Design of IOT Based Car Parking- Space Detection System

A Project and submitted in partial fulfilment of the requirements for the Award of Degree of
Bachelor of Science in Electrical and Electronic Engineering

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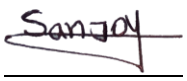
Certification

This is to certify that this project entitled **"**title" is done by the following students under my direct supervision and this work has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering of Daffodil International University in partial fulfilment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering.

Signature of the candidates



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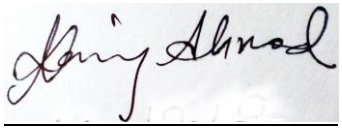

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The project entitled title**,** submitted by Sanjoy Kumar Nandi, ID No: 152-33-2654, Taki Ahammed Mitho, ID No: 152-33-2694, Session: Summer 2015 has been accepted as satisfactory in partial fulfilment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering on 20 November 2018.

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Dedicate to

Our Parents

and

Teachers

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LIST OF ABBREVIATIONS

IOT	Internet of Things
LCD	Liquid Crystal Display
AREF	Analogue Reference
ICSP	In Circuit Serial Programming
MOSI	Master Out Slave In
MISO	Master In Slave Out
USB	Universal Serial Bus
WI-FI	Wireless Fidelity
ACK	Acknowledgement
NACK	No Acknowledgement
CS	Chip Select
SDK	Software Development Kit
SPI	Serial Port In
CRT	Cathode Ray Tube
WPA	Wi-Fi Protected Access
WEP	Wired Equivalent Privacy
OTA	Over The Air
IPV4	Internet protocol version 4
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
HTTP	Hypertext Transfer Protocol
FTP	File Transfer Protocol

ACKNOWLEDGEMENT

First of all, we give thanks to God. Than we would like to take this opportunity to express our appreciation and gratitude to our project supervisor ‘Professor Dr. M. Shamsul Alam’ Dean of faculty of engineering and co-supervisor 'Kanij Ahmad' Lecturer of department of EEE, Daffodil International University for being dedicated in motivating, supporting and guiding us through this project. Our project can’t be done without her helpful helps and advices. Thanks a lot for giving us opportunity to choose this project.

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To ours beloved family, we want to give them our deepest love and gratitude for being very supportive and also for their inspiration and encouragement during our studies in this university.

ABSTRACT

This project is the internet of thing base car parking space detection system. Car parking problem is the major problem in our urban cities. This car parking problem increase day to day because of continuous growing number of vehicles. It not just a major problem in our country's urban cities problem but also all over the world's urban cities problem. Internet of Thing base car parking space detection system can solve the problem. Internet of Thing base car parking space detection system that connect to via internet and physical device. Our IOT base car parking space detection system use sonar sensor for detecting the car in the parking area. For control we use Arduino nano and also use NodeMCU for find the information in our physical device via internet, by the use of Google fire base system we collect the information about the parking space are available or not. IOT car parking space detection system helps the people to find the parking space. In IOT base car parking space diction system every user has a unique ID and password. In this system will solve the car parking problem .

CHAPTER 1

INTRODUCTION

1.1 Introduction

IOT base vehicle parking area detection device is most important nature in our daily lives. IOT system less human efforts, labours, time and errors. With improve the contemporary technology. Smart phones have end up a necessity for each and every person on this planet. IOT base smart parking house detection device helps to display vehicle-parking slot. IOT base auto parking area detection helps to control parking disaster among vehicles. When they are find, the parking slot at the same time that capability it helps in synchronized parking. This vehicle parking space detection gadget related to the parking vicinity and provide information by means of net about vehicle parking slot. IOT base vehicle parking area detection machine managed the parking slot. It helps the vehicle customers to discover free space in parking slot. It store person time as nicely as their fuel. It assist to obtain parking slot in urban cities, which is very hares. People waste time and fuel in looking out for parking space. Smart parking house detection machine gives data about parking slot. A sonar sensor is use at every slot in parking areas. It tells the parking area availability. Information about the empty and used slot sends over the Google firebase with the aid of internet. Day through day growing vehicle, so it is tough to discover a parking place in urban cities. A short quantity of time and it wasted a lot of fuel in looking an empty parking slot. Overcome from this serious problem, we put in force a IOT base car parking area detection system the place it can tell to person that parking house is reachable or not. If parking slot is full, in any other case want search a new parking region rather of go and search for parking slot. Our city cities, clever auto parking house detection machine will become foremost hassle with upward jostle numbers of vehicles. Generally, it takes more than 5 minutes to discover parking slot area. It will manage the system using IOT based cellular application. Here we used Google firebase to gather facts about parking slot area. Our approach is primarily based on Arduino Nano, Arduino runs with C++ code. We write easy C++ code via Arduino utility and immediately put the Arduino system. It works in accordance to code system keeps song of variety of vehicles in parking slot or not in parking building.

1.2 Problem statement

Day to day population is increase, number of vehicles increases and due to unmanaged parking it leads to many problems. In urban cities, people faces difficulties as increasing number of vehicles creates congestion in roads. so, our valuable time killed by the unmanaged car parking. Lots of fuel burn and creates traffic problems. But our urban buildings car-parking slot is wastage of free space. An emergency patient cannot go to the hospital because of this problem. Our footpath is block and people cannot walk easily on footpath of this problem. This problem also cause some other difficulties.

1.3 Objectives

The followings are the objectives of the project to ensure it meets the aim.

- To study about the IOT base car parking space detection system.
- To familiar with the equipment that used in this process.
- Utilize the application in recent circumstances.
- To improve the system with respect of time and need .

1.4 Possible outcome

IOT base vehicle parking area detection is one of the most time-honoured and rapid developing smart town solutions across the world. Universities, Airports, City garages and Shopping centres etc. Are just a few subsistence that have begun to recognize the amazing advantages of IOT base vehicle parking area detection system. Many earning source are feasible with IOT base smart parking system. Traffic glide upward jostle to countless motors are required to power around in search of an open parking space, so it decreased site visitors problem and decrease cities accident problem.

1.5 Methodology

To prepare the project information are collected and analysed form various source and our group discussion among which the following are notable.

- Main information collected form some online research papers.
- Other diagram and short note collected form journal papers.
- Some key information collected from online resources.
- Some information collected from our group discussion.
- And some information collected from our teachers.

1.6 Project Outline

Chapter 1: In chapter one we introduces about Introduction, Problem statement, Objectives, Possible outcome, Methodology and Project out line.

Chapter 2: This chapter we introduces about Introduction, Literature contributions, Literature survey, Summary.

Chapter 3: This chapter we introduce about Introduction, Arduino nano, Sonar sensor, I2C module, Flow chart, Block diagram, Circuit diagram.

Chapter 4: This chapter we introduce about Introduction, Hardware result, Program analysis, Discussion.

Chapter 5: This chapter we introduce about Conclusion, Applicability, Future scopes, Recommendations.

CHAPTER 2

LITERATURE REVIEWS

2.1 Introduction

The system of IOT base car parking that make parking easier and more sustainable has increased within the past few years. The ability to protect the IOT base car parking has been a latest challenge. The system that provides this ability through the use of efficient and reliable methods of our car parking system. Wireless sensor networking technologies are readily available in our mobile phone devices. It help the car user to get a better yield to find the car parking space and help the traffic system of the country. NodeMCU module connect the system with Google firebase by the Gmail ID and password via internet. When the car users need to free space for car parking to active the mobile internet and connect the Google fire base than the car user see the free space for his car parking by the wireless communication. All these devices of the system are connected to the Arduino nano. NodeMCU is used for communication purpose for the user to system.

2.2 Literature Contributions

In the literature, there are many contribution advocate in latest years in devices-to-devices communication. This contain layout prototype combine mobile telemedicine machine interface to a person use Google firebase server. Design the Wi-Fi device enforcing dimension system to monitor the auto-parking gadget using cloud server, designing to be the use of Arduino microcontroller. The device works by means of integrating the Arduino microcontroller, sonar sensor and NodeMCU. It makes use of the wireless community to ship electricity utilization reading the use of data to the approved operator. All structures are depends on sensor, micro-controller, NodeMCU then LCD saw output and saw our mobile phone.

2.3 Literature Survey

A real time execution of a IOT based car parking space detection system is Electrical and Control System utilizing parking "Mythology" deal IOT based parking Control System, which could give the slot of keeping up space. A software operating system is utilized for cell phones that incorporate a working framework, middleware and key implicational features. We proposed a framework commitment to the advancement of nursery generation in country. The proposed arrangement includes the advancement of car parking framework for mechanize the parking system.

2.4 Summary

The system consists of four main parts which is microcontroller circuit or Arduino, Wi-Fi module circuit, sensor and cloud server. This project used Arduino nano microcontroller, V3 NodeMCU Wi-Fi modulo, Google firebase cloud server, LCD display and using Arduino software for the programming. The purpose of this project is to prevent the express unmanaged car parking. This project utilized Arduino software for programming. At the same time the IOT car parking circuit will automatically interface to the firebase by mobile phone and send the parking slot area's details which are available or not to the user. In line with these works, we develop a low-cost and simple access to design intelligent parking space detection system using the concept of mobile-to-electronic circuit. First, we developed a ordinary electronic circuit design that can control parking area.

CHAPTER 3

THEORETICAL OVERVIEW

3.1 Introduction

In this chapter we discuss about the hard ware software. This document describes the theoretical information of this project. All functional components of this project are described in great detail. This document can help us quickly understand all device interface specifications. This project consists of an Arduino nano, Sonar sensor , NodeMCU, LCD, Google database, wire. All the details of this equipment is discuss in the below.

3.2 Arduino Nano

Arduino Nano is a little complete and breadboard-friendly board based on the ATmega328. Arduino Nano has within an inch the equal functionality to the Arduino Duemilanove, however in a distinct package. Arduino lacks only a dc electricity jack and works with a mini-b USB cable alternatively of a standard one.

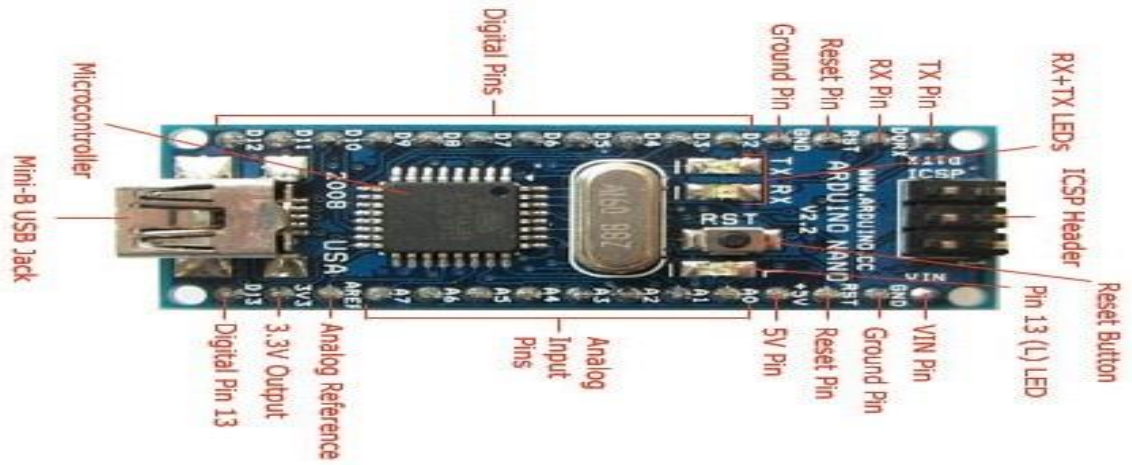

Fig 3.1: Printed circuit board of Arduino nano

3.2.1 Technical Specification

Microcontroller: ATmega328.

USB serial port: Ch340.

Operating voltage: 5v.

Input voltage: 5v-12v.

Digital i/o pins: 14

Analog input pins: 8.

DC current per i/o pin: 40ma

Flash memory: 32kb of which 2kb used by boot loader.

SRAM: 2kb.

EEPROM: 1kb.

Clock speed: 16 MHz

Dimensions: 0.73" x 1.70". Length: 45mm. Width: 18mm. Weight: 5g.

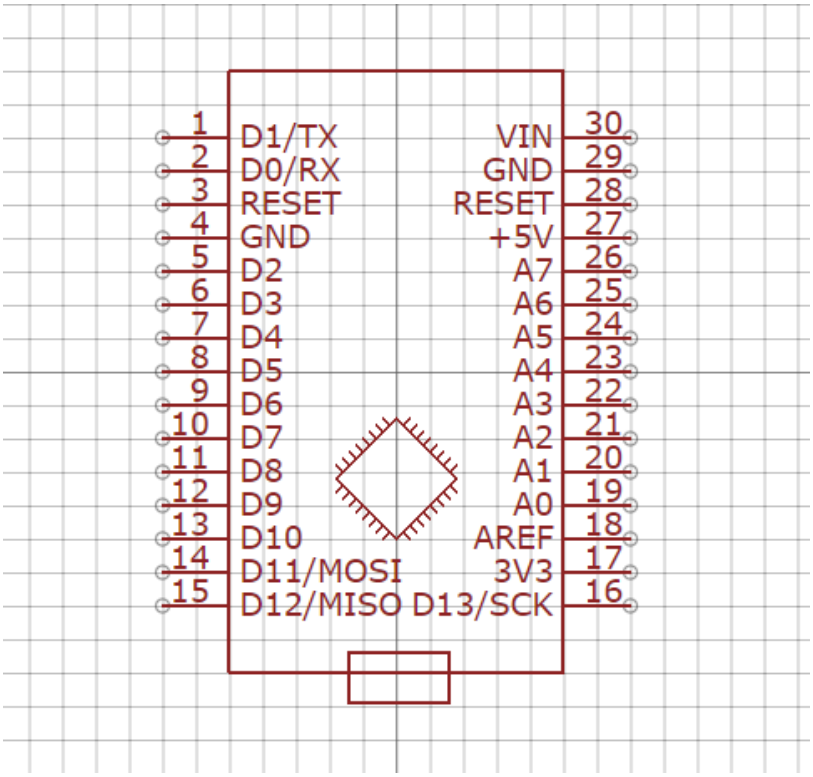

Fig 3.2: Pin diagram of Arduino nano

3.2.2 Arduino Nano Pin Description

Pins 1 to 30

Arduino Nano pin	Pin name	Type	Function
1	D1/TX	i/o	digital i/o pin serial TX pin
2	D0/RX	i/o	digital i/o pin serial RX pin
3	reset	input	reset
4	Gnd.	power	supply ground
5	D2	i/o	digital i/o pin
6	D3	i/o	digital i/o pin
7	D4	i/o	digital i/o pin
8	D5	i/o	digital i/o pin
9	D6	i/o	digital i/o pin
10	D7	i/o	digital i/o pin
11	D8	i/o	digital i/o pin
12	D9	i/o	digital i/o pin
13	D10	i/o	digital i/o pin
14	D11	i/o	digital i/o pin
15	D12	i/o	digital i/o pin
16	D13	i/o	digital i/o pin
17	3.3V	output	3.3v output
18	AREF	input	ADC reference
19	A0	input	analog input channel 0
20	A1	input	analog input channel 1
21	A2	input	analog input channel 2

22	A3	input	analog input channel 3
23	A4	input	analog input channel 4
24	A5	input	analog input channel 5
25	A6	input	analog input channel 6
26	A7	input	analog input channel 7
27	5V	output or input	5v output (from on-board regulator) or 5v (input from external power supply)
28	reset	input	reset
29	Gnd	power	supply ground
30	Vin	power	supply voltage

ICSP pins

Arduino nano ICSP pin name	Type	Function
MISO	input or output	master in slave out
Vcc	output	supply voltage
SCK	output	clock from master to slave
MOSI	output or input	master out slave in
RST	input	reset
GND	power	supply ground

3.2.3 Microcontroller

ATmega328 microcontroller is an eight-bit mega AVR device based on the AVR enhance RISC architecture. Feature is Pico power technology that offer ultra-low power consumption and low-power sleep modes, ideal for battery-powered applications.

Fig 3.3: ATmega328 microcontroller

3.2.4 Specification ATmega328P microcontroller

1) 20MHz max operating frequency.

2) Up to 20MIPS at 20MHz.

3) 32kb flash.

4) 1024b EEPROM.

5)2kb SRAM.

6)131instructions – most single clock cycle execution.

7) 32general purpose register.

8)23GPIO.

9) Power-on reset and programmable brownout detection.

10) Internal calibrated oscillator.

11) External and internal interrupt source.

12) Six power-saving sleep mode.

13) Internal and external interrupt.

14) Fully static operation.

3.2.5 Peripheral Features of microcontroller

1) 10-bit 15kips analogue-to-Digital converter – 8 or 6 channel.

2) Capacitive touch sense – 16channel.

3) Temperature sensor.

4) Two 8-bit timer.

5) One 16-bit timer.

6) Output compare module – 6channel.

7) Six PWM channel.

8) Programmable serial USART.

9) Master/slave SPI serial interface.

10) Byte-oriented 2-wire serial interface – I2C compatible.

11) Programmable watchdog timer with separate oscillator.

12) Analogue comparator.

13) Interrupt and wake-up on pin change.

3.2.6 Application

After 2013 the ATmega328p is mostly used in many projects and automation system where it is a simple, low-power, low-cost micro-controller is need probably the most common implement of this chip is of the popular Arduino nano, Arduino Pro Mini and Arduino mega models.

3.3 Sonar Sensor

Ultrasonic sensor HC-SR04 uses sonar to determine distance to an object. It gives high-quality non-contact range detection with high accuracy and secure readings in an easy-to-use package. From 2cm to 400 cm or 1" to thirteen feet. It operation is now not affected via sunlight or black fabric like Sharp rangefinders are although acoustically smooth materials like fabric can be challenging to detect. It comes complete with ultrasonic transmitter and receiver module.

Fig 3.4: Sonar sensor

3.3.1 Features of sonar sensor

♣ Power Supply: 5V DC

♣ Quiescent Current : <2mA

♣ Working Currant: 15mA

♣ Effectual Angle: <15°

♣ Ranging Distance : 2cm – four hundred cm/1″ – 13ft

♣ Resolution : two 0.3 cm

♣ Measuring Angle: 30 diploma Trigger Input Pulse width: 10uS

♣ Dimension: 45mm x 20mm x 15mm

3.3.2 Working principle

Ultrasonic sound vibrates at a frequency above the vary of human hearing. Two transducers are the microphones used to get hold of and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo. Two sensor determines the distance to a goal with the aid of measuring time lapses between the sending and receiving of the ultrasonic pulse.

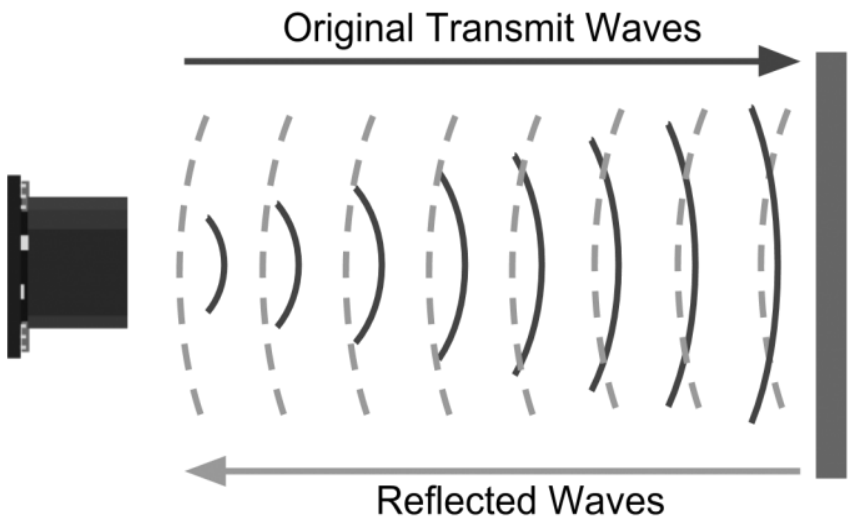

Fig 3.5: working procedure of sonar sensor

3.3.3 Application of sonar sensor

1) Ultrasonic Distance Measurement _____

Distance measurement would be utilized in a garage parking application, sensing when a car is pull absolutely into a garage.

2) Ultrasonic Sensors for water stage detection _____

Tank level measurement, Fuel gauging, irrigation control.

3) Ultrasonic Obstacle Detection _____

Our UAV Sensors for Drones as nicely as our proximity sensors that are used for robots are for impediment detection.

3.4 NodeMCU

The NodeMCU is an open-source Lau-based development kit with on-board ESP8266 Wi-Fi module that helps to prototype our IOT projects. The module is pre-loaded with NodeMCU a Lau-based ESP8266 firmware. It is designed to plug straight into any breadboard for quick and easy prototyping.

Fig 3.6: Printed circuit board of NodeMCU

The ESP8266 Series NodeMCU is a very special, the actual units are small and not overly easy to control in their standard form, with a 2mm pin pitch, this breakout allows access to all pins and also has an on-board USB/Serial chip with the reset logic circuitry to allow for automatic programming from an IDE. ESP8266's Support many firm wares, including AT, NodeMCU Luau interpreter, BASIC interpreters and also you can program them directly

from the Arduino IDE. 80/160MHz Microcontroller, Wi-Fi built in with some cryptographic functions also. Various common interfaces also on this Microcontroller, can also be used just for its Wi-Fi ability by another Microcontroller, but it is more than powerful enough to do both duties at the same time. PERFECT for IOT, it can send data straight to the cloud.

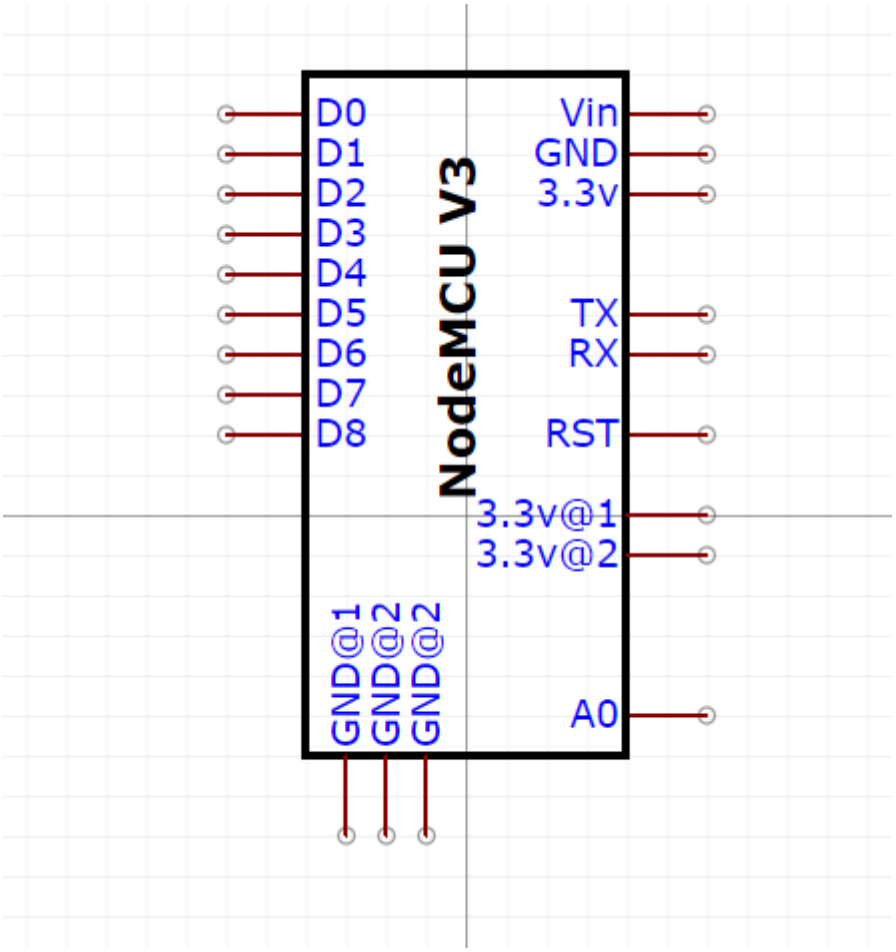

Fig 3.7: Pin diagram of NodeMCU

3.4.1 Features of NodeMCU

1. Low-cost Wi-Fi solution programmable with the Lau scripting language
2. On-board Silicon Labs CP2102 USB-serial adaptor .
3. PCB antennae (no external antenna required)
4. 10 GPIO pins
5. Bread-board compatible
6. Powered via micro USB

3.4.2 Specifications detail about NodeMCU

Categories	Item	Parameter
Wi-Fi	Standard	CCC-FCC-CE-TELEC-SRRC
	Protocols	802.11 b/g/n
	Frequency range	2400M～2484M
Hardware	MCU	X-tense L106
	RAM	50K
	Flash	4MB
	Peripheral interface	UART/SDIO/SPI/I2C/I2S/IR Remote Control
		GPIO/PWM
	Power supply	4.5V～9V(10VMAX),Support USB power supply
	Operating voltage	3.0~3.6V
	Operating current	Average: 80mA(200mA MAX)
	Standby current	<200uA
	Transmission rate	110-460800bps
	Port driving capability	15mA
	Operating temperature range	-40℃～+125℃
	Storage temperature range	-40℃～+125℃
	Board size	48mm x 26mm
	Weight	～7g
Software	Wi-Fi mode	Station soft AP soft AP +station
	Security	WPA/WPA2
	Encryption	WEP/TKIP/AES
	Firmware upgrade	UART download/OTA Download and write firmware via host
	Software development	Supports cloud server development/

		SDK for custom firmware development
	Network protocols	IPv4,TCP/UDP/HTTP/FTP
	User configuration	AT instruction set, cloud server, Android /I OS

3.5 LCD (Liquid Cristal Display)

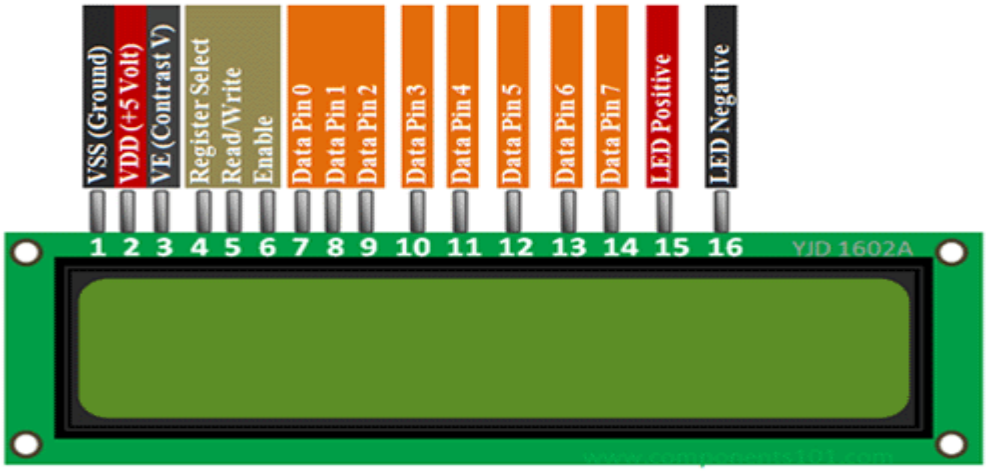

Fig 3.8: 16*2 LCD Module

This is the 16*2-character LCD display. LCD is use to display message access denied. In LCD has sixteen characters, per line by two lines and respectively. When parking slot is to be empty or full LCD display is use for show the message to empty full the parking slot or any other things that we use.

3.5.1 Features of 16*2 LCD module

1. Operating voltage is 4.5v to 5.3v.
2. Current consumption is one mille ampere without backlight.
3. LCD display module, meaning that can display letters and numbers.
4. Consists of two rows and each row can print 16 characters.
5. Each character is built by 5*8-pixel box.
6. Its works on both 8-bit and 4-bit mode.
7. It's also display any custom generated character.

3.5.2 Specification of LCD

Resolution: The range of column and row of pixels expresses Resolution of LCD. Every pixel is usually composed three sub-pixels, red, inexperienced and blue one. This one of the few characteristic of LCD overall performance that stay uniform among exceptional design. Hence, there are new designs that share sub-pixel among pixel and add Quattro which strive to efficient extend the pick out decision to a display except enlarge the authentic resolution to mixes results.

Spatial performance: A laptop or some other display that is being view from a very close distance decision is regularly express in phrases of pixels per inch, which is steady with the printing industry. LCD show density varies per application, with tv commonly having a small density for long-distance viewing and portable machine having a excessive density for shut range details. Viewing attitude of a LCD display may also be important relies upon on the display and, the difficulty of positive display technological know-how suggest the display only display correct in positive angle.

Worldly performance: Worldly resolution of LCD display is how it can display changing image or the accuracy and the number of time per seconds. Display draw the data, it is being given. LCD display pixel do not flash active or inactive between frame, so LCD monitor exhibit no refresh induced flicker no matter how low the refresh rate. A lower refresh rate can visual artefact like smearing, especially with fast moving images. Each pixel response time is also important, so all display have some inherent latency at displaying an image. It can be large enough to create artefacts if the display image change rapidly.

Temporal performance: Temporal resolution of an LCD display is well its can show exchange photos or accuracy and the variety of times per 2d the display draw the data its being given. LCD shows pixel do not have flash energetic or inactive between frames, so LCD show screen exhibit no refresh-induce flicker no rely and low the refresh rate. Therefore, a lower refresh rate can imply visible artefact like smearing, especially with quick transferring image. Each pixel response time is important, as all display have some inherent latency in display a photo that can be large enough to create visual artefacts if the displayed image alternate time to time.

3.5.3 Advantage of LCD

1. Low electricity consumption.
2. Little warmth emitted during operation, due to low electricity consumption.
3. No geometric distortion.
4. The possible ability to have little flicker relying on backlight technology.
5. The LCD pixels preserve their country between refreshes.
6. Sharp picture with no bleeding or smearing when operated a native resolution.
7. Can be made in almost any shape.
8. Can be made in large sizes of over 80-inch diagonal.
9. Unaffected with the aid of magnetic fields, such as the Earth's.
10. Power supply is nearly 12v.

3.5.4 Disadvantage of LCD

1) Watching perspective in some older or less expensive monitors, causing colour, saturation, distinction and brightness to differ with consumer position, even inside the meant viewing angle.
2) Unsmooth backlighting in some monitors, causing brightness distortion, specifically toward the edges.
3) Black tiers might also not be as dark as required because individual liquid crystals cannot definitely block all of the backlight from passing through.
4) Display action blur on transferring objects brought on by means of gradual response times and eye tracking on a sample-and-hold display, until a storing backlight is used. However, this stroking can motive eyestrain, as is noted next:
5) only one native resolution. Displaying any different decision requires either a video scalar, causing blurriness and jagged edges, or walking the display at native resolution the usage of 1:1 pixel mapping, inflicting the photo either not to fill the display or to run off the lower or right edges of the screen.
6) Many more cost effective LCDs are only in a position to display 262,000 colours. 8-bit S-IPS panels can show sixteen million colours and have extensively better black level, however are high priced and have slower response time.
7) Low refresh rate. All however a few high-end video display units guide no higher than 60 or 75 Hz; while this does now not cause seen flicker due to the LCD panel's excessive interior

refresh rate, the low input refresh price limits the maximum frame-rate that can be displayed, affecting gaming and 3D graphics.

8) Dead pixels may also happen throughout manufacturing or after a length of use. A stuck pixel will glow with shade even on an all-black screen, while a useless one will usually continue to be black.

9) Subject to burn-in effect, though the purpose differs from CRT and the effect might also not be permanent, a static photo can motive burn-in in a remember of hours in badly designed displays.

10) In a constant-on situation, the attention may additionally appear in case of awful thermal management, in which section of the display has overheated and looks discoloured compared to the rest of the screen.

11) Loss of brightness and much slower response times in low temperature environments. In sub-zero environments, LCD screens might also stop to function barring the use of supplemental heating.

12) Loss of distinction in excessive temperature environments.

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3.6 I2C Module

The module is an adapter that mounts immediately on the LCD. The show need to be of 1602 or 2004 and primarily based on HD44780 controller. I2C communication is an advantage because we want solely two wires to speak with the improvement board Arduino or other microcontroller. The two wires are required for clock and data. The module consists of a potentiometer to adjust contrast and is well matched with monitors that are backlit.

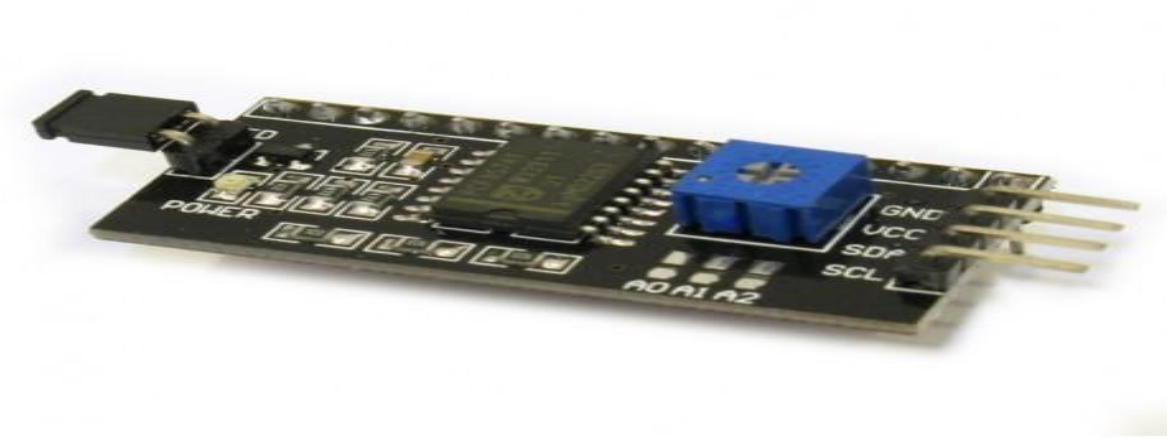

Fig 3.9: Printed circuit board of I2C Module

3.6.1 Features of I2C module

1. 16 x 2 Character LCD show is managed by just two wires.
2. Up to 8 LCD displays with adapters can be related and controlled by using the same two wire I2C bus.
3. Easy to manipulate the usage of Arduino board.
4. Compatible with sixteen x 2 character LCD displays.
5. Adapter consists of 16-PIN male header connector for soldering to LCD display.
6. Contrast is adjusted by means of on-board potentiometer.
7. Backlight may additionally be grew to become on/off by jumper.
8. Standard 5V voltage supply.

3.6.2 Use of I2C Module

In short, when we want to set up brief distance conversation within the equal board or device, you can use I2C. It requires solely two bidirectional wires for transmitting and receiving information. We additionally need to understand that I2C protocol supports serial conversation only. The protocol is very famous and more than one peripheral ICs are connected in master-slave configurations. Talking about master-slave configuration, we have a lot of flexibility when it comes to the usage of the I2C protocol. I2C allows designers to set up two-way conversation between more than one master ICs and slave ICs. In fact, we can join as many as 1008 slave devices.

3.6.3 Advantages of I2C Module

I2C conversation or protocol has a enormous facet over its friends such as serial port verbal exchange and SPI. Let us have a look into the a number benefits that renders the I2C protocol so advantageous for quick distance intra-board communication.

1. Flexibility – The I2C protocol helps multi-master, multi-slave communication, which implies you can add a lot of performance to your design. More than one master IC controlling and speaking with the slave ICs can pace things up and add functionalities to the embedded system.
2. Addressing function – Yet any other benefit of the I2C protocol lies in its inherent potential to use chip addressing. It capability that you can without difficulty add factors to the bus without any complexity. It eliminates the necessity of CS (chip select) lines.
3. Simplicity – I2C protocol doesn't complicate the design. It requires only two bidirectional sign traces to set up communication among multiple devices. Further, the pin matter is low as well.
4. Better error dealing with mechanism – To improve the error detection and correction mechanism, the I2C protocol depends on ACK/NACK feature, which is a sturdy error correction feature. ACK stands for Acknowledgement whereas NACK capacity No Acknowledgement.
5. Adaptable – The I2C protocol is adaptable in the feel that it can work nicely with both sluggish ICs and quick ICs

3.6.4 Disadvantages of I2C Module

I2C verbal exchange doesn't have too many disadvantages. However, it suffers from a few minor limitations.

1. Conflicts – Due to chip addressing, there's usually a possibility of an tackle conflict.
2. Slower speeds – I2C protocol makes use of pull-up resistors rather than the push-pull ones used by its peers. Due to the open-drain design, the velocity is limited.
3. Requires extra area – Now, as an embedded gadget engineer, you understand how treasured PCB actual property is. So, it isn't such a fantastic attribute that the I2C protocol

requires so much house for its pull-up resistors.

Despite these minor limitations, I2C is a strong and suitable protocol. It achieves precisely what it was once intended to - facilitate low-speed communication. So, if you are designing an entry-level embedded system, I2C verbal exchange may also be the proper desire .

3.7 Google Firebase

Firebase is platform, which enable to construct internet and cell functions without server facet programming language. We can store users' facts on its real-time database, which synchronize records among users information in no time.

Fig 3.10: Logo of Google firebase

Firebase is a Google product, which can so many necessary features. Like as real time database, push notification, firebase analytics, firebase authentication, firebase cloud messaging, firebase storage, firebase hosting, firebase test lab for android, firebase crash reporting, firebase notification, firebase app indexing, firebase dynamic link, firebase invites, and firebase add words.

3.7.1Real time Database

The firebase real time database is a cloud-hosted database that lets you keep and sync between your customers in real-time. The real time database is clearly just one massive JSON object that the developers can control in real time. With simply a single API, the firebase database provides your app with both the modern fee of the information and any updates to that data.

Fig 3.11:Real time data base

Real time synchronizing makes it handy for our users to get admission to their facts from any device, be it net or mobile. Real time database also helps your customers collaborate with one another. Another great benefit of real time database is that it ships with cell and web SDKs, allowing you to build your apps barring the need for servers. When ours users go offline, the real time database SDKs use neighbourhood cache on the machine to serve and shop changes. When the device comes online, the local facts is robotically synchronized. The real time database can also integrate with firebase authentication to supply a simple and intuitive authentication process.

3.7.2 Advantages of Firebase

Speed of development - Google firebase database is database with out of the box API connectors and wrappers for query purposes. As a result, rather than building REST API simply like the common way of connecting thin client to database, with firebase, a employer can surely use their SDK to do the same purpose. As a result, business would be able to

reduce their development time through eliminating the API development component. Less scope, potential much less development cost as properly.

Real time update - The old ways of doing things is that a client connected to database need batch update to get new sets of data. It is an inefficient architecture, imagine a program has to read 1 million records every fifteen minutes with or without update. With Google Firebase Database, a client can be automatically triggered for refresh via call back as soon as an update is made in the database. With thus technology, developers are assured to only get a new sets of data as needed basis.

Free- Developers and business owners can create two projects in Firebase for free. This means organization need not to buy premium license during R&D stage. It gives developers and decision makers enough time to learn and evaluate the technology.

Authentication - It comes with a built in authentication module. Supports Gmail, Face book, Twitter, and basic username and password login support. Integrating this module in your app is easy through their SDK.

3.7.3 Disadvantages of Firebase

No Data Explorer - This issue is more for developers. The Firebase Database does not provide an online tool to allow developers search for a data inside a node. It has a manual tree like data explorer but becomes complicated or difficult to traverse as dataset goes bigger.

No built-in Authorization - One of Firebase strong point is it's authentication module. However; it could had been better if it is shipped with a pre-created framework for authorization. To date, developers has to secure data and forms by manually coding the roles for a specific users.

CHAPTER 4

SYSTEM DESCRIPTION

4.1 System Methodology

There are three steps involved in this IOT base car parking space detection system project. These are described below----

4.2 Flow chart of IOT base car parking space detection

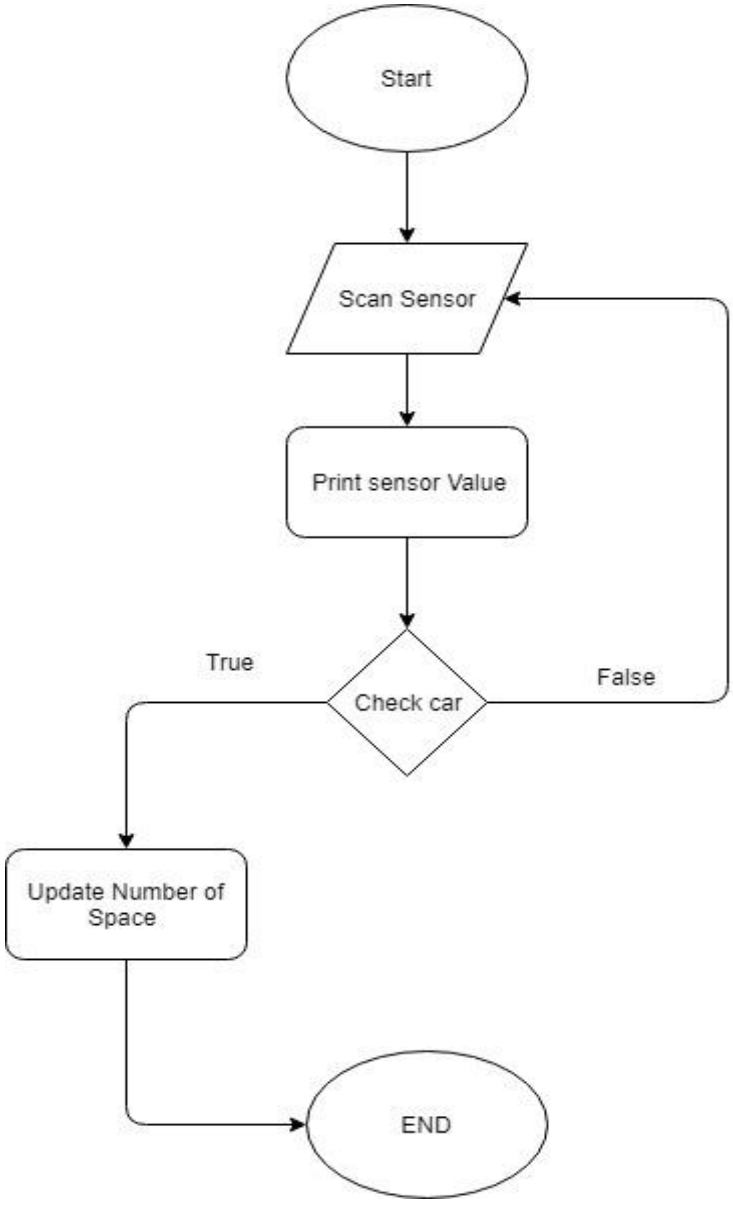

Fig 4.1: Flow chart of IOT base car parking space detection

At first start then go to the sensor then go to the print sensor and check the car , if condition is true then go to the update number of space then end. If start then go to the printed sensor value than condition is false and then go to the sensor and restart the process. Every time it check the condition if true then loop complete if false then continue restart the process.

4.3 Block diagram of IOT base car parking space detection

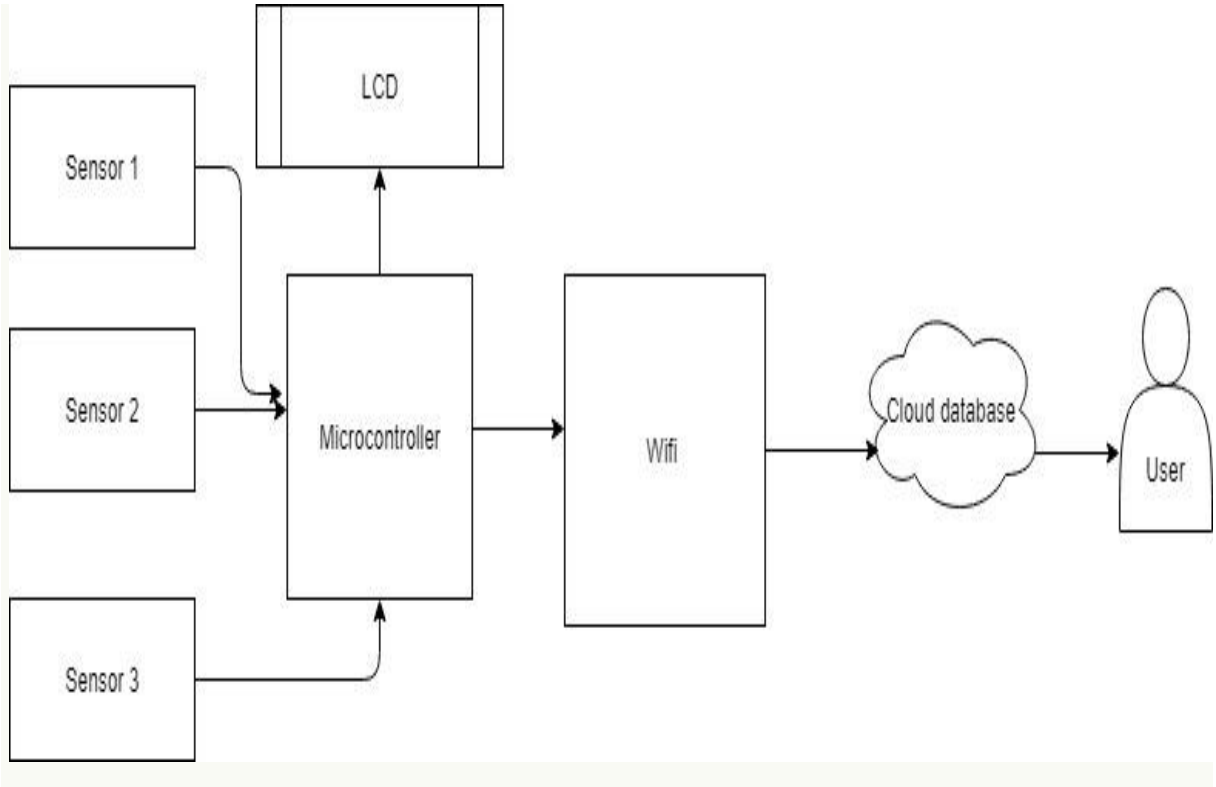

Fig 4.2: Block diagram of IOT base car parking space detection

In this block diagram here three sensor connected to the arduino nano microcontroller. Microcontroller control theses sensor and sensoe through the data microcontroller. LCD connected to the microcontroller, microcontroller through data LCD and LCD show the output. Wi-Fi module connected to the microcontroller, Wi-Fi module connect to the cloud database and user also connected to the cloud database via internet. Microcontroller through the data Wi-Fi module then Wi-Fi module through the data cloud database and user collect the data cloud database via internet.

4.4 Circuit diagram of IOT base car parking space detection

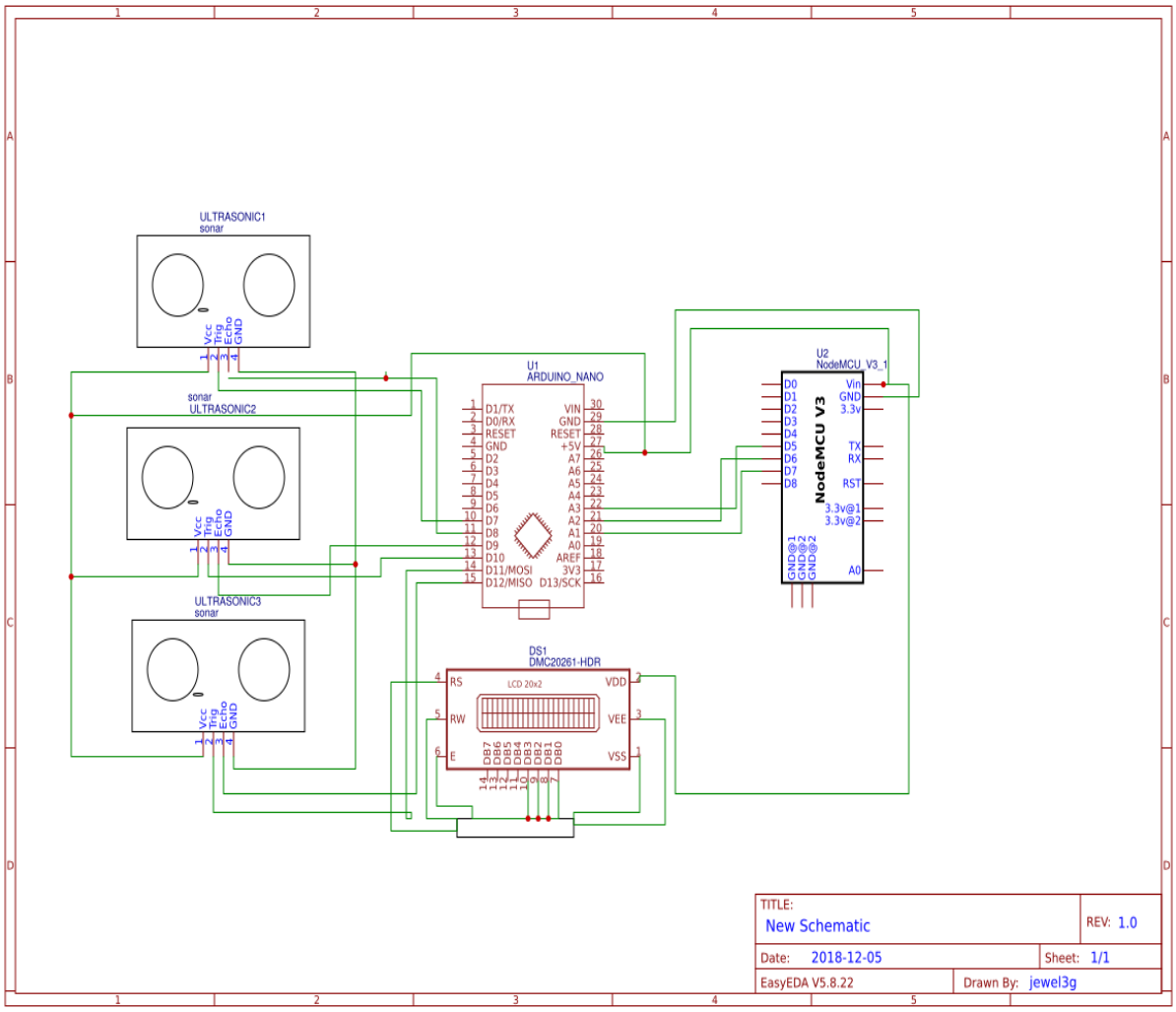

Fig 4.3: Circuit diagram of IOT base car parking space detection

Here this circuit diagram each sonar sensor positive and negative connected to each other and common supply voltage Vin connected to Arduino Nano. Each Sonar sensor Eques and Trig connected to Arduino Nano's digital pin. Also display connected to the Arduino Nano's digital pin. Wi-Fi module or NodeMCU connected to the Arduino Nano's Analog pin. For LCD display we use I2C module or LCD adopter.

CHAPTER 5

RESULT AND DISCUSSIONS

5.1 Introduction

The applications of IOT base car parking space detection system solve the parking problem. It is a low cost and high efficient project. In this project we know how to find a car parking space easily. In this chapter we will see the some output result in this project and also discuss about the problem and how to solve in discussion topic.

5.2 Hardware Result

All the components were connected as per the circuit diagram. The figures below shows the hardware connection and the output obtained.

Step 1= Projec**t** Over view

Fig 5.1: Over view of this project

Step 2= Internal circuit of the project

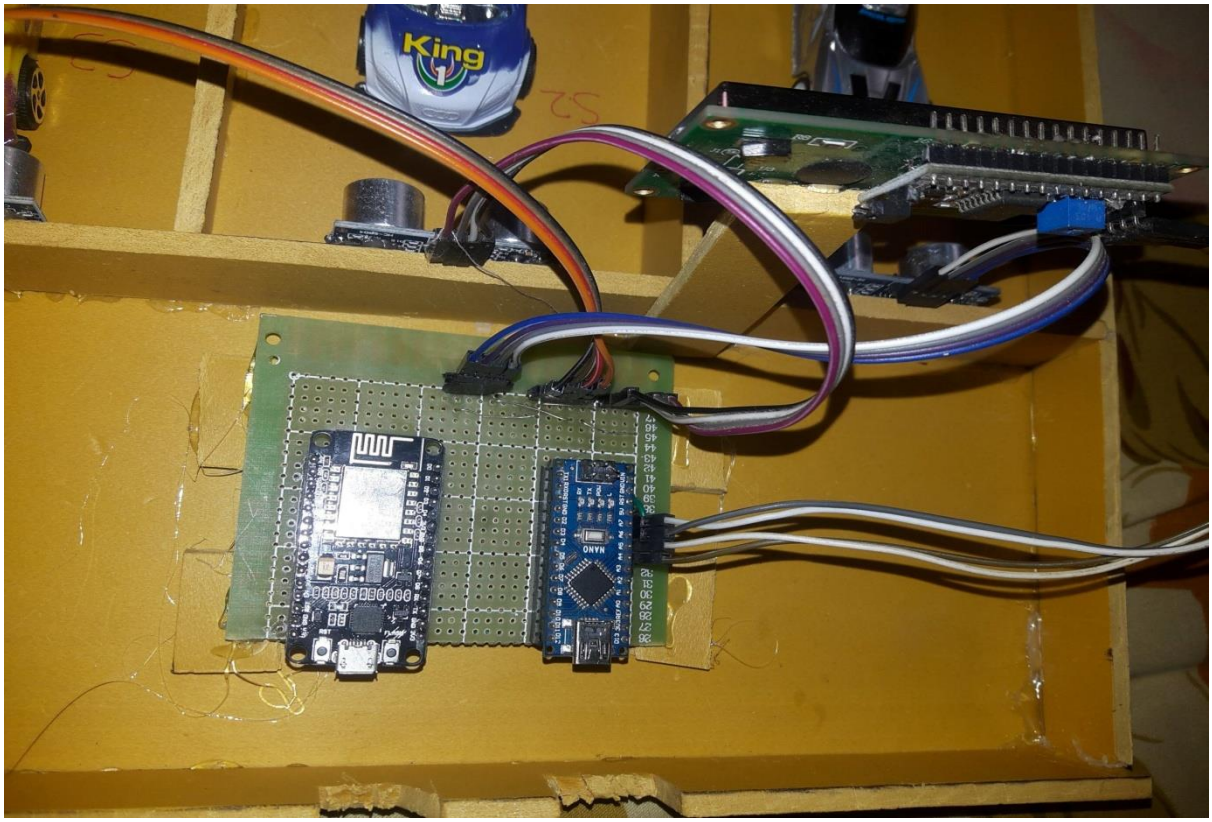

Fig 5.2: Internal circuit of this project

Step 3= When system is ON

Fig 5.3: System ON

Step 4= When parking slots are empty

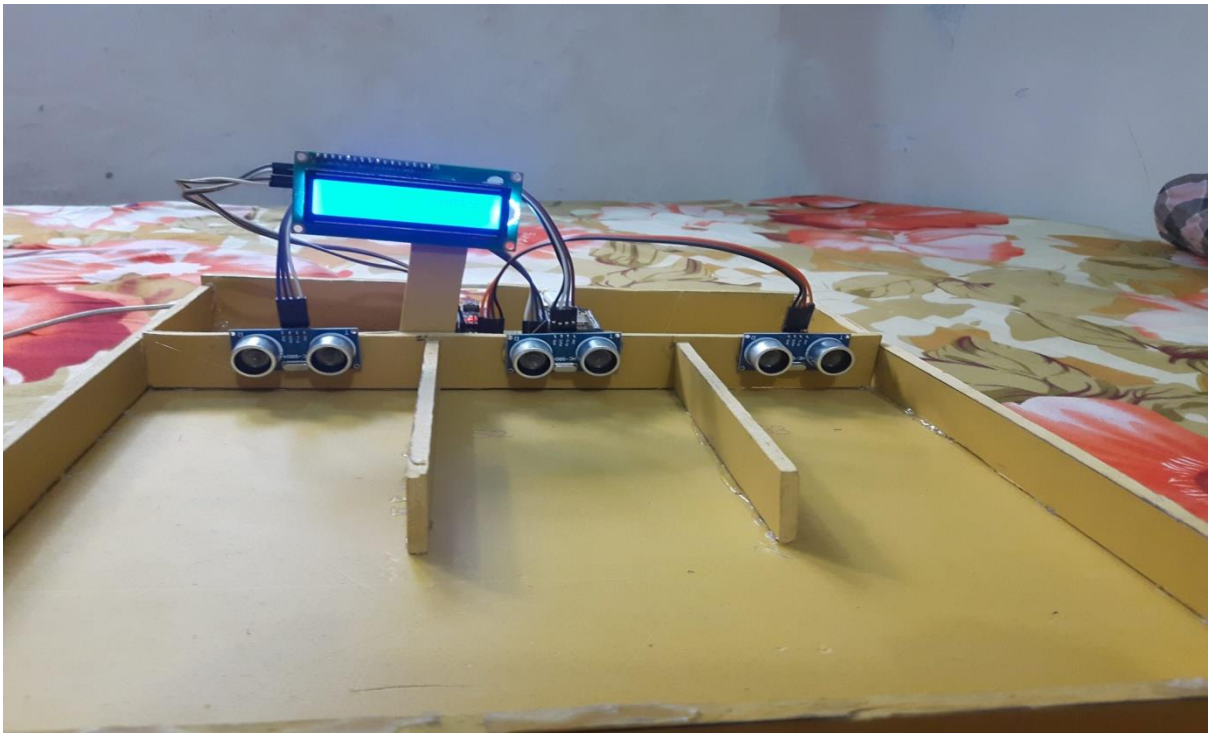

Fig 5.4: Parking slots are empty

Google Firebase result

Fig 5.5: All slots are empty

Step 5= When parking slot 1 is empty

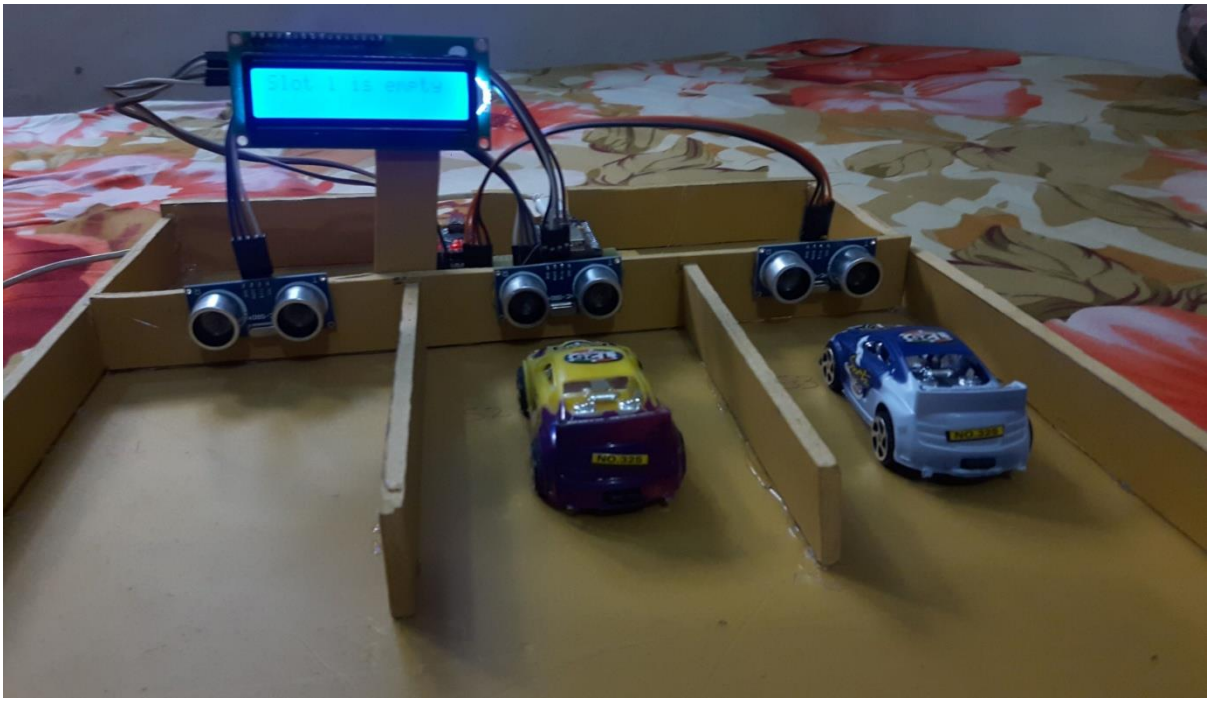

Fig 5.6: parking slot 1 is empty

Google Firebase result

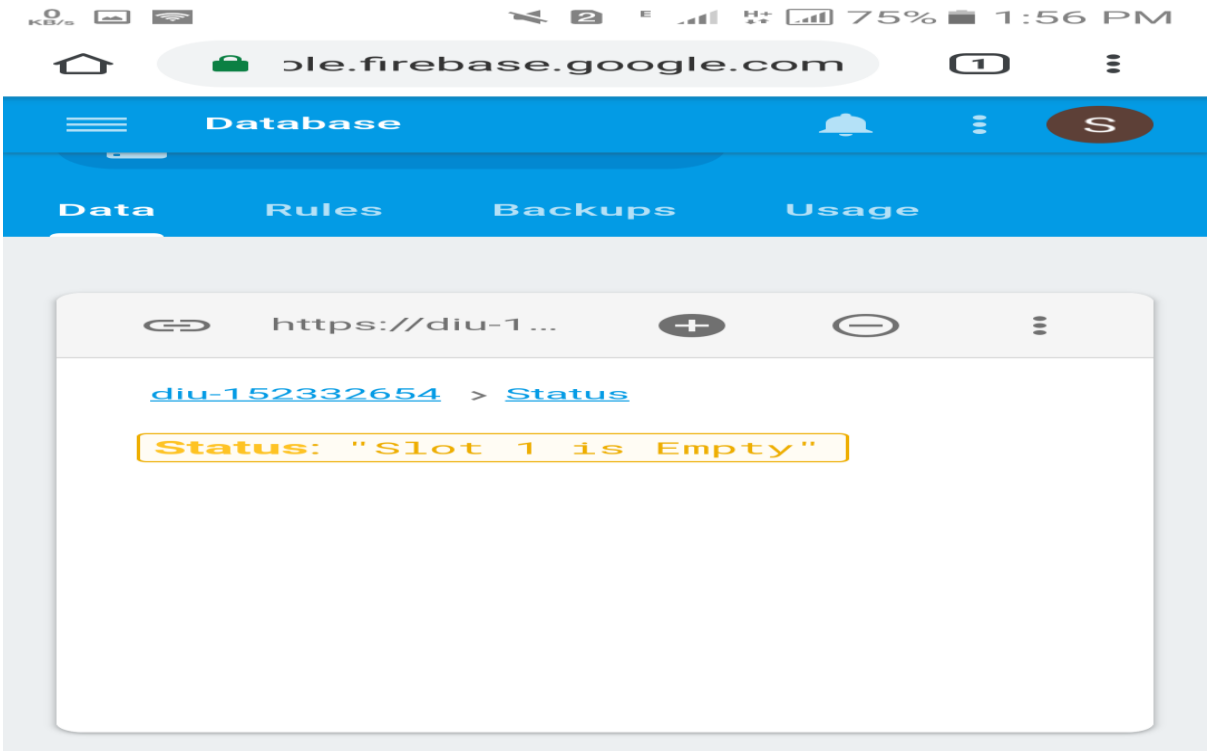

Fig 5.7: Slot 1 is empty

Step 6= When parking slot 2 is empty

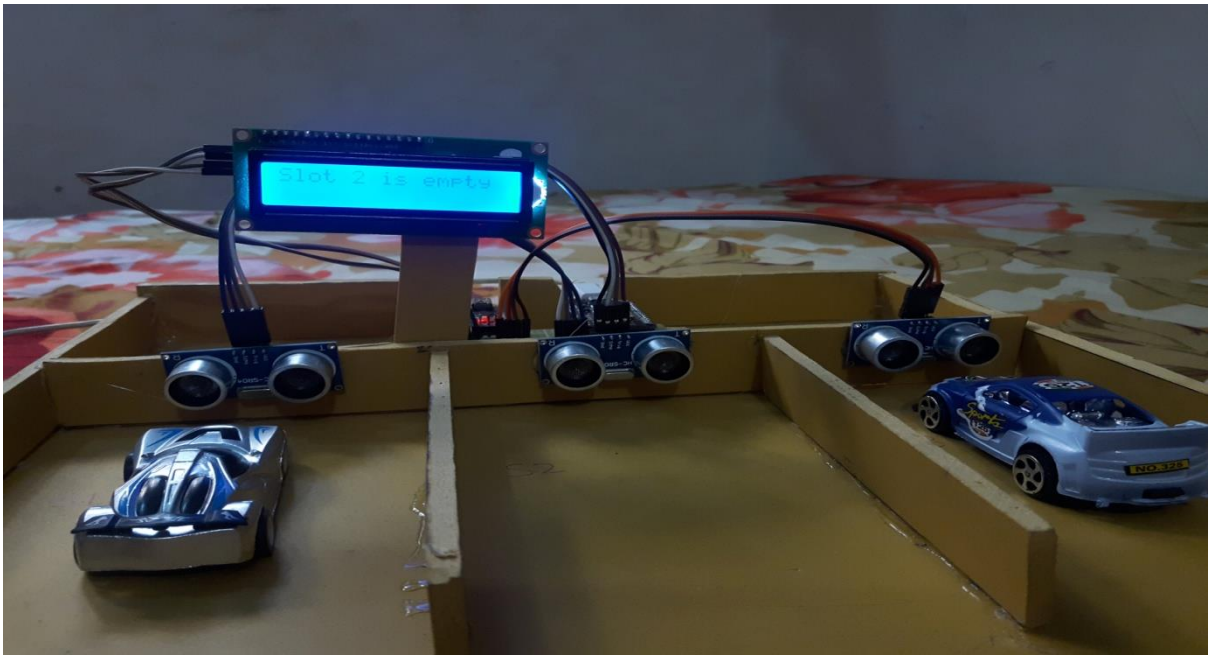

Fig 5.8: Parking slot 2 is empty

Google firebase result

Fig 5.9: Slot 3 is empty

Step 7= When parking slot 3 is empty

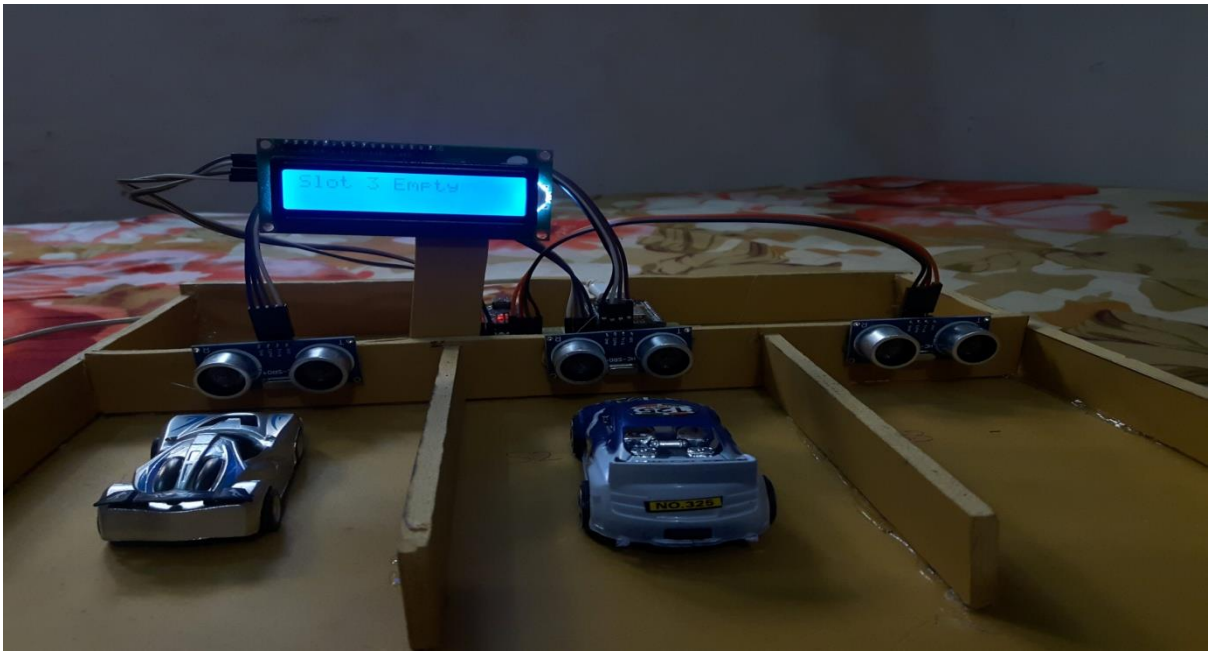

Fig 5.10: Parking slot 3 is empty

Google firebase result

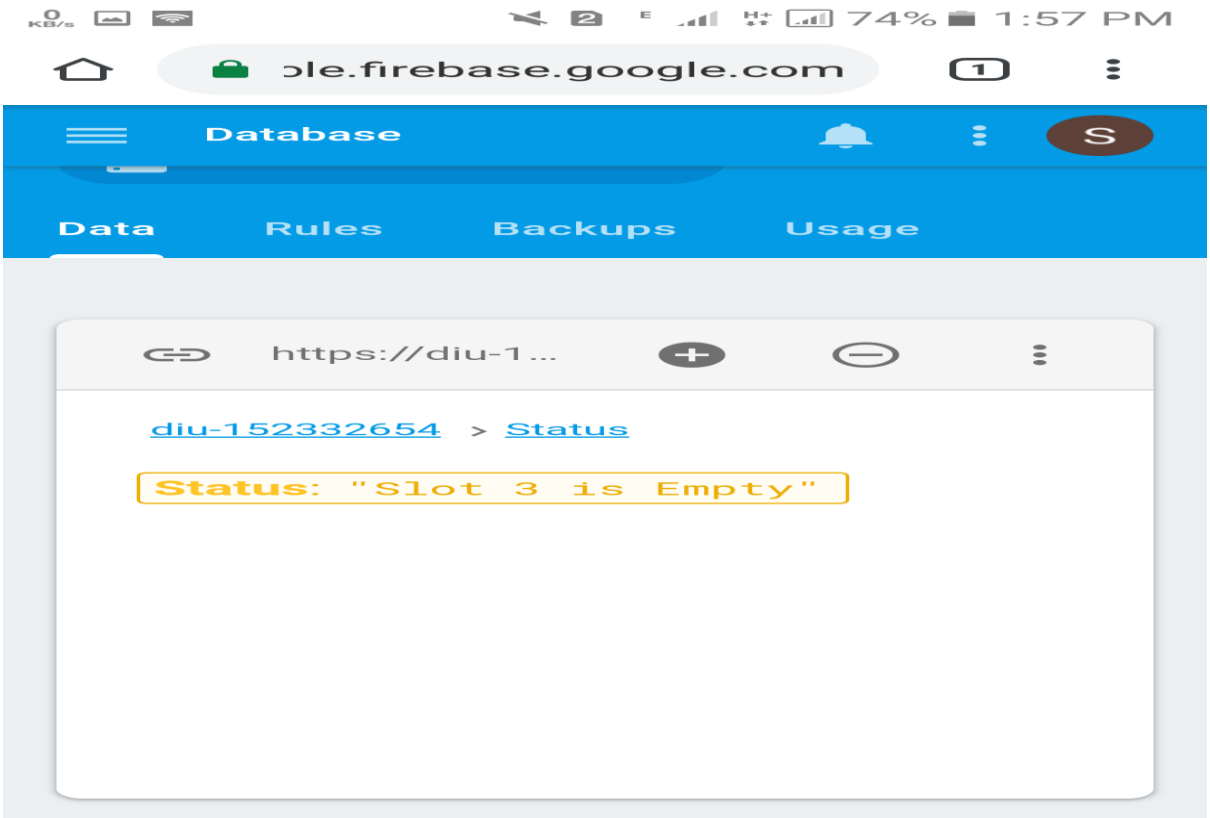

Fig 5.11: Slot 3 is empty

Step 8 = When all parking slots are full

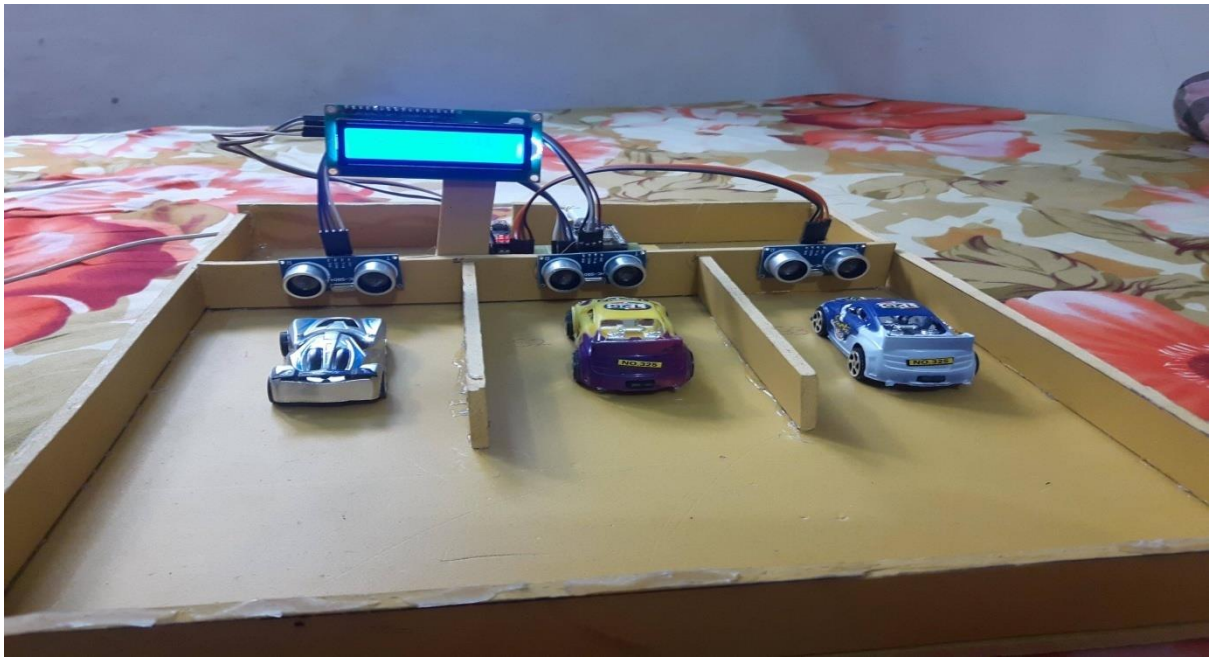

Fig 5.12: All Parking slots are full

Google firebase result

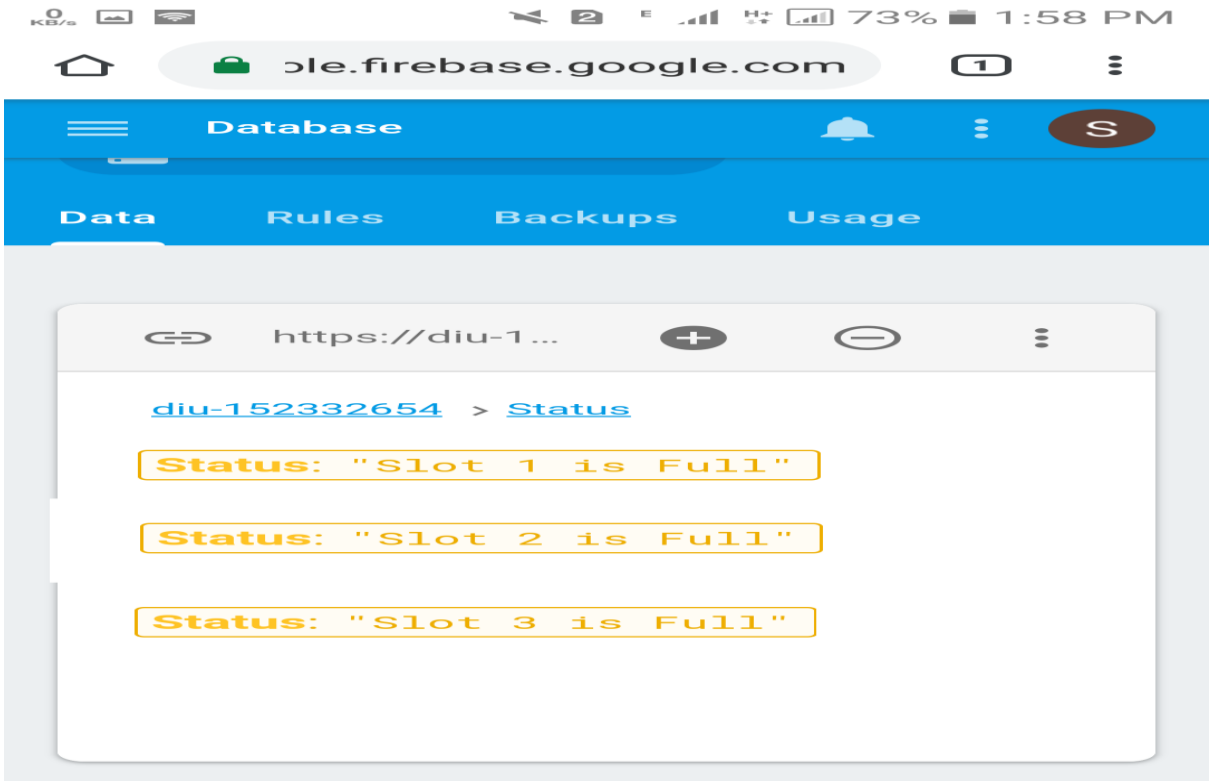

Fig 5.13: All Slots are full

5.3 Discussions

IOT based car parking space detection home control system is capable of reducing the car parking problem in our metropolitan cities. The combination of the hardware and program give the final design of IOT base car parking space detection project. There were some problems occurs in our project . The main problem was programming. It was a major part of this project because it connects by the all equipment and it also connects the cloud server. where we can see the parking slot information. We spend lots of time in this program. Finally we found the actual code in this project. In this project equipment has five part, Arduino nano, Sonar sensor, NodeMCU, Display, I2C module . I2C module is a LCD display adopter, its connected to the LCD display. Sonar sensor detect the car in parking slot by use of sonar wave. Firstly we test the sonar sensor then test the display by the arduino nano microcontroller. After connected to the NodeMCU by the Arduino nano micro controller and then connected to the Google firebase system. When all the equipment are connected then occurred some connection problem but this was not major, we solved the problem then finally we found our actual output. Pin number is important because it match the program coding.

CHAPTER 6

CONCLUSION

AND

FUTURE SCOPE

6.1 Conclusion

The parking system is quite a challenge in modern days. Since the modern cities, number of cars has been increasing and day to day people are facing bigger problem while trying to manage their cars into a parking slot. This continuity of parking crisis gives rise to new solutions with the help of Internet of things base car parking space detection thus managing car parking systems. The proposed project provides real time information of a car parking slot. In IOT base car parking space detection system can save our lots of things such a time kill, reduce traffic jam, car safety etc. This project is low cost and high efficiency. It will be benefit the urban building house holder, property developer to increase their revenue which will add to the government tax revenue. It is also helping the government by increasing tax revenue. It will also encourage Engineering in our country which will make advancement in increasing usage of technology.

6.2Applicability of our project

1. Office buildings
2. Shopping Malls
3. Hospitals
4. Amusement Parks
5. Multi-storeyed house etc.

6.3 Future Scopes

In this IOT base car parking projects have many future scope. Day by day man will be increase. So, man will be make house , shopping mall, etc and man will be buy vehicles. For this vehicles parking need parking slot. Manually it is not possible so, our dependency will be come IOT base car parking space detection system. It is much more easy and low cost. In future develop the software and create application for parking space detection. Using this app people can find parking space. For our country this project have lots of scope for find future car parking space detection. In future this project will be added Google map so, we can find easily our parking slot.

6.4 Recommendations

In many countries such as China, Japan, USA, UK etc. they are use IOT base car parking space detection system. It is much more easy than manually find car parking space detection. Lots of benefits of IOT base car parking system. Lots of money save in the use of IOT system. We also benefit for rent our parking space through the IOT base car parking space detection system. In future it will be available. Manually find the car parking space it is not possible in our country if it is possible but lots of gasoline burn for find the place and also kill our valuable time. For high traffic jam it causes for road side car parking. For our country we highly recommend this project .

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APPENDIX

For sender

```
#include <LiquidCrystal.h> // includes the Liquid Crystal Library

#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 20, 4);
const int trigPin = 2;
const int echoPin = 3;
long duration;
int distanceCm, distanceInch;
void setup() {
 lcd.init();
  lcd.backlight();
lcd.clear();
// Initializes the interface to the LCD screen, and specifies the dimensions (width and height) of the display
pinMode(trigPin, OUTPUT);
pinMode(echoPin, INPUT);
}
void loop() {
digitalWrite(trigPin, LOW);
delayMicroseconds(2);
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW);
duration = pulseIn(echoPin, HIGH);
distanceCm= duration*0.034/2;
distanceInch = duration*0.0133/2;
lcd.setCursor(0,0); // Sets the location at which subsequent text written to the LCD will be displayed
lcd.print("Distance: "); // Prints string "Distance" on the LCD
lcd.print(distanceCm); // Prints the distance value from the sensor
```

```
lcd.print(" cm");
delay(10);
lcd.setCursor(0,1);
lcd.print("Distance: ");
lcd.print(distanceInch);
lcd.print(" inch");
delay(10);
}
```

For receiver

```
#include <LiquidCrystal.h> // includes the Liquid Crystal Library

#include <LiquidCrystal_I2C.h>

LiquidCrystal_I2C lcd(0x27, 20, 4);

#include <ESP8266WiFi.h>

#include <Firebase Arduino.h>

// Set these to run example.

#define FIREBASE_HOST "diu-152332654.firebaseio.com"

#define FIREBASE_AUTH "ritDfQAuAIGV62V9TBaMzfvQ2JS3ZIBWIsD2hTMc"

#define WIFI_SSID "Anayet ullah"

#define WIFI_PASSWORD "12342345"


int s1,s2,s3,x=0;


void setup() {

pinMode(s1, INPUT);
```

```
pinMode(s2, INPUT);
pinMode(s3, INPUT);
Serial.begin(115200);
lcd.init();
lcd.backlight();
lcd.clear();
lcd.setCursor(0, 1);
lcd.print("Database test");
delay(900);
  // connect to wifi.
  WiFi.begin(WIFI_SSID, WIFI_PASSWORD);
  Serial.print("connecting");
  lcd.setCursor(0, 1);
lcd.print("Connecting...");
  while (WiFi.status() != WL_CONNECTED) {
    Serial.print(".");
    delay(500);
  }
  Serial.println();
  Serial.print("connected: ");
lcd.setCursor(0, 0);
  Serial.println(WiFi.localIP());
delay(700);
```

```
lcd.print(WiFi.localIP());
lcd.setCursor(0, 1);
lcd.print("Connected");
delay(700);
lcd.clear();
Firebase.begin(FIREBASE_HOST, FIREBASE_AUTH);


  }
void uplode(){
    if ((s1==1){
   Firebase.setString("Status", "Slot 1 is Full");
   // handle error
   if (Firebase.failed()) {
     Serial.print("setting /message failed:");
     Serial.println(Firebase.error());
     return;
   }
   delay(1000);
   if ((s1==0){
   Firebase.setString("Status", "Slot 1 is Empty");
   // handle error
   if (Firebase.failed()) {
     Serial.print("setting /message failed:");
```

```
    Serial.println(Firebase.error());
    return;
   }
   delay(1000);
  }
   if ((s1==1 & s2==1 & s3==0)) {
   Firebase.setString("Status", "Slot 1 & 2 is Full , 3 is free");
   // handle error
   if (Firebase.failed()) {
    Serial.print("setting /message failed:");
    Serial.println(Firebase.error());
    return;
   }
   delay(1000);
  }

  if ((s1==1 && s2==1 && s3==1)) {
   Firebase.setString("Status", "HouseFull");

 lcd.setCursor(0, 1);
lcd.print("Updated: Full");
delay(700);
   // handle error
```

```
    if (Firebase.failed()) {
      Serial.print("setting /message failed:");
      Serial.println(Firebase.error());
      return;
    }
    delay(1000);
  }
   if ((s1==0 & s2==0 & s3==1)) {
    Firebase.setString("Status", "Slot 3  Full , 1 & 2  free");
    lcd.setCursor(0, 1);
lcd.print("Updated:1&2 free");
delay(700);
    // handle erro
    if (Firebase.failed()) {
      Serial.print("setting /message failed:");
      Serial.println(Firebase.error());
      return;
    }
    delay(1000);
  }
 if ((s1==0 & s2==1 & s3==1) {
    Firebase.setString("Status", "Slot 2 & 3 is Full , 1 is free");
    lcd.setCursor(0, 1);
```

```
  lcd.print("Updated:1 free");
  delay(700);
   // handle error
   if (Firebase.failed()) {
     Serial.print("setting /message failed:");
     Serial.println(Firebase.error());
     return;
   }
   delay(1000);
 }
   if (s1==0 & s2==1 & s3==0) {
   Firebase.setString("Status", "Slot 2 is Full , 1 & 3 are free");
   lcd.setCursor(0, 1);
lcd.print("Updated:1&3 free");
delay(700);
   // handle error
   if (Firebase.failed()) {
     Serial.print("setting /message failed:");
     Serial.println(Firebase.error());
     return;
   }
   delay(1000);
  }
```

```
  if (s1==0 & s2==0 & s3==1) {
    Firebase.setString("Status", "Slot 3 is Full , 1 & 2 are free");
    lcd.setCursor(0, 1);
lcd.print("Updated: 1&2 free");
delay(700);
    // handle error
    if (Firebase.failed()) {
      Serial.print("setting /message failed:");
      Serial.println(Firebase.error());
      return;
    }
    delay(1000);
  }


}
void loop() {
  s1 = digitalRead(14);
  s2 = digitalRead(12);
  s3 = digitalRead(13);
  uplode();
Firebase.setString("Status", "Welcome");
}
```