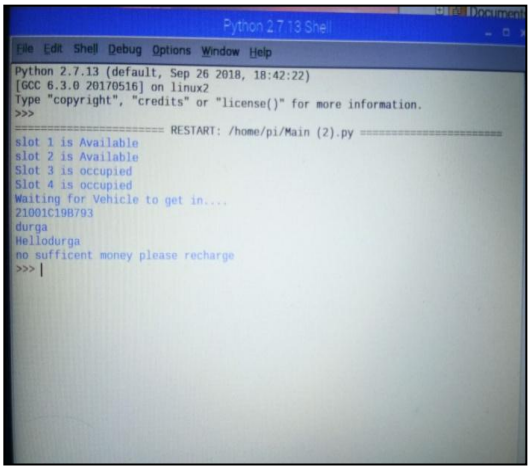


Figure 4.6 Output when the amount is zero

If the user does not have the sufficient money, it shows a message as “No sufficient money please recharge”.

5. System Specifications

5.1 Hardware Requirements

1. Raspberry Pi 3

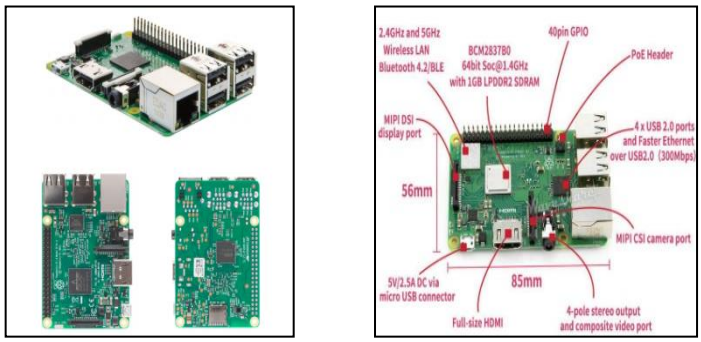


Figure 5.1Raspberry PI 3

The Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity and peripheral-device support.

2. IR Sensor[13][10]

IR Sensor module has great adaptive capability of the ambient light, having a pair of infrared transmitter and the receiver tube. It is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. The sensor module output port OUT can be directly connected with the microcontroller IO port can also be driven directly to a 5V relay; Connection: VCC-VCC; GND-GND; OUT-IO.3-5V DC power supply module can be used. When the power is turned on, the red power LED is lit.IR sensors are used in various Sensor based projects and also in various electronic devices which measures the temperature[1].

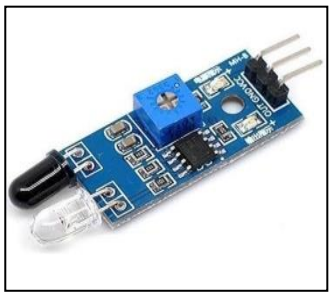


Figure 5.3 IR Sensor

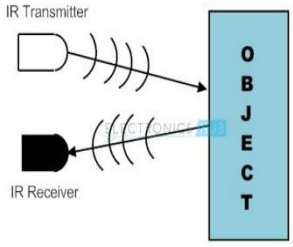


Figure 5.4 IR Transmitter and Receiver

IR Transmitter

Infrared Transmitter is a light emitting diode (LED) which emits infrared radiations. Hence, they are called IR LED’s. Even

though an IR LED looks like a normal LED, the radiation emitted by it is invisible to the human eye.

IR Receiver

Infrared receivers are also called as infrared sensors as they detect the radiation from an IR transmitter. IR receivers come in the form of photodiodes and phototransistors. Infrared Photodiodes are different from normal photo diodes as they detect only infrared radiation.

3. RFID Tag

Figure 5.5 RFID Tag

RFID tags [6] are a type of tracking system that uses smart barcodes in order to identify items. RFID is short for "radio frequency identification," and as such, RFID tags utilize radio frequency technology. These radio waves transmit data from the tag to a reader, which then transmits the information to an RFID computer program. RFID tags are frequently used for merchandise, but they can also be used to track vehicles, pets, and even patients with Alzheimer's disease. An RFID tag may also be called an RFID chip.An RFID tag works by transmitting and receiving information via an antenna and a microchip — also sometimes called an integrated circuit or IC. The microchip on an RFID reader is written with whatever information the user wants.

4. RFID Reader (EM 18 Module)

EM18 is a RFID reader which is used to read RFID tags of frequency 125 kHz.After reading tags, it transmits unique ID serially to the PC or microcontroller using UART communication or Wiegand format on respective pins.EM18 RFID reader reads the data from RFID tags which contains stored ID which is of 12 bytes. EM18 RFID reader doesn't require line-of-sight. Also, it has identification range which is short i.e. in few centimetres.

RFID reader EM-18 features:

1. Serial RS232/TTL output
2. Operating Frequency is 125KHz.
3. Range is 5-8 cm.

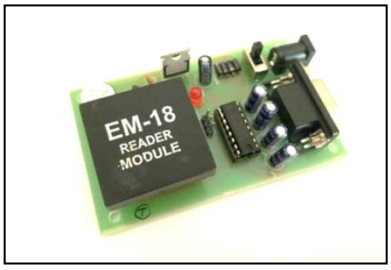


Figure 3.3.1.6 RFID EM-18 Reader Module

5.2 Software Requirements

- PHP, Html
- Wi-Fi, Internet
- Python

CONCLUSION

Internet of Things(IOT) is used to communicate with the device. By using this devices could be controlled or monitored through the internet, IOT acts as a platform to store data from the remote locations. IOT consists of web enabled devices that

collect the data from the surrounding environments using processors, sensors and communication devices. The devices could be monitored and tracked using computers connected through the internet. With the latest proliferation of the vehicle, finding the parking place availability is more difficult. Car parking is a main problem because of increasing in the vehicle number. Searching of the parking place around the cities is the routine work. This smart way of parking is very easy for users especially in places like airport, malls where they are likely to be in hurry more than usual and the payment gate way add more comfort to the users which saves time and reduce the manual work. The money is calculated fairly based on time duration.Future research work would be the extension of this system by calculating the duration of stay of a vehicle in a parking lot as well as deduction of the parking charges on the basis of time spent. The Tag will be recharged with a certain amount and this amount will be deducted at each visit. For realization of this a time recording technique is to be used. By using this kind of system the manual work will be minimize at a great extent.

APPENDIX

Source Code (Python)

```
import RPi.GPIO as GPIO
import time
import serial
import subprocess
GPIO.setmode(GPIO.BCM)
GPIO.setwarnings(False)
buzzer=21
GPIO.setup(buzzer,GPIO.OUT)
GPIO.output(buzzer,False)
ir = [6,13,19,26]
for i in range(4):
GPIO.setup(ir[i],GPIO.IN,pull_up_down = GPIO.PUD_UP)
port = serial.Serial("/dev/serial0",baudrate=9600,timeout=0.5)
people = {"21001C19B793":"durga","4C00326E0515":"Praveen"}
amount=1000
def slotStatus():
file = open("/home/pi/log.txt", "r+")
file.truncate(0)
if (GPIO.input(6) == 0):
slot1Status="Slot 1 is occupied"
else:
slot1Status="slot 1 is Available"
if (GPIO.input(13) == 0):
slot2Status="Slot 2 is occupied"
else:
slot2Status="slot 2 is Available"
if (GPIO.input(19) == 0):
slot3Status="Slot 3 is occupied"
else:
slot3Status="slot 3 is Available"
if (GPIO.input(26) == 0):
slot4Status="Slot 4 is occupied"
else:
slot4Status="slot 4 is Available"
Status=str(slot1Status)+"\n"+str(slot2Status)+"\n"+str(slot3Status)+"\n"+str(slot4Status)
print(Status)
time.sleep(7)
file = open("/home/pi/log.txt", "a")
file.write(str(Status))
file.write("\n")
file.close()
slotStatus()
try:
while(1):
print("Waiting for Vehicle to get in....")
rcv = port.readline()
print(rcv)
if(rcv is not ''):
print(people[rcv])
name="Hello"+str(people[rcv])
print(name)
```

```
if (amount==0):
print("no sufficent money please recharge")
break
GPIO.output(buzzer,True)
time.sleep(1)
GPIO.output(buzzer,False)
inTime=time.time()
slotFlag = 1
subprocess.call(["sudo", "espeak", name])
while(slotFlag==1):
print("Waiting for car to leave...")
rcv = port.readline()
if (rcv is not "):
GPIO.output(buzzer, True)
time.sleep(1)
GPIO.output(buzzer, False)
print("Card swiped to leave")
outTime=time.time()
slotFlag=0
break
standbyTime=outTime-inTime
if(standbyTime < 10.0):
print("Amount detected from your account:20")
amount=amount-20
elif(10.0 < standbyTime < 50.0):
print("Amount detected from your account:50")
amount=amount-50
elif(standbyTime>50.0):
print("Amount detected from your account:80")
amount=amount-80
else:
slotStatus()
print("Remaining Amount in your account:",amount)
print("! Thank you for visiting !")
msg="Thank you for visiting"+str(name)
subprocess.call(["sudo", "espeak", msg])
except KeyboardInterrupt:
print("stopping")
GPIO.cleanup()
```

Php code

```
<html>
<head>
<meta name="viewport" content="width=device-width" />
<title>Monitoring</title>
</head>
        <meta http-equiv="refresh" content="1">
<body align="center" style="background:powderblue;">
        <h1>ADVANCED TICKETING SYSTEM FOR PARKING LOTS</h1>
        <?php
                $myfile = fopen("/home/pi/log.txt", "r") or die("Unable to open file!");
                echo fread($myfile,filesize("/home/pi/log.txt"));
                fclose($myfile);
        ?>
        </body>
</html>
```

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