VISVESVARAYA TECHNOLOGICAL UNIVERSITY,

BELAGAVI - 590018

Iot Project Report on

Smart parking with slot detection system

Submitted in partial fulfillment of the requirements as per VTU curriculum of

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE & ENGINEERING

By

NAME	USN
Netra Suresh Gudagamnala	4AL17CS055
Shanbhag Atish Manoj	4AL17CS085
Ramitha Y S	4AL17CS074
Sana F Habib	4AL17CS081

Under the Guidance of

Mr. SUSHANTH M,

ASSISTANT PROFESSOR

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

ALVA'S INSTITUTE OF ENGINEERING AND TECHNOLOGY

MOODBIDRI-574225, KARNATAKA

2018– 2019

ALVA'S INSTITUTE OF ENGINEERING AND TECHNOLOGY

MIJAR, MOODBIDRI D.K. -574225

KARNATAKA

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

CERTIFICATE

This is to certify that

Netra Suresh Gudagamnala	**4AL17CS055**
Shanbhag Atish Manoj	**4AL17CS085**
Ramitha Y S	**4AL17CS074**
Sana F Habib	**4AL17CS081**

has submitted Iot project Report on "Smart Parking with Slot Detection System" for the V semester B.E. in Computer Science & Engineering during the year 2019-20

Sushanth M	**Dr. Manjunath Kotari**
Project Guide	**Professor and Head**

ACKNOWLEDGEMENT

The satisfaction and euphoria that accompany a successful completion of any task would be incomplete without the mention of people who made it possible, success is the epitome of hard work and perseverance, but steadfast of all is encouraging guidance.

So, with gratitude I acknowledge all those whose guidance and encouragement served as beacon of light and crowned the effort with success.

I thank my project guide Sushanth M Assistant Professor in Department of Computer Science & Engineering, who has been my source of inspiration. He/She has been especially enthusiastic in giving his/ her valuable guidance and critical reviews.

The selection of Technical Seminar Topic as well as the timely completion is mainly due to the interest and persuasion of my activity coordinator **Mr. Sushanth M,** Associate Professor, Department of Computer Science & Engineering. I will remember his contribution for ever.

I sincerely thank, **Dr. Manjunath Kotari**, Professor and Head, Department of Computer Science & Engineering who has been the constant driving force behind the completion of the seminar.

I thank Principal **Dr.Peter Fernandes,** for his constant help and support throughout.

I am also indebted to **Management of Alva's Institute of Engineering and Technology, Mijar, Moodbidri** for providing an environment which helped me in completing the seminar.

Also, I thank all the teaching and non-teaching staff of Department of Computer Science & Engineering for the help rendered.

Finally, I would like to thank my parents and friends whose encouragement and support was invaluable

Netra Suresh Gudagamnala	**4AL17CS055**
Shanbhag Atish Manoj	**4AL17CS085**
Ramitha Y S	**4AL17CS074**
Sana F Habib	**4AL17CS081**

TABLE OF CONTENTS

CHAPTER NO.	DESCRIPTIONS	PAGE NO.
	ACKNOWLEDGEMENTS……	i
	ABSTRACT……	ii
	FIGURES……	iii
1.	**INTRODUCTION**	
	1.1 INTRODUCTION	1
	1.2 STATEMENT OF THE PROBLEM	2
	1.3 OBJECTIVES	3
	1.4 SCOPE FOR THE STUDY	3
2.	**METHODOLOGY & WORKING**	
	2.1 Ultrasonic Sensor & Infrared Sensor	5
	2.2 Infrared Sensor	6
	2.3 Arduino Board	8
	2.4 Arduino UNO Software	10
3.	**APPLICATIONS**	12
4.	**CONCLUSION AND FUTURE ENHANCEMENT**	
	4.1 CONCLUSION	13
	4.2 FUTURE ENHANCEMENT	14
	REFERENCES……	15

ABSTRACT

The internet of things (IOT) are able to implement transparently a very large amount of heterogeneous end systems, while digital service provides open access to subset of data. The concept of IOT based smart parking system will improve the reliability of urban infrastructure, saves time in searching the parking slot and reduce the environmental impact of traffic and improves the quality of life in the city. The Smart parking system is mainly involving the wireless sensor-based technologies such as ultrasonic sensor and proximity sensor to detect parking of the vehicles in the parking slots and empty slots, and this information is displayed on the LCD which is helpful to the driver to park their vehicles in the empty slots.

LIST OF FIGURES

Figure No	Name of the Figure
2.1	Ultrasonic Sensor
2.2	Infrared Sensor
2.3	Arduino Board
2.4	Servo Motor
2.5	Arduino Uno Software
2.6	LCD Display
2.6.1	I2C Driver

CHAPTER 1

1.INTRODUCTION

Now a days searching for vacant parking slots in metropolitan area is the issue for most drivers, and it is very time consuming. Just cruising for vacant parking slots results more Traffic congestion and air pollution[1]. According to the survey of the metropolitan city about 40% of the total traffic is generated by vehicles searching for the vacant parking spaces. To avoid this traffic congestion problems and improve the convenience for drivers many smart parking are introduced in order to avoid traffic congestion and also provide a better convenient parking system for public. In traditional parking system there is no guarantee of finding available parking space. In this Project, we mainly focus on designing a new smart parking system that assists drivers to find parking spaces in aspecific parking district. In addition, an important goal of the system is to reduce the traffic searching for parking, hence reduce energy consumption and air pollution. For instance, in Malaysia window-shopping, or visiting shopping complexes simply for looking rather than buying, is a common activity [2].

With the rapid development in each and every sector of society that can be hospitals, transportation, shopping complexes etc. providing sufficient, secure parking facilities is one of the main issues in developing sectors if the society. In this paper we are introducing a smart parking system (SPS) which is very cheap, convenient, and easy to use which provide better facility to drivers. This paper is organized as follows: the introduction details the parking lots. Part 2 discusses current parking lot problems and the difficulties that customers encounter in parking lots. Section 3 gives a system overview and the features of SPS. Section 4 outlines SPS architecture and the devices required to implement it. Finally, the last section offers conclusions and discusses current research.

1.1 STATEMENT OF THE PROBLEM

Difficulty in finding vacant parking slots: With the rapid growth in population and vehicles production, finding a vacant space in any metropolitan city is difficult, but it gets very hard on weekends. A show that 86% of drivers face difficulty in finding a parking space in multilevel parking lots [3]. Stadiums and shopping complexes are crowded at peak periods and difficulty in finding vacant slots at these places is a major problems for customers [4]. Insufficient car parks spaces lead to the traffic congestion and driver frustration [5]. And also

in our society, parking is the major problem as it will create many conflicts and also parking anywhere will create conflicts among peoples so Smart parking System was introduced in order to overcome the issue of parking and our vehicle will be safe.

1.2 OBJECTIVES

In this project the main intension is time efficiency for finding the parking areas in the society.

It will also provide the customers some kind of relaxation for security about their vehicles.

1.3 SCOPE OF THE STUDY

- **Optimized parking** – Users find the best spot available, saving time, resources and effort. The parking lot fills up efficiently and space can be utilized properly by commercial and corporate entities.
- **Reduced traffic** – Traffic flow increases as fewer cars are required to drive around in search of an open parking space.
- **Reduced pollution** – Searching for parking burns around one million barrels of oil a day. An optimal parking solution will significantly decrease driving time, thus lowering the amount of daily vehicle emissions and ultimately reducing the global environmental footprint.
- **Enhanced User Experience** – A smart parking solution will integrate the entire user experience into a unified action. Driver's payment, spot identification, location search and time notifications all seamlessly become part of the destination arrival process.

CHAPTER 2

METHODOLOGY & WORKING

There are mainly 6 parts:

2.1 Ultrasonic Sensor

2.2 Infrared Sensor

2.3 Arduino Board

2.4 Servo Motor

2.5 LCD Display

2.6 I2C Driver

2.1 Ultrasonic Sensor

As shown above the **HC-SR04 Ultrasonic (US) sensor** is a 4 pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that

Distance = Speed × Time

The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module as shown in the picture below.

Figure 2.1.1 Ultrasonic Sensor

Now, to calculate the distance using the above formulae, we should know the Speed and time. Since we are using the Ultrasonic wave we know the universal speed of US wave at room conditions which is 330m/s. The circuitry inbuilt on the module will calculate the time taken for the US wave to come back and turns on the echo pin high for that same particular amount of time, this way we can also know the time taken. Now simply calculate the distance using a microcontroller or microprocessor.

2.2 Infrared Sensor

We have already discussed how a light sensor works. IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold.

Figure 2.1.2 Infrared Sensor

2.3 Arduino Board

The Arduino Uno R3 is a open source microcontroller board based on the ATmega328 chip. This Board has 14 digital input/output pins, 6 analog input pins, Onboard 16 MHz ceramic resonator, Port for USB connection, Onboard DC power jack, An ICSP header and a microcontroller reset button. It contains everything needed to support the microcontroller. Using the board is also very easy, simply connect it to a computer with a USB cable or power it with DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2Atmega8U2 up to version R2) programmed as a USB-to-serial converter. While the Arduino UNO can be powered via the USB connection or with an external power supply, the power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Also leads from a battery can be inserted in the Gnd and Vin pin headers of the Power connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 5v to 12v for Arduino Uno.

Figure 2.2.0 Arduino Board

2.3 Servo Motor

A **servo motor** is an electrical device which can push or rotate an object with great precision. If you want to rotate and object at some specific angles or distance, then you use servo motor. It is just made up of simple motor which run through **servo mechanism**. If motor is used is DC powered then it is called DC servo motor, and if it is AC powered motor then it is called AC servo motor. We can get a very high torque servo motor in a small and light weight packages. Doe to these features they are being used in many applications like toy car, RC helicopters and planes, Robotics, Machine etc.

Figure 2.3 Servo Motor

Servo motors are rated in kg/cm (kilogram per centimeter) most hobby servo motors are rated at 3kg/cm or 6kg/cm or 12kg/cm. This kg/cm tells you how much weight your servo motor can lift at a particular distance. For example: A 6kg/cm Servo motor should be able to lift 6kg if the load is suspended 1cm away from the motors shaft, the greater the distance the lesser the weight carrying capacity.

2.5.1 Arduino UNO Software

The Arduino Integrated Development Environment (IDE) is a cross platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to

write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU tool chain also included with the IDE distribution. The Arduino IDE employs the program *argued* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

In October 2019 the Arduino organization began providing early access to a new Arduino Pro IDE with debugging and other advanced features.

Arduino IDE is an open-source software program that allows users to write and upload code within a real-time work environment. As this code will thereafter be stored within the cloud, it is often utilized by those who have been searching for an extra level of redundancy. The system is fully compatible with any Arduino software board.

Arduino is a computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. Arduino programs may be written in any programming language with a compiler that produces binary machine code. Atmel provides a development environment for their microcontrollers, AVR Studio and the newer Atmel Studio, which can be used for programming Arduino. The Arduino project provides the Arduino integrated development environment (IDE), which is a cross platform application written in the programming language Java. A program written with the IDE for Arduino is called a "sketch". Sketches are saved on the development computer as files with the file extension . ino. The Arduino IDE supports the languages C and C++ using special rules to organize code.

2.6 LCD Display

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels.

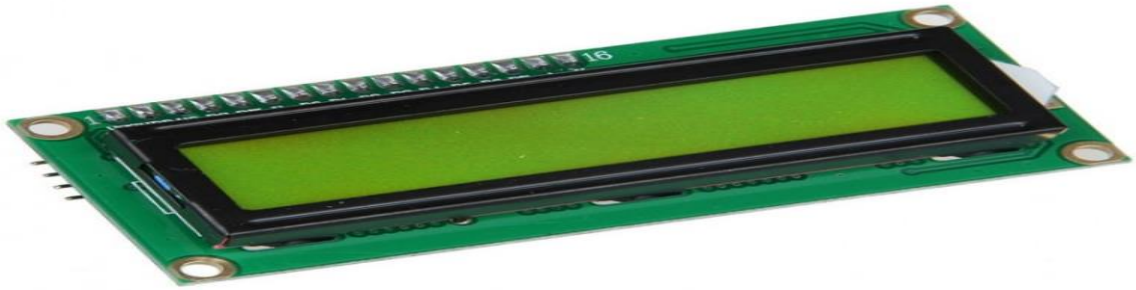

Figure 2.6 LCD Display

LCDs were a big leap in terms of the technology they replaced, which include light-emitting diode (LED) and gas-plasma displays. LCDs allowed displays to be much thinner than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it. Where an LED emits light, the liquid crystals in an LCD produces an image using a backlight.

2.6.1 I2C Driver

I²CDriver is an easy-to-use, open source tool for controlling I²C devices. It works with Windows, Mac, and Linux, and has a built-in color screen that shows a live "dashboard" of all the I²C activity. It uses a standard FTDI USB serial chip to talk to the PC, so no special drivers need to be installed. The board includes a separate 3.3 V supply with voltage and current monitoring.

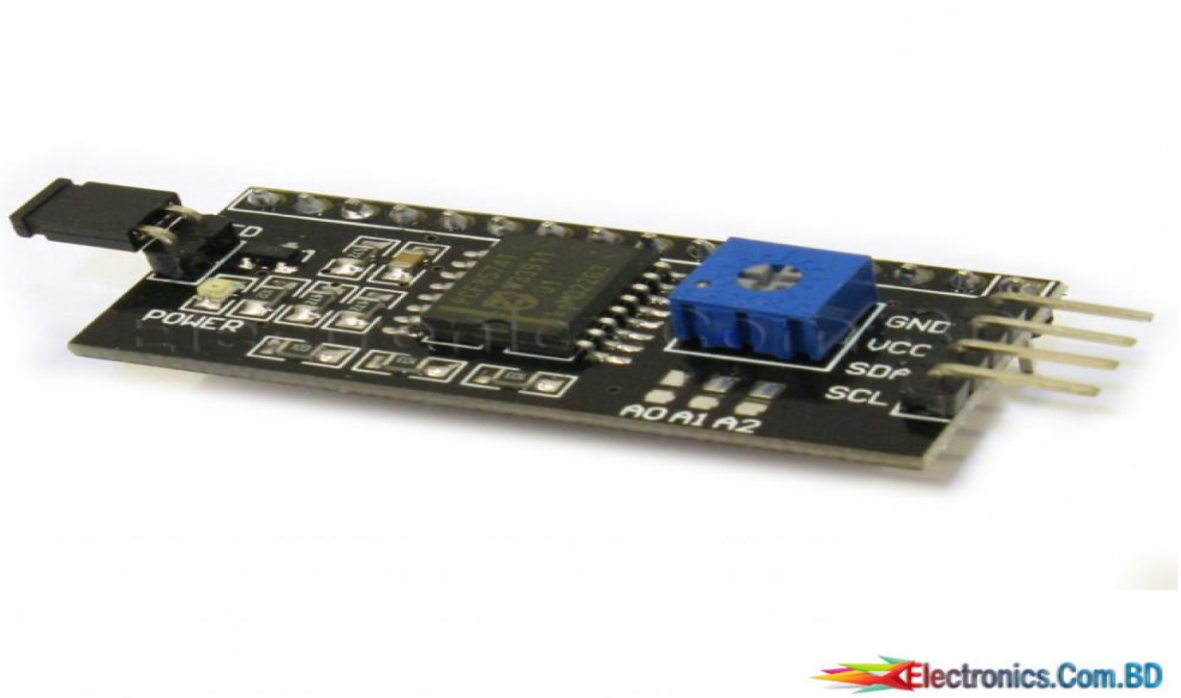

Figure 2.6.1 I2C Driver

WORKING

- In this project we have used Arduino Board, along with its software. It mainly works on sensors like Infrared and Ultrasonic Sensors.
- The project is for empty slot detection and occupancy of the slots by car.
- When a car enters the parking area it automatically gets sensed by ultrasonic sensors and it will also display the driver that which an all slots are empty in LCD display.
- When car comes near the gate it will open if the slots are empty if it is full it will remain closed.
- When car enters the area and occupy the slot it gets detected by IR sensor and notify it to LCD display that it has been occupied and it will display the remaining empty slots.
- If the slots are full it display as Parking Slots are full and will not open the gate

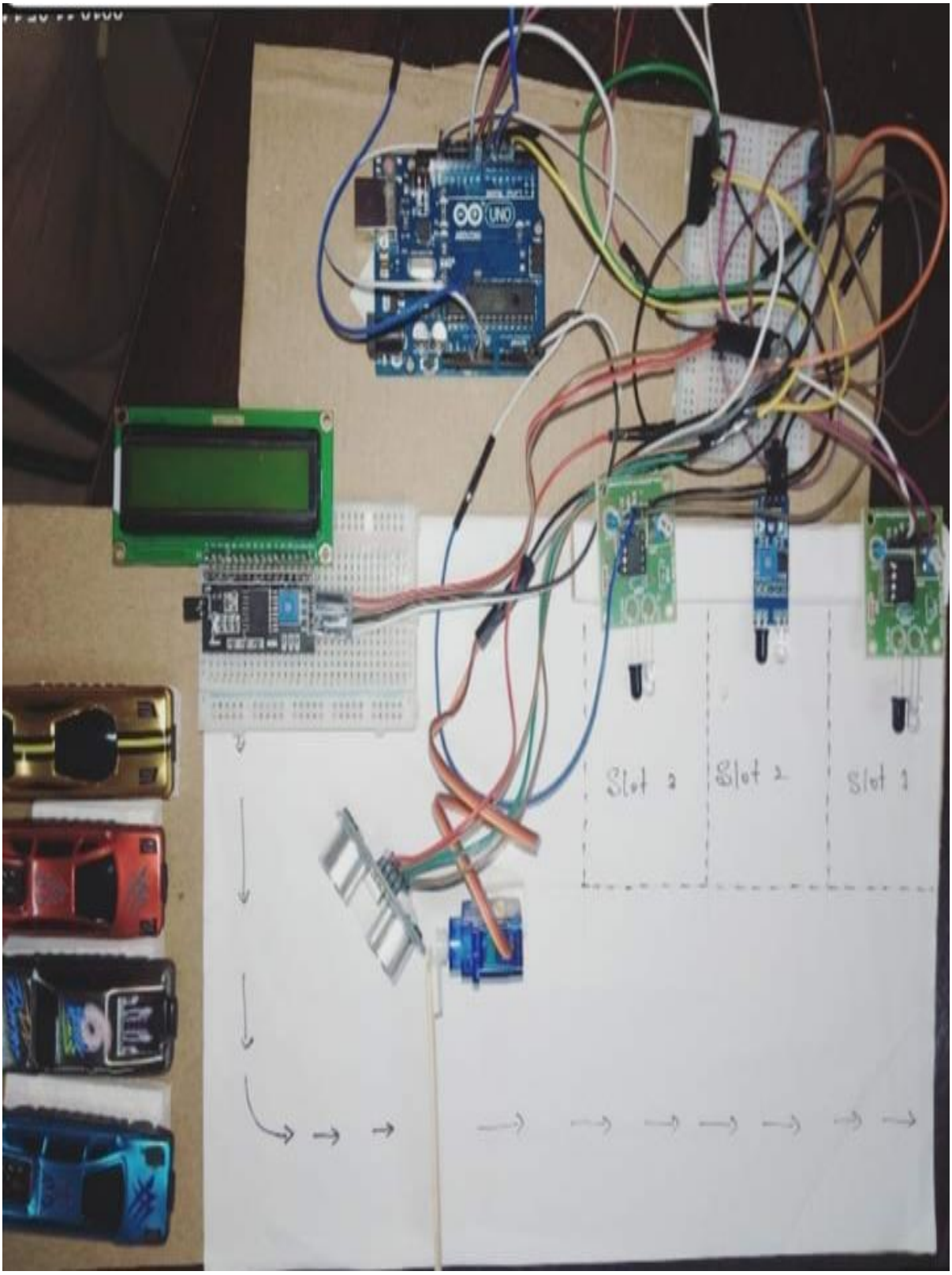

Figure 2.5.1: Experimental Setup

CHAPTER 3

3. APPLICATIONS

- **New Revenue Streams** – Many new revenue streams are possible with smart parking technology. For example, lot owners can enable tiered payment options dependent on parking space location. Also, reward programs can be integrated into existing models to encourage repeat users.
- **Integrated Payments and POS** – Returning users can replace daily, manual cash payments with account invoicing and application payments from their phone. This could also enable customer loyalty programs and valuable user feedback.
- **Increased Safety** – Parking lot employees and security guards contain real-time lot data that can help prevent parking violations and suspicious activity. License plate recognition cameras can gather pertinent footage. Also, decreased spot-searching traffic on the streets can reduce accidents caused by the distraction of searching for parking.
- **Real-Time Data and Trend Insight** – Over time, a smart parking solution can produce data that uncovers correlations and trends of users and lots. These trends can prove to be invaluable to lot owners as to how to make adjustments and improvements to drivers.
- **Decreased Management Costs** – More automation and less manual activity saves on labor cost and resource exhaustion.
- **Increased Service and Brand Image** – A seamless experience can really skyrocket a corporate or commercial entities brand image to the user. Whether the destination is a retail store, an airport or a corporate business office, visitors will surely be impressed with the cutting edge technology and convenience factor.

CHAPTER 4

CONCLUSION AND FUTURE EHANCEMENT

CONCLUSION:-

The main motive of this study is to introduce parking system to avoid the problem i.e., finding an empty space and propose a solution. Ultrasonic sensors can be used both for parking space detection and improper parking detection. The proposed system for a parking detection system would decrease searching time for vacant spaces and reduce instances of single cars improperly parking across two spaces. Future research might examine car park booking procedures and optimization of sensor usage. Cost effectiveness and marketing could be studied as well.

FUTURE ENHANCEMENT

The future scope to adopt this automatic Smart Parking System (SPS) so that availability of spaces could be displayed on a smart phone Application or even to satellite navigation device so that drivers will always aware of whether there are free spaces are not. And also enhance to send some notifications to users smart phone when vehicle enters to particular shopping places and some streets in a city etc.

REFFERENCES

[1] Ajzen, M. F. (1975). Belief, Attitude and behavior, and an Introduction to theory and beResearch. AddisonWesley.

[2] P. W. H. Coopers, “From Beijing to Budapest - Winning Brands. Winning Formats”, (2005), pp. 126.

[3] Kianpisheh, N. Mustaffa, J. M. Y. See and P. Keikhosrokiani, “User Behavioral Intention toward Using Smart Parking System”, Proceeding of ICIEIS, (2011) Kuala Lumpur, Malaysia, pp. 732-747.

[4] D. B. L. Bong, K. C. Ting and K. C. Lai, “Integrated Approach in the Design of Car Park Occupancy Information System (COINS)”, IAENG International Journal of Computer Science, IJCS, vol. 35, no. 1, (2008).

[5] M. Y. I. Idris, E. M. Tamil, N. M. Noor and K. W. Fong, “Parking Guidance System Utilizing Wireless Sensor Network and Ultrasonic Sensor”, Information Technology Journal, ISSN 1812-5638, (2009).

.