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Collage of Engineering

School of Electronics Engineering

Internet Based Robot Driving System

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Prepared by:

1. **Ali Alfadel Alhassan Mohamed**
2. **Eman Mujtaba Abdallah Abdallah**
3. **Isr'a Salim Hassan Saeed**
4. **Waad Mohammed Abd Alwahab Salih**

Supervised by:

Dr. Yassir Obeid Mohammed

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صدق الله العظيم

DEDICATION

The sake of Allah my Creator and my Master,

My great teacher and messenger, Mohammed (May Allah bless and grant him), who taught us the purpose of life,

My homeland Sudan, the warmest womb;

Sudan University: my second magnificent home;

My great parents, who never stop giving of themselves in countless ways,

My beloved brothers and sisters; who stand by me when things look bleak,

My friends for being supportive,

All the people in my life who touch my heart,

I dedicated this research to you.

ACKNOWLEGMENT

In the name of Allah, the most Merciful, the Most Compassionate all praise be to Allah, the Lord of the worlds; and prayers and peace be upon Mohammed His servant and messenger.

First and foremost, I must acknowledge my limitless thanks to Allah, the Ever-Magnificent; the Ever-Thankful, for His Help and bless. I am totally sure that this work would have never become truth, without His guidance.

I owe a deep debt of gratitude to our university for giving us an opportunity to complete this work.

I am grateful to some people, who worked hard with me from beginning till the completion of the present research particularly my supervisor Dr.Yassir Obeid Mohammed, who has been always generous during all phases of the research, and I highly appreciate the efforts expanded by Teacher Hashim Batran.

ABSTRACT

In years past, the motion of wireless robotic vehicles has been restricted by limited distance of control, line-of-sight control and interference which is mainly caused by the use of infra-red, radio frequency and microcontroller for the remote control of the robot. In life-threatening situations and regions, where human life could be in danger and may be surrounded with disasters, human safety is crucial. This project presents a solution of such problems whereby a robot driving system has been designed to provide an operator with a welfare road vision and internet based control using IOT technology. The design and testing of this system is accomplished.

المستخلص

في السنوات الماضية،كانت حركة المركبات الآلية اللاسلكية مقيدة بفعل كثير من العوامل والمؤثرات،منها مدى التحكم القصير الذي قد لا يتجاوز مدى بصر الإنسان،ومنها أيضا التداخل بين اشارات التحكم المختلفة والذي يرجع في الأساس الى استخدام تقنيات مثل الأشعة تحت الحمراء،الترددات الراديوية،والمتحكمات الدقيقة في توجيه تلك المركبات والتحكم بها عن بعد.في الأوضاع والمناطق التي تشكل تهديدا للحياة،حيث تكون حياة الإنسان في خطر ومحاطة بالكوارث،تصبح سلامة الإنسان أمرا في غاية الأهمية.هذا المشروع يقدم حلا لمثل تلك المشاكل،حيث يستعرض تصميم نظام قيادة آلي مكون من روبوت يقوم بنقل رؤية جيدة للطريق ويزود المشغل بامكانية التحكم عن طريق الإنترنت بواسطة تقنية إنترنت الأشياء.تم انجاز واختبار هذا النظام.

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LIST OF ABBREVIATIONS

ABBREV.	Explanation
JAVA	Just Another Vulnerability Announcement
JSP	Java Servlet Pages
AJAX	Asynchronous Javascript And Xml
JSON	JavaScript Object Notation
HTML	Hypertext Markup Language
CSS	Cascading Style Sheet
RF	Radio Frequency
PID	Proportional Integral Derivative
TRCC	Tele RC Car
RC	Remote control
TCP/IP	Transmission Control Protocol/Internet Protocol
ID	*Identity document*
SOAP	Simple Object Access Protocol
WLAN	Wide local area network
SQL	Structured Query Language
4G	Forth Generation
LTE	Long Term Evolution
R & D	Research and Development
SUV	sport utility vehicle

DC	Direct Current
AC	Alternative Current
RPM	revolutions per minute
IOT	Internet Of Things
USB	Universal Serial Bus
CPU	central processing unit
GPS	Global Positioning System
GSM	Global System for Mobile Communications
SIM	subscriber identity module
SOC	System On Chip
ICSP	In-Circuit Serial Programming
IDE	integrated development environment
GPRS	General Packet Radio Service
HD	High Definition
EDR	Enhanced Data Rate
BLE	Blue Tooth technology
MIPI	Mobile Industry Processor Interface

CHAPTER ONE

INTRODUCTION

Chapter One

Introduction

1.1 Preview

1.2 Problem statement

1.3 Proposed solution

1.4 Research aims and objectives

1.5 Methodology

1.6 Thesis outlines

1.1 Preview:

In the age of high technologies and speeds it has become possible to develop a mobile surveillance system for different complicated missions which cannot be done by human. The most important thing is that this kind of system does not require any special expensive equipment and can be easy controlled through common devices such as (a personal computer, a microcontroller) with a mobile phone from anywhere. The system is a striking example of up-to-date surveillance and control system. It is a completely mobile cross-platform complex which consists of a mobile platform server and client systems. The mobile platform is a car with an integrated video camera and sensors. The server performs functions of connecting link of system, manager and data collection centre. The client represents web control mechanisms and interfaces for an end user who controls the mobile platform. The main function that can be performed by this complex is a remote surveillance of the environment. The area of this thesis is a developing of a web based system for remote control of the mobile platform with modern web oriented technologies and languages as JavaScript, JSP, Java Applet, Ajax, JSON, HTML, CSS, Google Maps and Postgre. The aim of our work is to make a perfect web control service, to improve our knowledge in web technologies.

1.2 Problem Statement:

Some applications and environments are very dangerous and could be so harmful for humans, such as military applications where the soldier's life are in danger. Also in nuclear radiations areas, radiations affect the human body cells.

Human with inabilities are having a condition that markedly restricts their ability to function physically properly.

1.3 Proposed Solutions:

To convert manual control to automatic control using actuators to motivate steering wheel and the pedals. The system is to be supported by a video camera for live video transmission purpose.

1.4 Research Aims and Objectives:

The main aim of this project is to minimize and reduce the human intervention in some critical applications that require automatic driving and control and this can be fulfilled with the following objectives:

- Switching from manual driving to automatic driving.
- Using internet-of-things technology to provide wide area coverage.
- Grant a perfect vision for the driver.

1.5 Methodology:

To accomplish this project the work is to be conducted into four phases:

First phase: construction of the actuators that make movement of wheel guide, pedal gearbox stick, using set of servo motors.

Second phase: using Arduino's controllers to build controllers that receive data from internet to control actuator movement.

Third phase: design of a web site to be used to send control data signals to the controller (Arduino). Then assign it to one of the professional pages that offers control over internet throw them.

Fourth phase: use of wireless camera with the assistance of raspherry pi to monitor the process and enables the driver to take action according to the observed state of the system.

1.6 Thesis Outlines:

Chapter one previews the work, states the problem and proposed solution. It also outlines the research objectives and methodology as well as these organization.

Chapter two describes on paper background of automation and discusses published informations in relative project areas within different time periods.

Chapter three illustrates the physical parts and components that build up the system and their characteristics and structure.

Chapter four presents the systematic structure in a detailed way, and explains the process of combining software and hardware to achieve the project goals correctly.

Chapter five draws the results after fulfillment of this project, and offers a recommendations for future developments.

CHAPTER TWO

LITERATURE REVIEW

Chapter two

Literature review

2.1 Background

2.2 Literature review

2.1 Background:

Our lives have been immensely improved by decades of automation research; we are more comfortable, more productive and safer than ever before. Just imagine a world where familiar automation technologies have failed. In that world, thermostats don’t work you have to monitor your home heating or cooling system manually. Every elevator has to have a human operator to hit the right floor, most manufactured products are assembled by hand, and you have to wash your own clothes Physical systems such as elevators, cars, home appliances, and manufacturing equipment were more troublesome, more time consuming, less safe, and far less convenient [1].

Now, suppose we put ourselves in the place of someone 20 years in the future, a future of autonomous systems. A future where transportation is largely autonomous, more efficient, and far safer; a future where dangerous occupations like mining or disaster response are performed by autonomous systems supervised remotely by humans; a future where manufacturing and healthcare are twice as productive per person-hour by having smart monitoring and readily re-tasked autonomous physical agents; a future where the elderly and infirm have 24 hour in-home autonomous support for the basic activities, both physical and social, of daily life [1].

2.1.1 Automation vs. Autonomy:

Automation has been transforming our world since the industrial revolution. Most of what we experience today in our cars, in our homes, and in our factories is automation; it is not autonomy. The difference between autonomy and automation is subtle, but important. One way to articulate the difference is as follows [1]:

Automation is the implementation of a process to be executed according to a fixed set of rules with little or no human interaction. The automation can be fixed, whereby specific rules are defined for all situations (e.g. an airplane autopilot), or flexible, where different situations (e.g. different manufactured products) are guided by different rules. However, the key idea is that whatever the process is, the rules are defined and fixed in advance to achieve a predetermined outcome under all anticipated inputs. In most cases, the system can effectively be tested against all (or at least a representative set) of inputs to guarantee the desired output [1].

Autonomy is a property of a system that is able to achieve a given goal independent of external (human) input while conforming to a set of rules or laws that define or constrain its behavior. The key difference is that explicit execution rules are not (and cannot) be defined for every possible goal and every possible situation. For example, an autonomous car will take you to your destination (a goal) or park itself (another goal) while obeying the traffic laws and ensuring the safety of other cars and pedestrians. An autonomous tractor will till a field while avoiding ditches and fences and maintaining safety of the equipment and any human operators. An autonomous bricklaying system will build a wall in many different situations and with many different materials while ensuring the wall conforms to both building plans and building codes [1].

In short, a key difference is that autonomous systems must be able to act independently and intelligently in dynamic, uncertain, and unanticipated environments. But, no system is omnipotent. Another key element of the science of autonomy will necessarily be that a system must be able to detect when its goals stand in conflict with the laws that govern its behavior, and it must have a way to "fail" gracefully in those situations [1].

2.1.2 Autonomous vehicles:

Recent headlines have been awash with stories of self-driving cars and futuristic flying devices. Visions of unmanned and autonomous machines are not new, however. Experiments with unmanned aircraft began in the First World War, and a radio controlled car was demonstrated in the streets of New York in 1925. Nevertheless, recent years have seen considerable progress towards the goal of autonomous and unmanned vehicles. Such vehicles are an applied use of increasingly sophisticated artificial intelligence and robotics capabilities [2].

Unmanned vehicles can be defined as vehicles which are controlled remotely by an operator, or autonomously operated. Autonomous vehicles are vehicles which are capable of driving themselves. In order to do this, the vehicle must be able to perceive its environment, make decisions about where is safe and desirable to move, and do so. It can also be possible for a vehicle to be only partially autonomous, so that some decisions are made by a human driver, and some by the machine itself [2].

Beyond road traffic, autonomous or unmanned technology could be suitable for doing jobs which are "dull, dirty or dangerous" for humans. It has an almost inconceivable scope of applications and implications. Unmanned technology can go to places where people would be unable to, such as inside a volcano plume, or carry out repetitive or time-consuming tasks, for which people struggle to maintain concentration. Unmanned vehicles can also potentially be cheaper than the alternative of employing a team of people [2].

2.1.3 Levels of Autonomy:

Figure 2-1 shows the different levels of functions automation and driver functions.

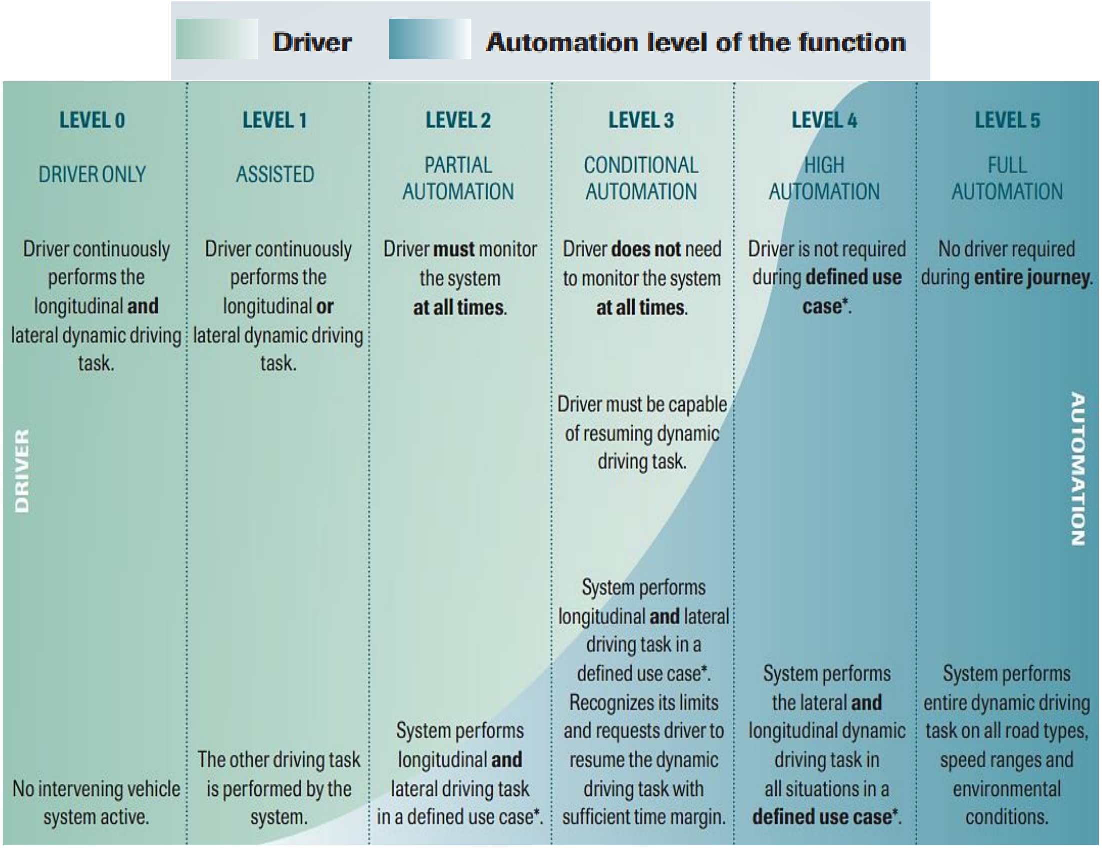

Figure 2-1: Levels of automation for automated driving

2.2 Literature review:

Thesis [3] creates a mobile robot that operates in real-time with a mediated control system to increase the robots autonomy. The robot operates remotely through a transmitter, which sends a signal to a receiver that passes the signal to a microprocessor that executes a control algorithm. The microprocessor outputs control signals to drive and steer the robot.

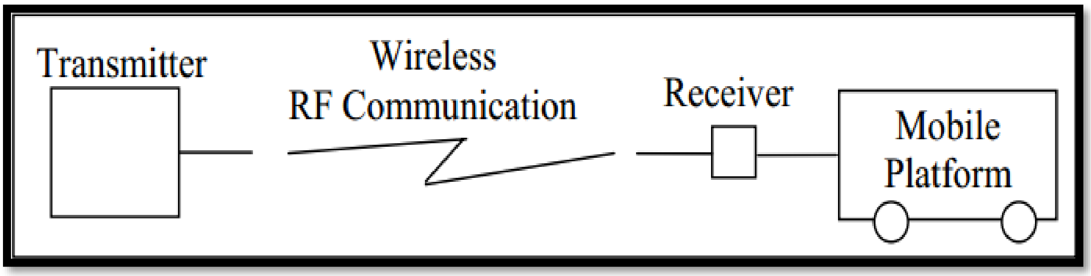

Figure 2-2: Command directly passes to mobile platform

With the configuration shown in Figure 2-2, the operator has direct control over the mobile platform, which means that the success of a task depends completely on the operator's skill. The above configuration had been investigated with a computer inserted between the receiver and mobile platform. The microprocessor will mediate the command sent from the transmitter and the signal sent to the mobile robot [3].

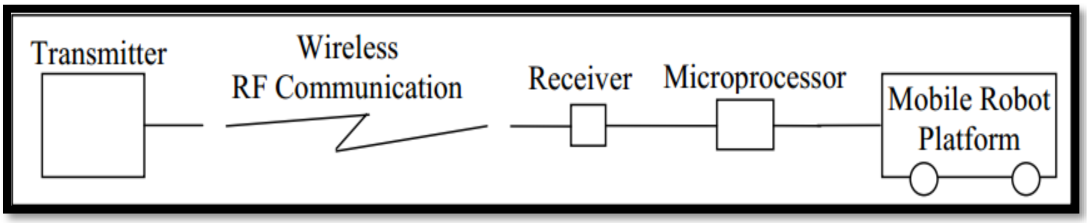

Figure 2-3: Real-time remote operation with microprocessor mediation

Using the configuration in Figure 2-3 allows for computer mediation between the command signal and the output signal sent to the mobile robot platform. Now when an operator executes a task,the microprocessor can assist by sensing the environment and help guide the vehicle through a successful task by avoiding obstacles and intercepting erroneous commands sent to the robot [3].

In the manner of autonomy, the system takes burden off and assists the operator in executing tasks. The smart car can detect obstacles and prevent collisions without totally removing control from the driver.In the manner of flexibility,the hand driver can still drive the vehicle away from the obstruction and full control will resume when he successfully moves beyond the obstacle. The digital PID controller accurately assisting the operator by tracking the desired wheel speed set by him allowing more focus attention on complicated tasks such as possibly controlling robotic arms.

The encoder design should be more powerful to handle dirt, water, vibration and shock, In addition, the obstacle detection array should be enhanced by replacing the infrared rangers with ultrasonic rangers which has longer distance sensing range.

Thesis [4] design a conceptual diagram of the TRCC system, as shown in Figure 2-4 The research is separated into two parts. The first part is the client part for a user to send the remote commands to operate the RC car. The second part is the server part for receiving remote command and operating the RC car based on the received operation. Both server and client system are installed in the Internet network for a remote controlling purpose.

This module connects a client computer to a server computer via the Internet network by using the TCP/IP protocol. The TRCC system uses port number 8080 to transfer the data between the client and server computers. This module consists of 2 sub-modules, which are the client connection sub-module and the server connection sub-module. Both sub-modules operate the TCP/IP connection between client-server computers. Figure 2-5 illustrates the structure chart of TCCR system [4].

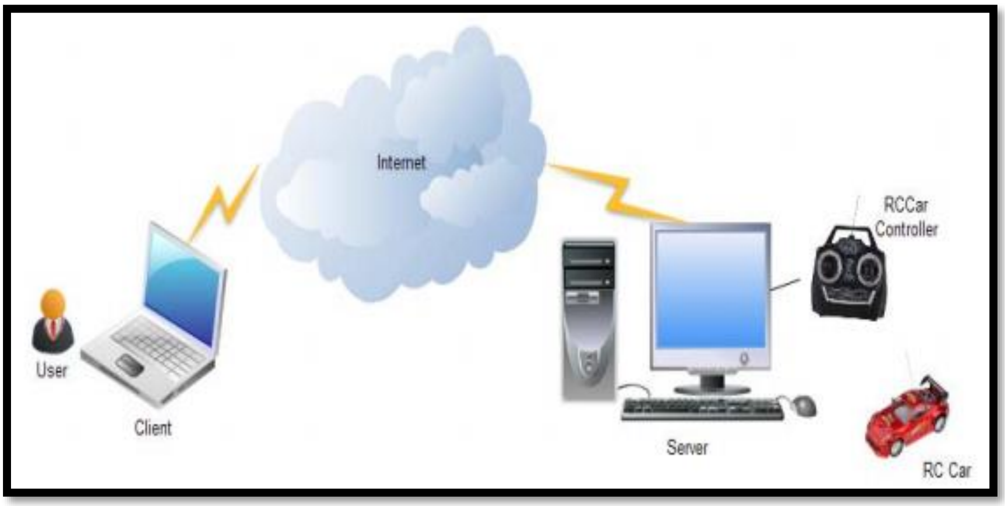

Figure 2-4: The conceptual diagram of the TRCC system

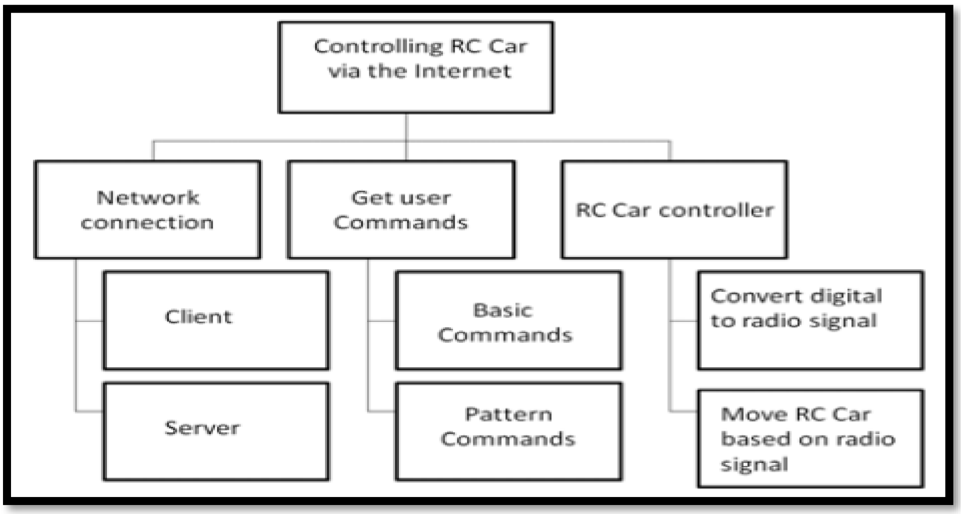

Figure 2-5: The TRCC system structure chart

Thesis [5] system architecture which consists of Telepresence Robot requirements for both hardware and software. The hardware is based on the electrical, electronics and communication devices. The Software is based on open source platform.

When a user logs on to Techbot web user interface,the very first thing that needs to be done is synchronize the sequence ID with the

Techbot web application gateway.This sequence ID is needed to ensure SOAP requests are processed by the Techbot web application gateway in the order they were submitted by a user through a browser.Afterwards,the two timers are started, the first timer is used to poll the Techbot web application gateway for the TechRobot status.The status is important because the status contains relevant information (battery temperature,battery charge,etc) a user might need to determine the next best course of action. Figure 2-6 represents a functional digram of the system[5].

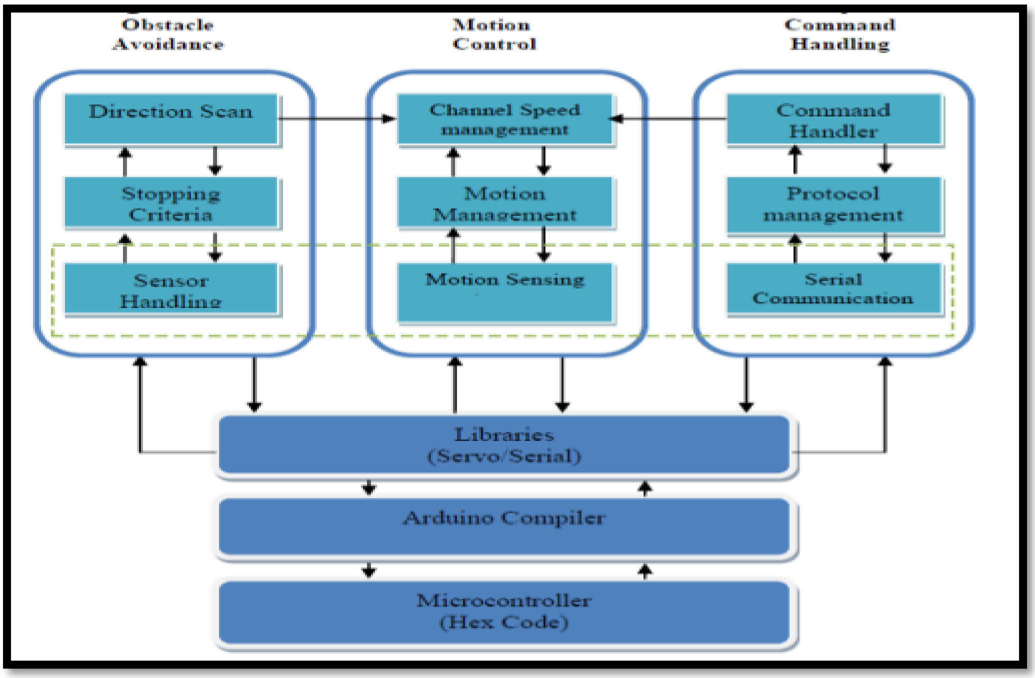

Figure 2-6: Functional Diagram for Object detection and Avoidence

System that antecedently explained is portable and have a number of advavantages. The user interface of the Robot implemented with low cost and wide communication coverage range. Moreover, the TechRobot was capable of negotiating with another access point on a different WLAN that had higher signal ,and connecting to another wireless network between 7-150 seconds.

On the other hand, Website pictures would only load in the Internet Explorer but not the Firefox browser, even though the static html code was written properly.

Thesis [6] In order to access the robot remotely with a secure connection that is platform- and device-independent, the .NET framework provides an effective and ideal solution by using the concept of web services.The applications of web services provide a safe and secure connection with the robot at one end and the process or operation at the other end of the connection. The framework also does not confine itself to computers and makes the whole operation inter compatible across devices. Thus, using the .NET framework in ASP.NET, the code for operation of a robot can be programmed on a different server, which can be accessed using the web services protocols using a web interface to remotely access it.Remote access of Bearcat Robot III was performed using web services in the .NET framework. The pages were designed using ASP. NET with SQL server as the back end. Web services were then consumed from a different server into this server. The pages were integrated together and were hosted on the web.

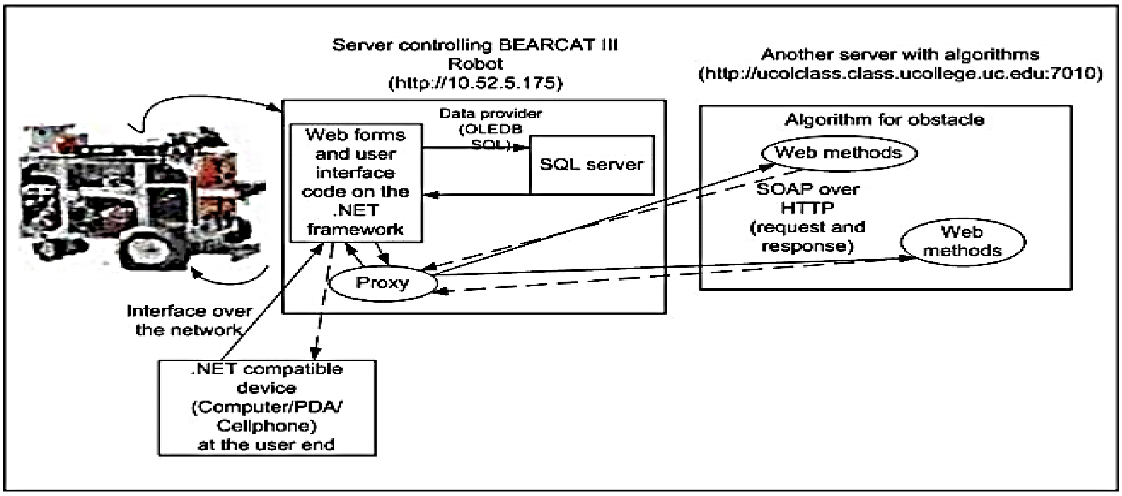

Figure 2-7: Schematic layout of operation

Implementation of the operation which descriped in Figure 2-7 using a web services provides the user with secure and reliable transfer of information.Net framework presents an inter-operatability characteristic. furthermore, this system permits any Internet user to become a consultant for tele-pathology without the acquisition of specialized hardware or software. As a disadvantage, one of the most unacceptable issues is the coding in the client side.

Thesis [7] For the system shown in Figure 2-8 the webcam will capture live data with regards to its surroundings and then send it to a desired device through internet. The user will be observing this data on the monitor at the user end. According to the desired movement, the user will control the robotic vehicle and the robotic arm through the webpage or keyboard available at the user end. The input given through the webpage or the keyboard is then sent through the internet and the desired movement occurs at the robot end.

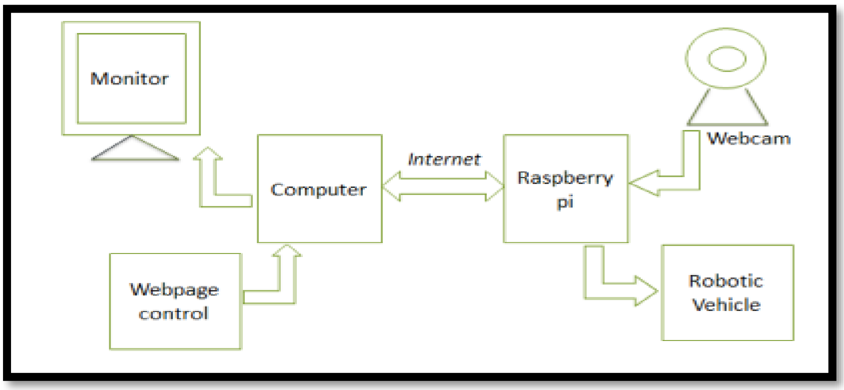

Figure 2-8: Block diagram

Thesis [8] Ford tested a technology that controls vehicles thousands of miles away using off-the-shelf parts and a standard 4G LTE connection. At the automaker's new Silicon Valley R&D center, software engineer Sudipto Aich sat at a desk with three computer monitors with a steering wheel and pedals designed for gaming. He hit the accelerator, and just like that, was driving a golf cart around a parking lot on Georgia Tech's campus in Atlanta, 2,400 miles away. The system is one of 25 "mobility experiments" Ford commissioned to explore ideas that might one day appear in cars.

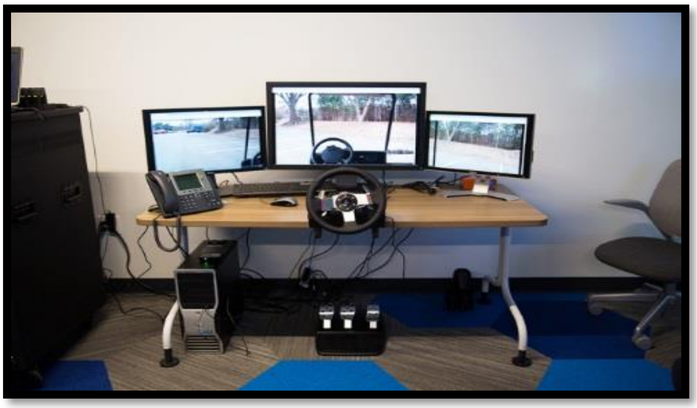

Figure 2-9: Ford's remote controlling technology

The system viewed in Figure 2-9 above doesn't rely on new or expensive technology, beside that it costs a total less than 300$.It consists of off the shelf sensors.It's easy to tap into the controllers on modern, especially electric vehicles (like golf carts), so there is no need for a physical mechanisms to turn the wheel and apply the brakes or accelerator [8].

By looking closer to the structure of the system, a defect has been noticed which is nonexistence of the safety benefits that will come once humans are programmed out of the loop.

Thesis [9] Jaguar Land Rover tested a sport utility vehicle which displayed in Figure 2-10 using a smartphone application to drive through streams and over rocky patches in a potential contribution to auto technology that doesn't require someone to be at the wheel.

The Range Rover Sport steers, accelerates, brakes and makes U-turns with the driver walking alongside the SUV to help it negotiate rocky or steep terrain. Away from the backwoods, drivers can use the app to steer the vehicle into and out of tight parking spots [9].

Figure 2-10: Land Rover autonomous car technology

This technology reduced human intervention.But according to the technique of remote-controlling app that has been used,it can not be exploited within a distance longer than 10 meters.It,s also expected to require only “small” changes to auto-safety and insurance regulations because the user would still be in full control of the vehicle.

CHAPTER THREE

HARDWARE COMPONENTS

Chapter three

Hardware Components

3.1	Servo motor
3.2	Raspberry pi 2 model B V1.1
3.3	Arduino Uno
3.4	LinkIt one
3.5	Raspberry pi camera Rev1.3
3.6	Voltage regulator LM7805
3.7	Polarized capacitor
3.8	Bread board
3.9	Battery 9volt
3.10	Power bank
3.11	USB cables
3.12	Male-to-male jumper wires
3.13	Battery connector

3.1 Servo motor:

Figure 3-1: Servo motor

A servo motor which presented in figure 3-1 is an electrical device which can push or rotate an object with great precision. If you want to rotate an object at some specific angle or distance, then you can use a servo motor. It is just made up of simple motor which run through servo mechanism. If the motor 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. The position of a servo motor is decided by electrical pulse and its circuitry is placed beside the motor.

3.1.1 Types of servo motors:

a) Depending on it's movement:

1. **Positional rotation servo**: This is the most common type of servo motor. The output shaft rotates in about half of a circle, or 180 degrees. It has physical stops placed in the gear mechanism to prevent turning beyond these limits to protect the rotational sensor. These common servos are found in radio-controlled cars and water- and aircraft, toys, robots, and many other applications.
2. **Continuous rotation servo**: This is quite similar to the common positional rotation servo motor, except it can turn in either direction indefinitely. The control signal, rather than setting the static position

of the servo, is interpreted as the direction and speed of rotation. The range of possible commands causes the servo to rotate clockwise or counterclockwise as desired, at varying speed, depending on the command signal. You might use a servo of this type on a radar dish if you mounted one on a robot. Or you could use one as a drive motor on a mobile robot.

3. **Linear servo:** This is also like the positional rotation servo motor described above, but with additional gears (usually a rack and pinion mechanism) to change the output from circular to back-and-forth. These servos are not easy to find, but you can sometimes find them at hobby stores where they are used as actuators in larger model airplanes.

b) Depending on its gear type:

1) Plastic Gear servo motor as figure 3-2 shows.

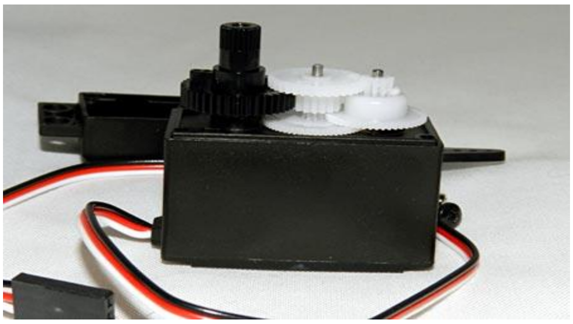

Figure 3-2: Plastic gear servo

2) Metal gear servo motor which viewed in figure 3-3.

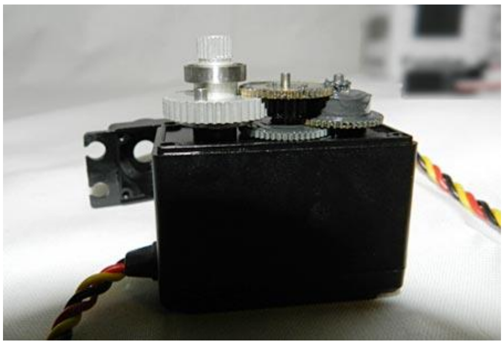

Figure 3-3: Metal gear servo

3.1.2 Servo Mechanism:

It consists of three parts:

1) Controlled device.
2) Output sensor.
3) Feedback system.

It is a closed loop system where it uses positive feedback system to control motion and final position of the shaft. Here the device is controlled by a feedback signal generated by comparing output signal and reference input signal.

reference input signal is compared to reference output signal and the third signal is produces by feedback system. And this third signal acts as input signal to control device. This signal is present as long as feedback signal is generated or there is difference between reference input signal and reference output signal. So the main task of servomechanism is to maintain output of a system at desired value at presence of noises.

3.1.3 Internal and external structure:

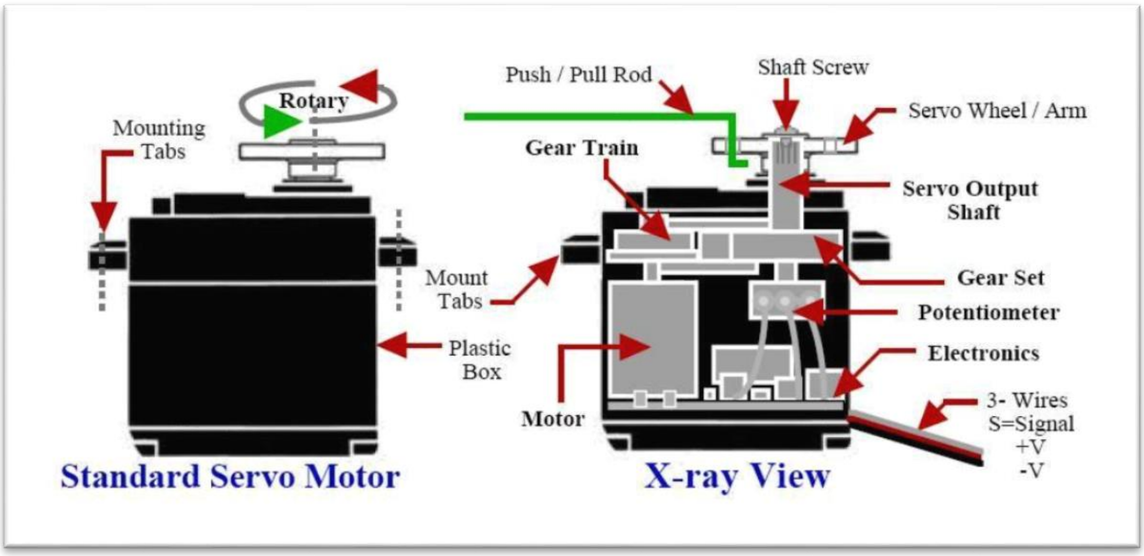

Figure 3-4: Internal and External structure of servo motor

Figure 3-4 illustrates the basic hardware components that construct servo motor internally and externally.

3.1.4 Working principle of Servo Motors:

A servo consists of a Motor (DC or AC), a potentiometer, gear assembly and a controlling circuit. First of all in our design a gear assembly is to reduce RPM and to increase the motor torque. Say at initial position of servo motor shaft, the position of the potentiometer knob is such that there is no electrical signal generated at the output port of the potentiometer. Then an electrical signal is given to another input terminal of the error detector amplifier. Now difference between these two signals, one comes from potentiometer and another comes from other source, is processed in feedback mechanism and output is provided in term of error signal. This error signal acts as the input for motor and motor starts rotating. Now motor shaft is connected with potentiometer and as motor rotates the potentiometer generates a signal. So when the potentiometer's angular position changes, its output feedback signal changes. After sometime the position of potentiometer reaches at a position that the output of potentiometer is same as external signal provided. At this condition, there will be no output signal from the amplifier to the motor input as there is no difference between external applied signal and the signal generated at potentiometer, and in this situation motor stops rotating.

3.1.5 Controlling servo motor:

Figure 3-5 explains that servo motor is controlled by Pulse with Modulation (PWM) which is provided by the control wires. There is a minimum pulse, a maximum pulse and a repetition rate. Servo motor can turn 90 degrees from either direction form its neutral position. The servo motor expects to see a pulse every 20 milliseconds (ms) and the length of the pulse will determine how far the motor turns. For example, a 1.5 ms pulse will make the motor turn

to the 90° position, such as if pulse is shorter than 1.5 ms shaft moves to 0° and if it is longer than 1.5 ms than it will turn the servo to 180°.

Servo motor works on PWM principle, means its angle of rotation is controlled by the duration of applied pulse to its Control PIN. Basically servo motor is made up of DC motor which is controlled by a variable resistor (potentiometer) and some gears**.** High speed force of DC motor is converted into torque by Gears. We know that WORK= FORCE X DISTANCE, in DC motor Force is less and distance (speed) is high and in Servo, force is High and distance is less. Potentiometer is connected to the output shaft of the Servo, to calculate the angle and stop the DC motor on required angle.

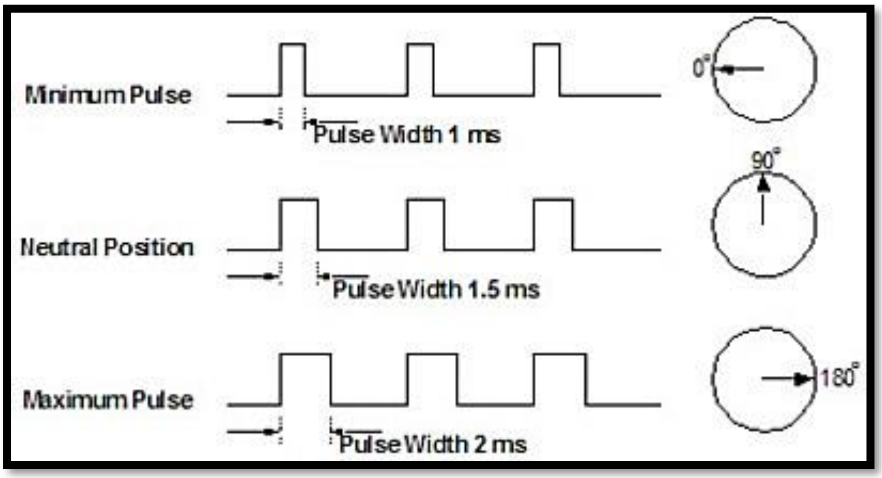

Figure 3-5: Control pulse of servo motor

Servo motor can be rotated from 0 to 180 degree, but it can go up to 210 degrees, depending on the manufacturing. This degree of rotation can be controlled by applying the Electrical Pulse of proper width, to its Control pin. Servo checks the pulse in every 20 milliseconds. Pulse of 1 ms (1 millisecond) width can rotate servo to 0 degree, 1.5ms can rotate to 90 degrees (neutral position) and 2 ms pulse can rotate it to 180 degrees.

3.2 Raspberry pi 2 model B V1.1:

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python.

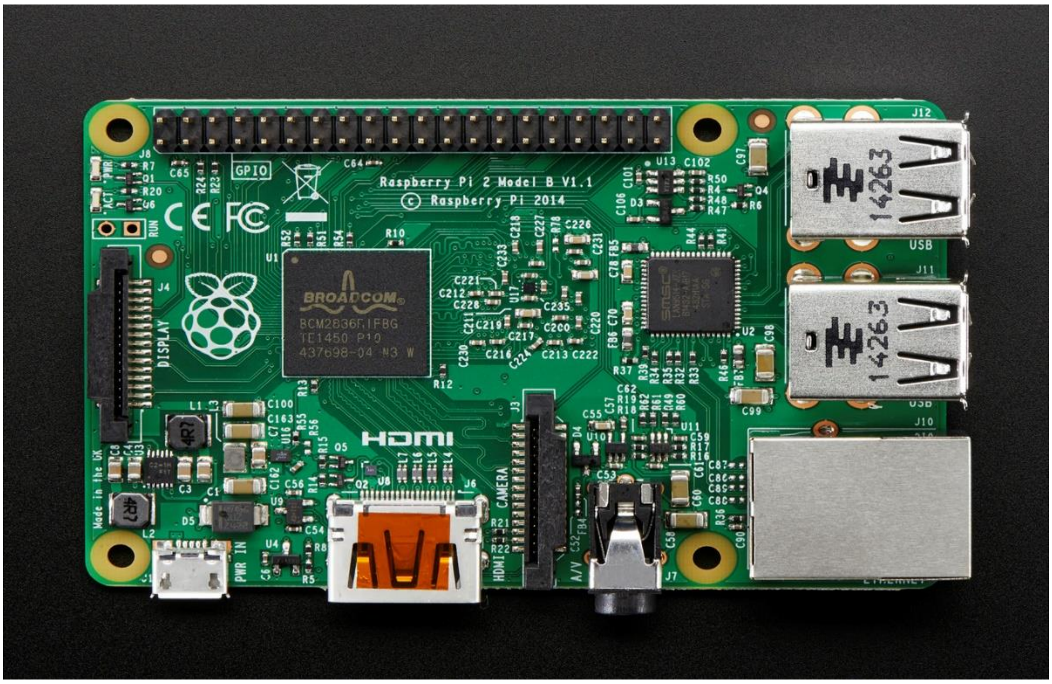

Figure 3-6: Raspberry pi 2 model B V1.1

The Raspberry Pi 2 B single computer board from the Raspberry Pi Foundation can help you learn about programming and computing or create exciting, innovative projects. The Pi 2 B shown in figure 3-6, also has the processing power to create Internet of Things (IoT) projects.

3.2.1 features:

- A 900MHz quad-core ARM Cortex-A7 CPU.

- 1GB RAM.
- USB ports.
- 40 GPIO pins.
- Full HDMI port.
- Ethernet port.
- Combined 3.5mm audio jack and composite video.
- Camera interface (CSI).
- Display interface (DSI).
- Micro SD card slot.
- VideoCore IV 3D graphics core.

3.2.2 Hardware Architecture:

Figure 3-7 presents the hardware architecture of raspberrypi2 and its basic components.

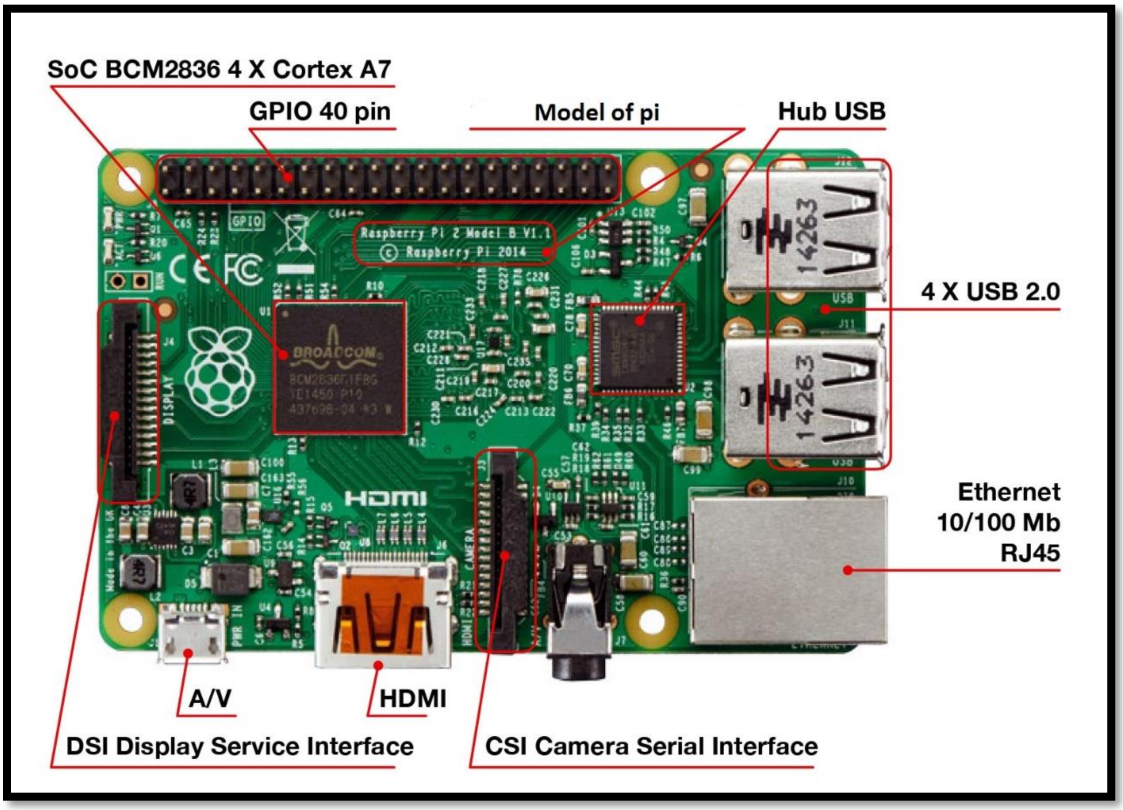

Figure 3-7: Hardware architecture of raspberrypi2

3.2.3 Benefits of using raspberry pi:

- It has a low-cost.
- It’s easy to use.
- It’s Linux-based open source.
- It has great connectivity.
- It’s flexible to the user.

3.3 Arduino Uno:

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. Also Arduino is an open-source physical computing platform based on a simple i/o board and a development environment that implements the Processing/Wiring language. Arduino can be used to develop stand-alone interactive objects or can be connected to software on your computer. Figure 3-8 shows the Arduino Uno main board while Figure 3-9 presents the hardware architecture of Arduino Uno.

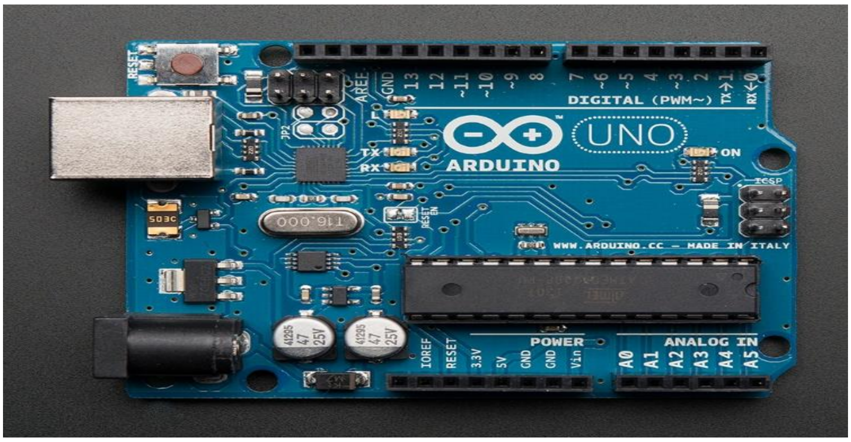

Figure 3-8: Arduino Uno

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0.

3.3.1 Hardware architecture of Arduino Uno:

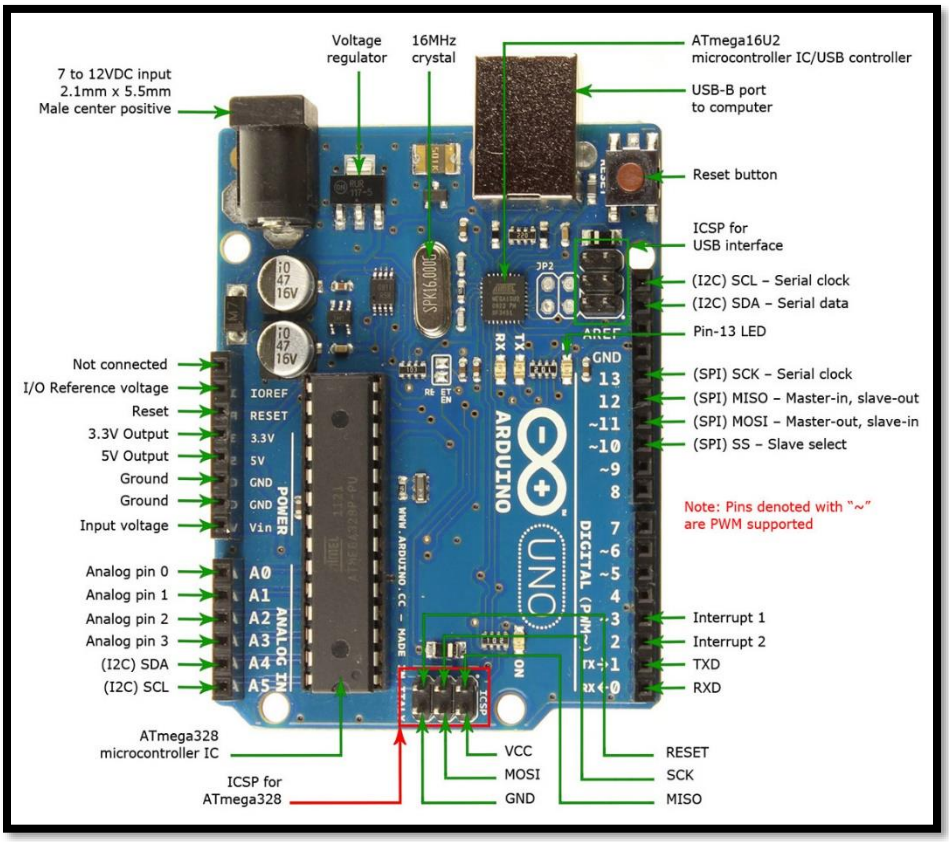

Figure 3-9: Hardware Architecture of Arduino Uno

3.3.2 Technical Features:

- ✓ ATmega 328 microcontroller
- ✓ Input voltage - 7-12 V
- ✓ 14 Digital I/O Pins (6 PWM outputs)
- ✓ 6 Analog Inputs
- ✓ 32 k Flash Memory
- ✓ 16 Mhz Clock Speed

3.3.3 Advantages of Arduino Uno over microcontroller:

- ➢ It's easy to program.

- It's well documented.
- It's relatively cheap.
- It has a lot of add-ons readymade.
- Arduino is made to help you use the microcontroller easily.
- Includes free code library.
- The Arduino Environment provides easiest debugging environment which is cross-platform and is accepted by every member of the family.
- You don't need to take datasheet out every time and figure what the architecture is what are the addresses ofthe microcontroller to write simple functions like delay or interrupt.

3.4 LinkIt one:

The LinkIt ONE development board shown in Figure 3-10 is an open source, high performance board for prototyping Wearables and IoT devices. It's based on the world's leading SoC for Wearables, MediaTek Aster (MT2502) combined with high performance Wi-Fi (MT5931) and GPS (MT3332) chipsets to provide you with access to all the features of MediaTek LinkIt. It also provides similar pin-out features to Arduino boards, making it easy for you to connect to various sensors, peripherals, and Arduino shields.

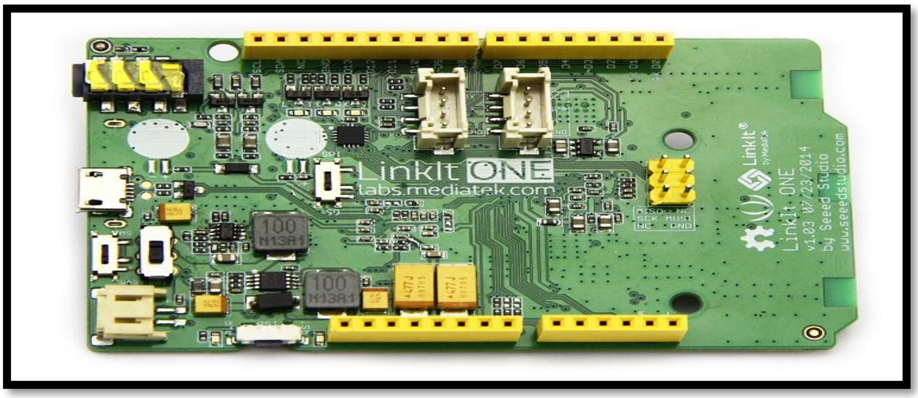

Figure 3-10: LinkIt one

3.4.1 Hardware overview of linkit one:

Figure 3-11 is a Front view of LinkIt one hardware and Figure 3-12 is its hardware back view.

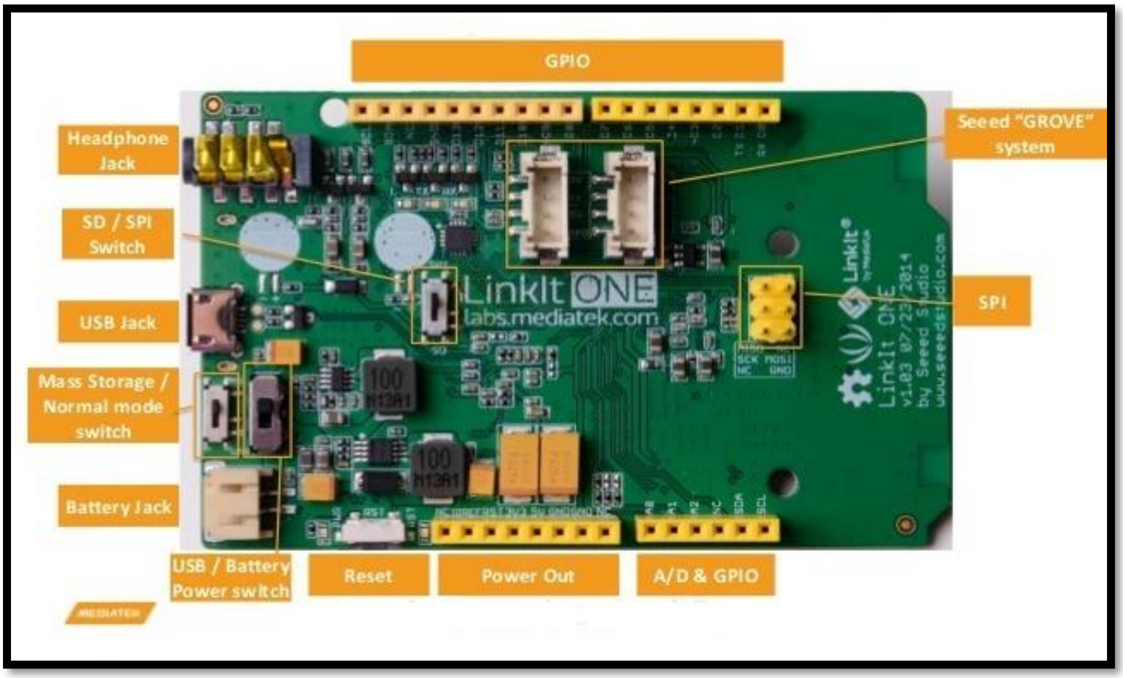

Figure 3-11: LinkIt one Front view of hardware

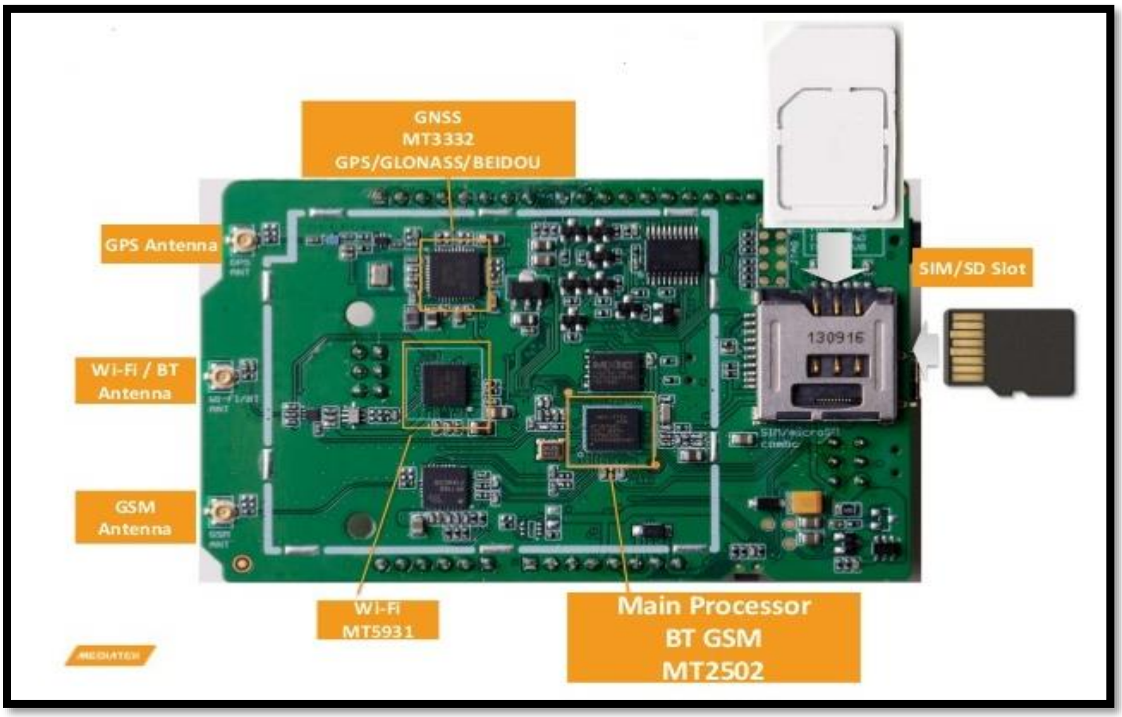

Figure 3-12: LinkIt one back view of hardware

3.4.2 Features:

- Includes ARM7 EJ-S™, GSM, GPRS, Wi-Fi, Bluetooth BR/EDR/BLE, GPS, Audio codec, and SD card connector on a single development board.
- Pin-out similar to Arduino boards, including Digital I/O, Analog I/O, PWM, I2C, SPI, UART and power supply, compatible with Arduino.
- Provides various interfaces for connecting to most sensors, peripherals, Groves, and other widgets.

3.4.3 Applications:

- ❖ Internet of Things.
- ❖ Smart House.
- ❖ Wearable Design.
- ❖ Industrial.
- ❖ Sensor Hub.
- ❖ Automation & Transportation.

3.5 Raspberry pi camera Rev 1.3:

The Raspberry Pi Camera Board plugs directly into the CSI connector on the Raspberry Pi. It's able to deliver a crystal clear 5MP resolution image, or 1080p HD video recording at 30fps.

Custom designed and manufactured by the Raspberry Pi Foundation in the UK, the Raspberry Pi Camera Board features a 5MP (2592×1944 pixels) Omnivision 5647 sensor in a fixed focus module. The module attaches to Raspberry Pi, by way of a 15 Pin Ribbon Cable, to the dedicated 15-pin MIPI Camera Serial Interface (CSI), which was designed especially for interfacing to cameras. The CSI bus is capable of extremely high data rates, and it exclusively carries pixel data to the BCM2835 processor.

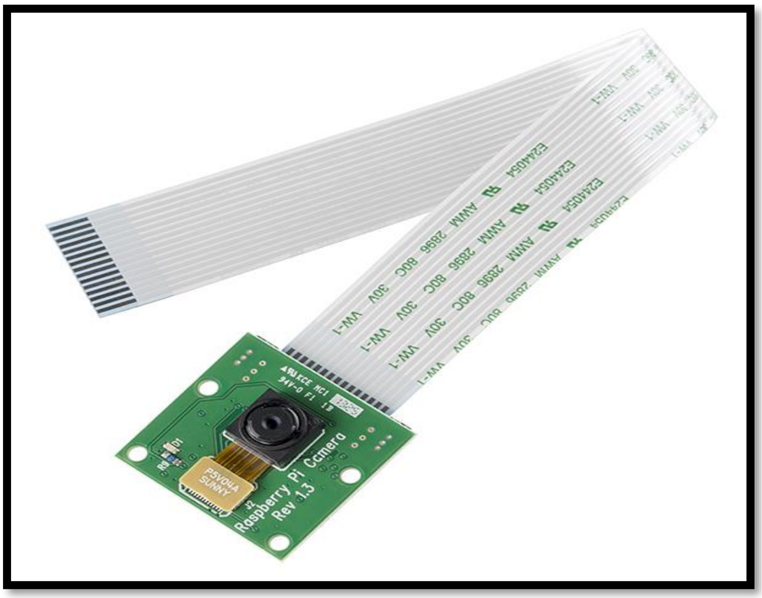

Figure 3-13: Raspberry pi camera

As Figure 3-13 shows, the board itself is tiny, at around 25mm x 20mm x 9mm, and weighs just over 3g, making it perfect for mobile or other applications where size and weight are important. The sensor itself has a native resolution of 5 megapixels, and has a fixed focus lens onboard. In terms of still images, the camera is capable of 2592 x 1944 pixel static images, and also supports 1080p @ 30fps, 720p @ 60fps and 640x480p 60/90 video recording.

The camera is supported in the latest version of Raspbian, the Raspberry Pi's preferred operating system.

3.5.1 Features:

- Fully Compatible with Both the Model A and Model B Raspberry Pi.

- 5MP Omnivision 5647 Camera Module.
- Still Picture Resolution: 2592 x 1944.
- Video: Supports 1080p @ 30fps, 720p @ 60fps and 640x480p 60/90 Recording.
- 15-pin MIPI Camera Serial Interface – Plugs Directly into the Raspberry Pi Board.
- Size: 20 x 25 x 9mm.
- Weight 3g.
- Fully Compatible with many Raspberry Pi cases.

3.6 Voltage regulator LM7805:

Voltage Regulator is one of the most important and commonly used electrical components. Voltage Regulators are responsible for maintaining a steady voltage across an Electronic system. Voltage fluctuations may result in undesirable effect on an electronic system, so maintaining a steady constant voltage is necessary according to the voltage requirements of a system.

Voltage regulator IC's are the IC's that are used to regulate voltage. IC 7805 is a 5V Voltage Regulator that restricts the voltage output to 5V and draws 5V regulated power supply. It comes with provision to add heatsink.

The maximum value for input to the voltage regulator is 35V. It can provide a constant steady voltage flow of 5V for higher voltage input till the threshold limit of 35V. If the voltage is near to 7.5V then it does not produce any heat and hence no need for heatsink. If the voltage input is more, then excess electricity is liberated as heat from 7805.

IC 7805 shown in Figure 3-14 is a series of 78XX voltage regulators. It's a standard, from the name the last two digits 05 denotes the amount of voltage that it regulates. Hence a 7805 would regulate 5v and 7806 would regulate 6V and so on.

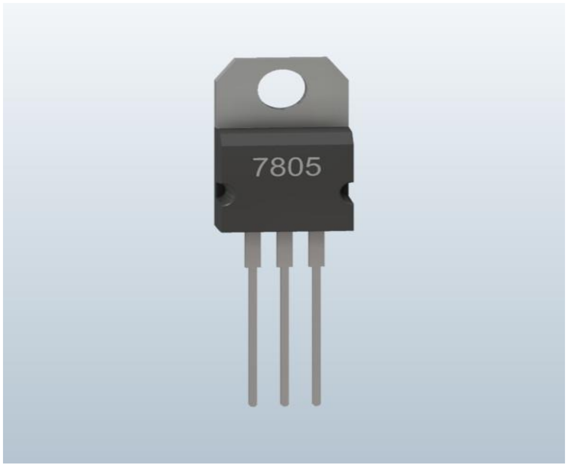

Figure 3-14: Voltage regulator IC LM7805

3.6.1 LM7805 pinout diagram:

Figure 3-15 depicts the pinout diagram of LM7805.

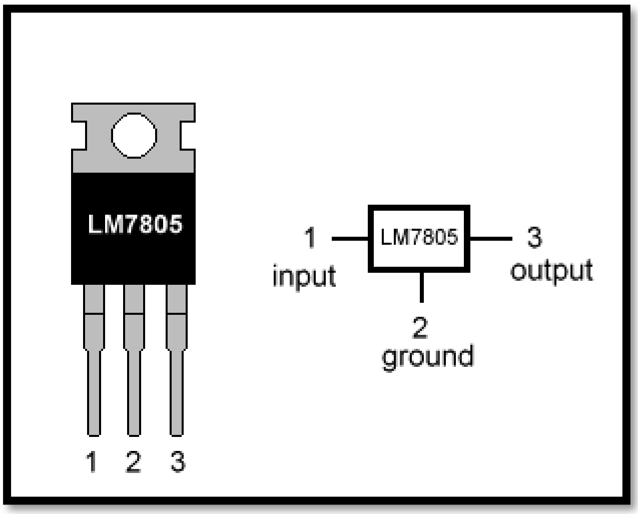

Figure 3-15: Pinout diagram of LM7805

Table 3-1: Pinout diagram of Lm7805

1	INPUT	In this pin of the IC positive unregulated voltage is given in regulation.
2	GROUND	In this pin where the ground is given. This pin is neutral for equally the input and output.
3	OUTPUT	The output of the regulated 5V volt is taken out at this pin of the IC regulator.

3.6.2 LM7805 Voltage regulator circuit:

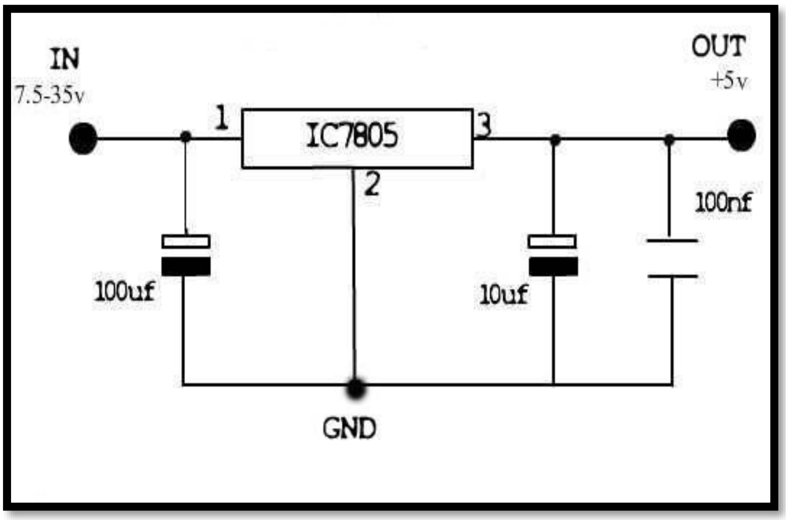

Figure 3-16: Circuit of LM7805

3.7 Polarized capacitors:

A capacitor consists of two conducting plates with an isolation material called a dielectric between them. The conducting plates can be aluminum discs, aluminum foil or a thin film of metal. When a potential difference like a battery is applied to the two different plates of the capacitor electricity flows into the plates and they are charged up until they are at the same potential as the battery. When the battery is removed the capacitor retains it’s charged up state for a while until the charge slowly leaks away. Capacitance is measured in Farads but a Farad is a very big unit and most capacitors are in the Micro Farad and Pico Farad range.

A Polarized Capacitor's plates are polarity sensitive and are normally electrolytic and tend to be bigger than normal non-polarized capacitors.

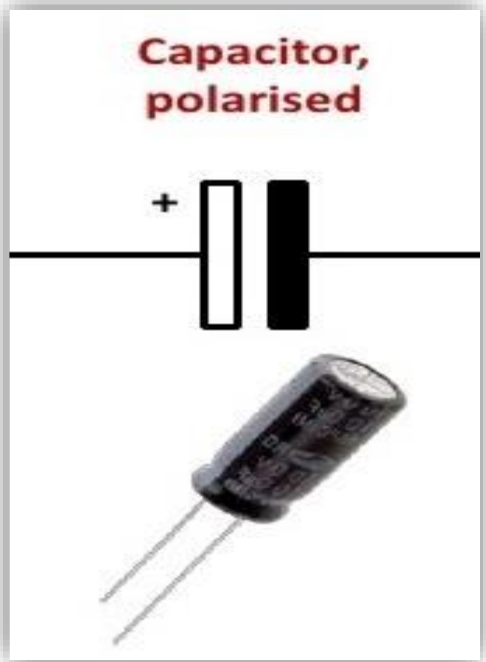

Figure 3-17: Polarizes capacitor

3.8 Bread board:

A breadboard is a solderless device for temporary prototype with electronics and test circuit designs. Most electronic components in electronic circuits can be interconnected by inserting their leads or terminals into the holes and then making connections through wires where appropriate. The breadboard has strips of metal underneath the board and connect the holes on the top of the board. The metal strips are laid out as shown below in Figure 3-18. Note that the top and bottom rows of holes are connected horizontally and split in the middle while the remaining holes are connected vertically.

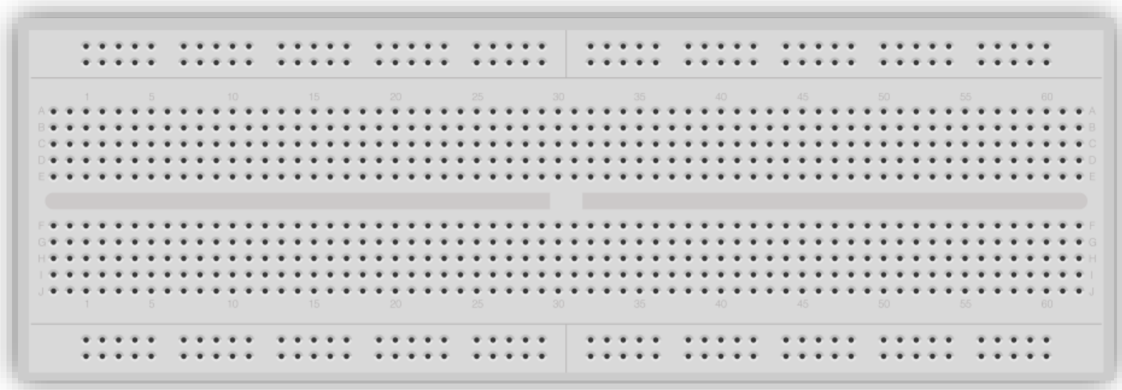

Figure 3-18: Bread board

A breadboard also known as protoboard is a type of solderless electronic circuit building. You can build an electronic circuit on a breadboard without any soldering! Best of all it is reusable. It was designed by Ronald J Portugal of EI Instruments Inc. in 1971. Building or prototyping circuits on a breadboard like the one presented in Figure 3-19 is also known as 'breadboarding '.

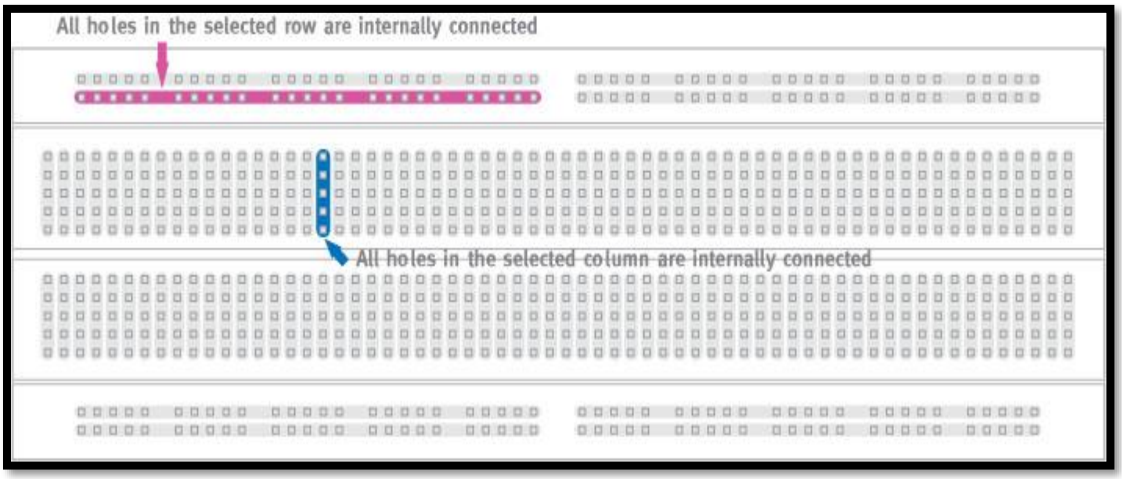

Figure 3-19: Bread board interconnection

3.9 Battery 9volt:

The dry cell battery is one of the most commonly used types, including AA, 9-volt, and watch batteries. Dry cell batteries are different from wet cells because their electrolytes are contained in a low-moisture paste, while a wet cell has electrolytes contained in a liquid, hence the difference is in names. A chemical reaction within the battery creates an electrical charge that flows from inside to an outer circuit that is connected to an electrical device.

Figure 3-20: Battery 9 volts

3.9.1 Internal structure of dry cell battery:

Dry cell batteries, regardless of their size, typically have the same basic components as those shown in Figure 3-20. At the center of each is a rod called a cathode, which is often made of carbon and surrounded by an electrolyte paste. Different chemicals can be used to create this paste, such as ammonium chloride and manganese dioxide, depending on the type of battery. The cathode and electrolyte paste are wrapped in paper or cardboard and sealed into a metal cylinder called an anode, which is typically made of zinc.

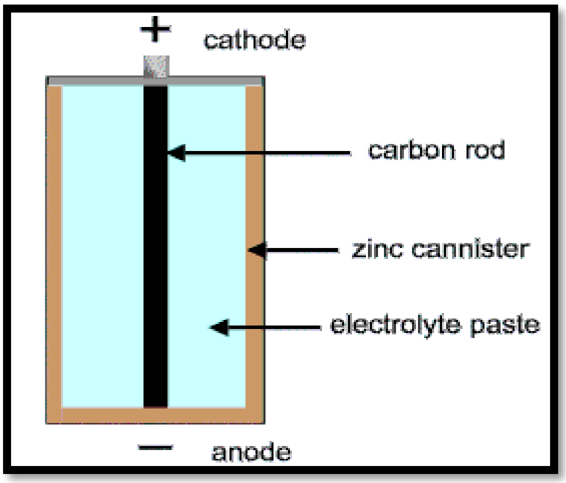

Figure 3-21: Structure of dry cell battery

3.9.2 Working principle:

The anode in the dry cell battery has two terminals, one is positive and the other is negative. When a load is connected to the battery's terminals, a chemical reaction occurs between the anode and the paste that produces roughly 1.5 volts of electricity. A pin or "collector" in the middle of the battery conducts this charge out of the battery to an external circuit. This circuit physically connects to the electronic device in which the battery is placed, providing the charge necessary for the device to function.

Each set of anode, electrolyte, and cathode acts as a single cell, and multiple cells can be connected together within one dry cell battery to produce a higher overall voltage. After the load has been connected for a long time, the battery's chemicals break down and no longer produce a charge. Primary batteries should be discarded once they reach this point, while secondary batteries can be recharged through special devices. This effectively reverses the chemical reaction within each cell, allowing the battery to continue working.

3.10 Power bank:

Portable Power Banks are comprised of a special battery in a special case with a special circuit to control power flow. They allow you to store electrical energy (deposit it in the bank) and then later use it to charge up a mobile device (withdraw it from the bank). Power Banks have become increasingly popular as the battery life of our beloved phones, tablets and portable media players is outstripped by the amount of time we spend using them each day. By keeping a battery backup close by, you can top-up your device(s) while far from a wall outlet.

The Power Banks we're talking about are good for almost any USB-charged devices. Cameras, GoPros, Portable speakers, GPS systems, MP3 players, smartphones and even some tablets can be charged from a Power Bank - practically anything that charges from USB at home can be charged from a Power Bank. Power Banks may also be known as Power Stations or Battery Banks. A power bank looks like the one shown in Figure 3-22.

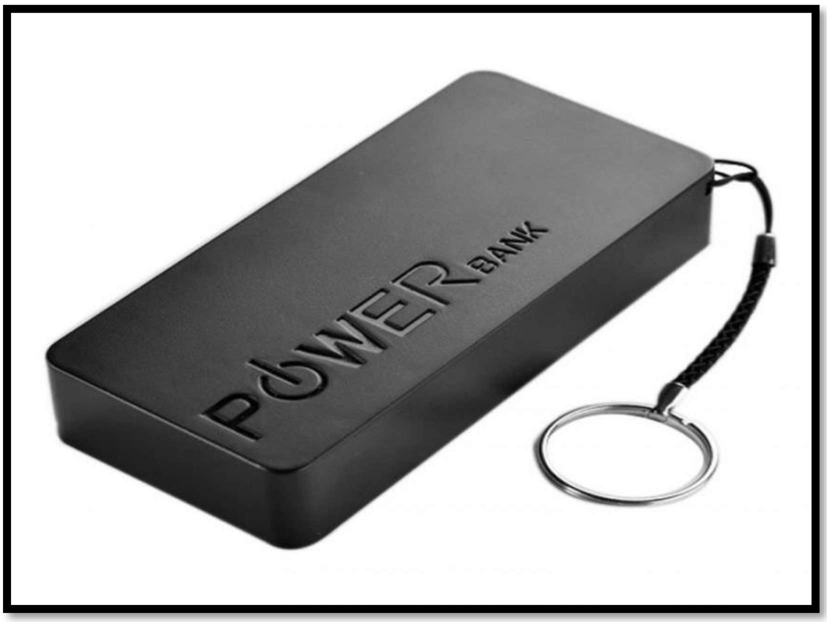

Figure 3-22: Power bank

3.10.1 Charging the power bank:

Most commonly, a Power Bank will have a dedicated input socket for receiving power. This power can come from a USB socket on your computer, but may charge faster when using a wall socket adapter. We most often see Power Banks use a Mini or Micro-USB socket for charging, and full-sized USB sockets for discharging. On very rare occasions, Power Banks can use the same socket for input and output, but this is rare and should not be assumed of any Power Bank, as trying to force power into an output can damage the battery. It is advised to check the manual for specific instructions if you're not able to find a clearly marked input socket.

3.11 USB cables:

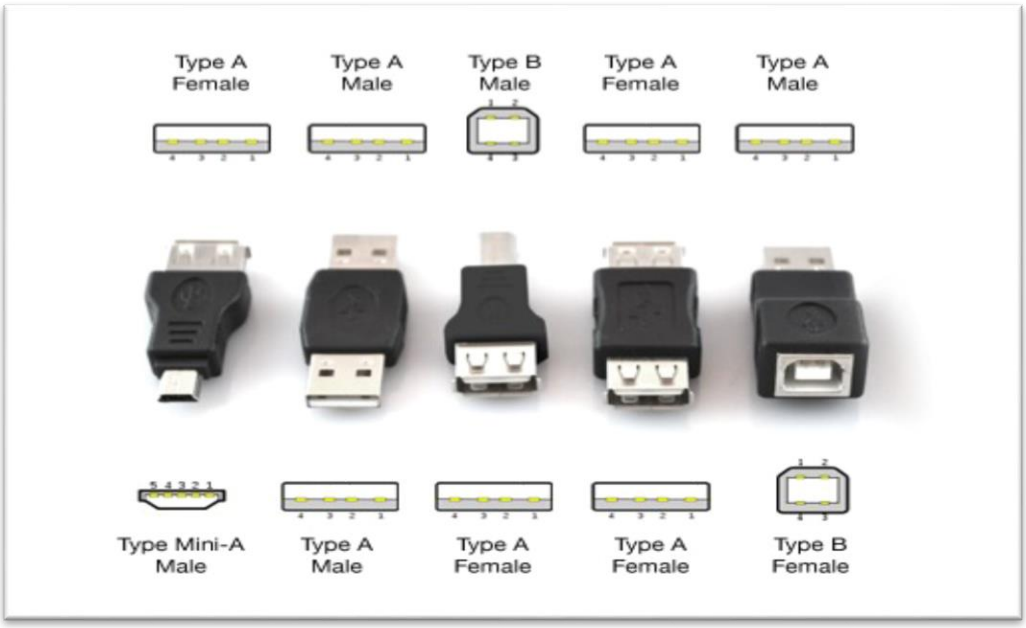

Figure 3-23: USB types

A Universal Serial Bus (USB) Cable is primarily used to connect a USB device to a host. Common hosts include computers and video game consoles. While there are multiple USB standards, cables that are fully compliant with USB 1.1 specifications will work with USB 2.0

technology and vice versa. USB cables can be identified by the USB trident on top of the plug over molds of type “A” and “B” connectors.

A USB cable can have numerous types of plug ends, the style of which is called a connector. Connector types as those presented in Figure 3-23, include Standard-A, Standard-B, Mini-B, Micro-A, Micro-B, and Micro-AB. These plugs go into corresponding receptacles built into hosts and devices. Standard-A receptacles are the type commonly referred to as USB ports on computers; Standard-B receptacles are usually found on large peripheral devices such as printers and scanners; Mini and micro receptacles are usually on small devices like digital cameras and cellular phones; Mini-AB receptacle are, according to the standard, only on USB On-The-Go devices. Most USB cables that connect a device to a computer will have a Standard-A plug on one end and another type of plug on the other.

3.12 Male-to-male jumper wires:

A jumper wire of Figure 3-24 is a conducting wire used to transfer electrical signals between two points in a circuit. The wires can either be used to modify circuits or to diagnose problems within a circuit.

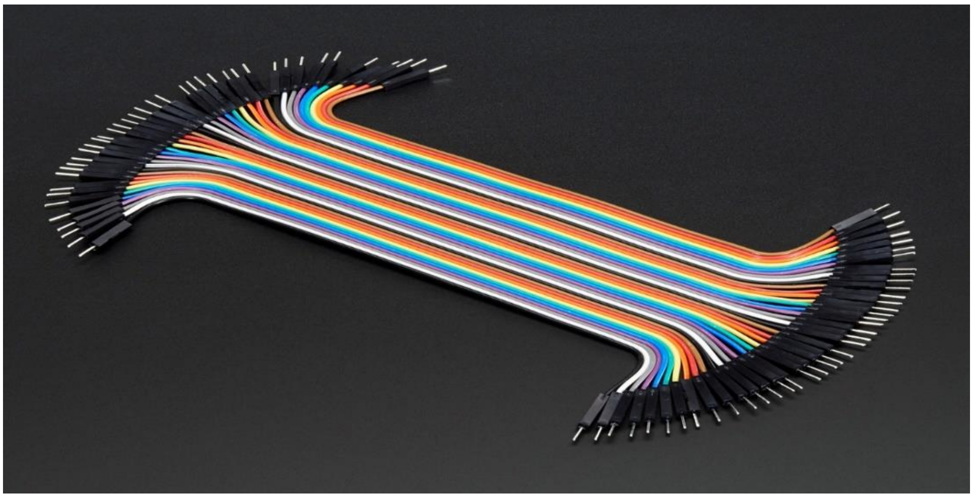

Figure 3-24: Male-to-male jumper wires

Jumper wires typically vary in color and size depending on what they are being used for. In breadboards, jump wires are used to establish connections between the central micro controller and other devices such as buttons and sensors.

If possible, the jumper wire should always be placed on the component side of a circuit board during assembly. The wires should also be routed in an X-Y manner, avoiding any bends. Jump wires should never be raised more than 1/8 of an inch above the surface of the circuit board.

3.13 Battery connector:

It is a connector for 9-volt batteries. It is used to connect battery terminals to the desired device or circuit to be supplied. This battery connector has a pair of red and black lead wires that are stripped and tinned 5 mm on the ends. The connector back so as in Figure 3-25 is covered with black vinyl for additional protection and safety.

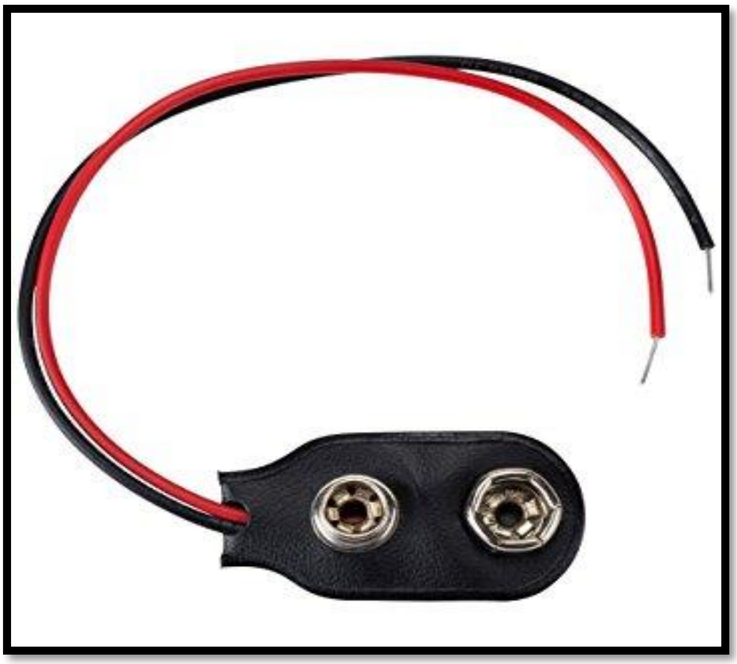

Figure 3-25: Battery connector

CHAPTER FOUR

HARDWARE IMPLEMENTATION

Chapter Four

Hardware Implementation

4.1 system overview

4.2 Hardware description

4.3 Introduction to Internet Of Things technology

4.1 system overview:

As figure 4-1 previews, our robot constructed of electronical and mechanical parts. Each part has it's own roll to achieve a certain task, whether this task is a component fixation, movement, or connecting to the internet. That All will be discussed in details later in this chapter.

Figure 4-1:System overview

4.2 Hardware description:

4.2.1 Robot body:

The robot stands on a base of a seat chair as can be seen in figure 4-1.

4.2.2 Robot head:

The head as figure 4-2 represents, consists of a raspberry pi camera which is fixed by screws.

Figure 4-2: Robot head

4.2.3 Robot neck:

The neck as shown in figure 4-3 is constructs of a furniture leg pined on robot body using screws and holding a servo motor above. The servo motor is placed using a steel angle bracket L shape and a cold welding paste.

Figure 4-3:Robot neck

4.2.4 Robot driving wheel system:

Driving wheel system is composed of a servo motor whichdisplayed in Figure 4-4 and settled on a furniture leg using hinges. A driver pulley is located on the shaft screw of the servo using cold welding paste. A smooth half rounded surface has been place above the pulley to prevent the belt from slipping and friction.

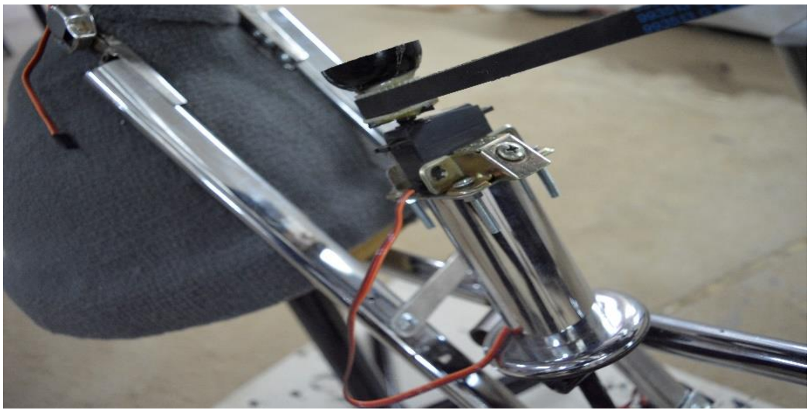

Figure 4-4: Servo motor pulley

The second pulley which is the driven pulley as Figure 4-5 describes is welded with the driving wheel and connected to the driver pulley by a belt.

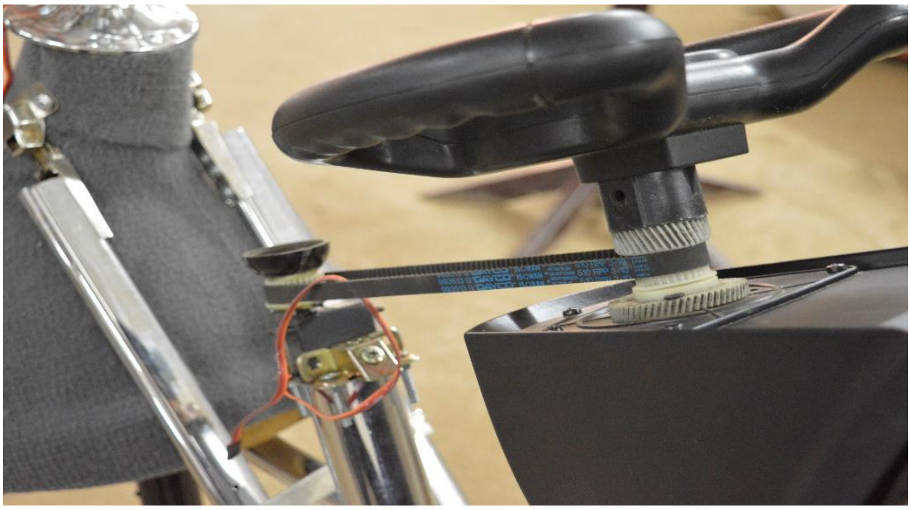

Figure 4-5:The driven pulley

4.2.5 Robot Legs:

Robot leg is an Aluminum Pipe as Figure 4-6 presents and a servo motor pined to that pipe using steel angle bracket L shape and cold welding paste. Servo motor moving part is connected to a piece of plastic using screws. The plastic piece end is connected to the heel of a wooden foot which as Figure 4-7 illustrates is pined near the pedals using screws and steel angle bracket L shape. The other leg has a typical structure.

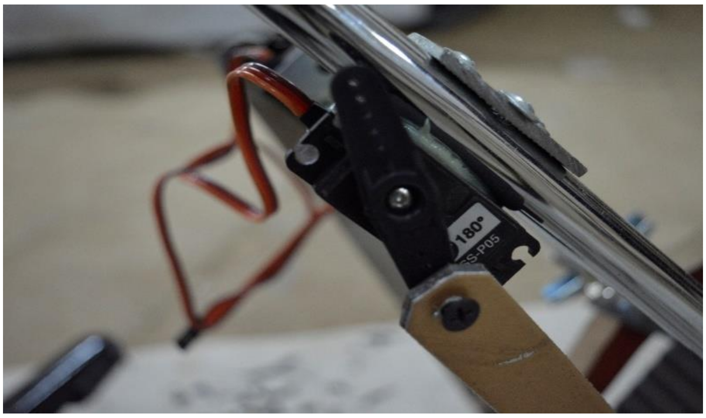

Figure 4-6: Servo position in robot leg

Figure 4-7: Detailed structure of robot leg

4.2 Signal tracing:

Figure 4-8 displayed a GUI for the operator to make him able to control the robot in an easy and understandable way.

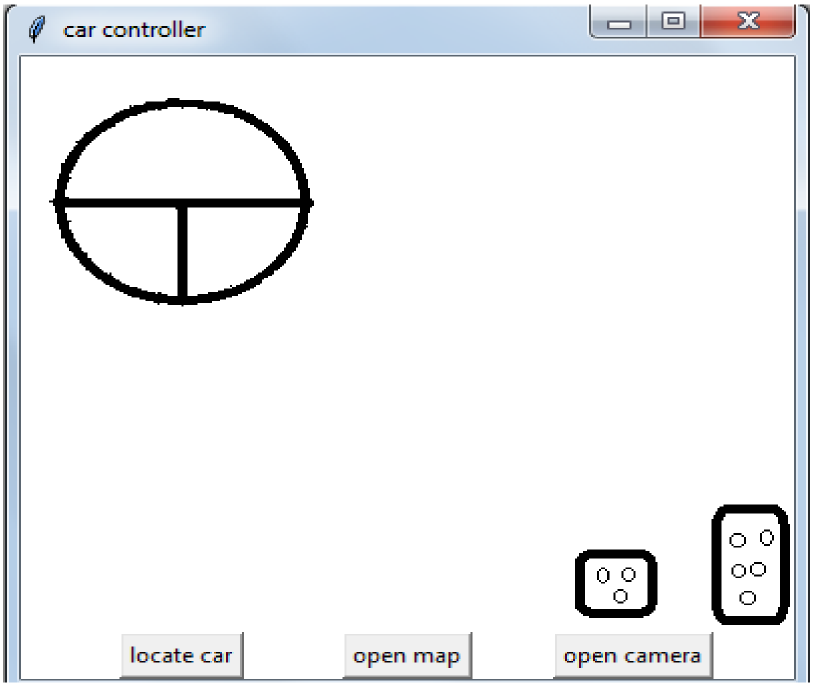

Figure 4-8: GUI of operator

4.2.1 Pressing left and right pedals:

After the operator press the pedals, operator program will send data to Ubidots which offers an IOT control, Ubidots then sends data to raspberry pi which send commands to the Arduino uno to make servo motors of the pedals move. When the servo move, the plastic piece which pined to it’s moving part will pulled up and pushed down in order to lift the heel of the foot to push the pedal and vice versa.

4.2.2Rotating the driving wheel:

When the operator rotates the driving wheel, operator program will send data to Ubidots, and thenUbidots will send data to raspberry pi which send commands to the Arduino uno to make servo motor of the driving wheel move, that movement leads to make the driver pulley move clockwise and anti-clockwise and cause the driven pulley of the driving wheel to move either.

4.2.3Pressing open camera button:

This button is pressed to view a life video vision of the road. When an operator presses that button, operator program will send data to Ubidots,and then Ubidots will send data to raspberry pi which send commands to the camera which attached to it to take video. Also raspberry pi will send commands to Arduino uno to make the servo motor of the head in a range of 180 degree to allow camera to take side visions either.

4.2.4Pressing open map button:

By pressing this button, the operator will be able to see the location of his car in the map and trace it as can be seen in Figure 4-9.The operator program will make a connection to google maps service.

Figure 4-9: Google maps service

4.2.4Pressing locate car button:

This button is used to allow car location whenever the operator needs instead of making the program in a continuous state of checking car locations and sends it every single time.

4.3Introduction to Internet Of Things technology:

The Internet of Things is a futuristic technology in which interconnection of devices and the Internet is proposed. It can make possible the automation of many daily chores. Simply put, this is the concept of basically connecting any device with an on and off switch to the Internet (and/or to each other). This includes everything from cellphones, coffee makers, washing machines, headphones, lamps, wearable devices and almost anything else you can think of. This also applies to components of machines, for example a jet engine of an airplane or the drill of an oil rig. As I mentioned, if it has an on and off switch then chances are it can be a part of the IoT. The analyst firm Gartnersays that by 2020 there will be over 26 billion connected devices. That's a lot of connections (some even estimate this number to be much higher, over 100 billion). The IoT is a giant network of connected "things" (which also includes people). The relationship will be between people-people, people-things, and things-things.

4.3.1Advantages of IOT:

- **Communication:**

IoT encourages the communication between devices, also famously known as Machine-to-Machine (M2M) communication. Because of this, the physical devices are able to stay connected and hence the total transparency is available with lesser inefficiencies and greater quality.

- **Automation and Control:**

Due to physical objects getting connected and controlled digitally and centrally with wireless infrastructure, there is a large amount of automation and control in the workings. Without human intervention, the machines are able to communicate with each other leading to faster and timely output.

- **Information:**

it is obvious that having more information helps making better decisions. Whether it is mundane decisions as needing to know what to buy at the grocery store or if your company has enough widgets and supplies, knowledge is power and more knowledge is better.

- **Monitor:**

The second most obvious advantage of IoT is monitoring. Knowing the exact quantity of supplies or the air quality in your home, can further provide more information that could not have previously been collected easily. For instance, knowing that you are low on milk or printer ink could save you another trip to the store in the near future. Furthermore, monitoring the expiration of products can and will improve safety.

- **Time:**

As hinted in the previous examples, the amount of time saved because of IoT could be quite large. And in today's modern life, we all could use more time.The machine-to-machine interaction provides better efficiency, hence; accurate results can be obtained fast. This results in saving valuable time. Instead of repeating the same tasks every day, it enables people to do other creative jobs.

- **Automation of daily tasks leads to better monitoring of devices:**

The IoT allows you to automate and control the tasks that are done on a daily basis, avoiding human intervention. Machine-to-machine communication helps to maintain transparency in the processes. It also leads to uniformity in the tasks. It can also maintain the quality of service. We can also take necessary action in case of emergencies.

- **Saves Money:**

The biggest advantage of IoT is saving money. If the price of the tagging and monitoring equipment is less than the amount of money saved, then the Internet of Things will be very widely adopted. IoT fundamentally proves to be very helpful to people in their daily routines by making the appliances communicate to each other in an effective manner thereby saving and conserving energy and cost. Allowing the data to be communicated and shared between devices and then translating it into our required way, it makes our systems efficient.

Optimum utilization of energy and resources can be achieved by adopting this technology and keeping the devices under surveillance. We can be alerted in case of possible bottlenecks, breakdowns, and damages to the system. Hence, we can save money by using this technology.

- **Better Quality of Life:**

All the applications of this technology culminate in increased comfort, convenience, and better management, thereby improving the quality of life.

4.3.2Disadvantages of IOT:

❖ **Compatibility:**

Currently, there is no international standard of compatibility for the tagging and monitoring equipment. I believe this disadvantage is the most easy to overcome. The manufacturing companies of these equipment just need to agree to a standard, such as Bluetooth, USB, etc. This is nothing new or innovative needed.

As devices from different manufacturers will be interconnected, the issue of compatibility in tagging and monitoring crops up. Although this disadvantage may drop off if all the manufacturers agree to a common standard, even after that, technical issues will persist. Today, we have Bluetooth-enabled devices and compatibility problems exist even in this technology! Compatibility issues may result in people buying appliances from a certain manufacturer, leading to its monopoly in the market.

❖ **Complexity:**

As with all complex systems, there are more opportunities of failure. With the Internet of Things, failures could sky rocket. For instance, let’s say that both you and your spouse each get a message saying that your milk has expired, and both of you stop at a store on your way home, and you both purchase milk. As a result, you and your spouse have purchased twice the amount that you both need. Or maybe a bug in the software ends up automatically ordering a new ink cartridge for your printer each and every hour for a few days, or at least after each power failure, when you only need a single replacement.

The IoT is a diverse and complex network. Any failure or bugs in the software or hardware will have serious consequences. Even power failure can cause a lot of inconvenience.

❖ **Privacy/Security:**

With all of this IoT data being transmitted, the risk of losing privacy increases.

❖ **Safety:**

Imagine if a notorious hacker changes your prescription. Or if a store automatically ships you an equivalent product that you are allergic to, or a flavor that you do not like, or a product that is already expired. As a result, safety is ultimately in the hands of the consumer to verify any and all automation.

As all the household appliances, industrial machinery, public sector services like water supply and transport, and many other devices all are connected to the Internet, a lot of information is available on it. This information is prone to attack by hackers. It would be very disastrous if private and confidential information is accessed by unauthorized intruders.

❖ **Lesser Employment of Menial Staff:**

The unskilled workers and helpers may end up losing their jobs in the effect of automation of daily activities. This can lead to unemployment issues in the society. This is a problem with the advent of any technology and can be overcome with education.With daily activities getting automated, naturally, there will be fewer requirements of human resources, primarily, workers and less educated staff. This may create Unemployment issue in the society.

❖ **Technology Takes Control of Life:**

Our lives will be increasingly controlled by technology, and will be dependent on it. The younger generation is already addicted to technology for every little thing. We have to decide how much of our daily lives are we willing to mechanize and be controlled by technology.

4.3.3Applications of IOT:

- Smart Cities
- Home Automation
- Industrial Automation
- Health Monitoring
- Smart Environment

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

Chapter Five

Conclusion and Recommendations

5.1 Conclusion

5.2 Recommendations

5.1 Conclusion:

Thesis contains detailed information for controlling a robot driving system guided via internet. The project has been successfully designed and tested with the use of internet of things technology. The quality of the images sent by the robot is affected by internet speed available for Raspberry pi to upload. A successful actuators movement of the robot was achieved, but due to internet speed, a slow response sometimes occurs.

Faster communication will ensure that we can send high quality, high resolution images with minimal delay or latency. This will help reduce delay in execution of commands providing real time access to the robot. It will be of great use for automation and monitoring illegal activities occurring around us.

5.2 Recommendations:

The robot driving system presented in this thesis work was not designed as a fully developed system ready to be transferred to a full-scale vehicle. Instead, the main focus was on experimentation and research in new different area of autonomous vehicle technologies. Possible future work based on this thesis therefore is further experimentation, research and optimization of the presented system. This work can be divided in different manners:

- Replace LinkIt one with just a GPS module.
- Develop the system by adding sensors and cameras to grant safe and fully functional system.
- Design all the necessary actuators that makes the robot able of self-operation.

- Adding artificial intelligence algorithms and techniques to make the robot able to take decisions in case of weak signals or unexpected disconnections.

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APPENDIX A

- **Sender Code:**

```
from tkinter import *

from mhwrmp import *
import webbrowser
from ubidots import ApiClient
api =ApiClient(token='Q0eTx8D9cAZu25yJxXDqOnryFBEtn7')
my_variable =api.get_variable('5762de327625424e17dd6db2')
ser2=api.get_variable('580b41d476254205e5ff5d42')
my_new=api.get_variable('580cbf0376254242310147a9')
#dre =api.get_variable('5762de327625424e17dd6db2')
#lat =api.get_variable('5762de327625424e17dd6db2')
#lng =api.get_variable('5762de327625424e17dd6db2')
global u,l,r,d,s,A
main =Tk()
u=0
A=0
l=0
r=0
d=0
s=0
def leftkey (event):
        #print("l key pressd")
        global r


        r=r-1
```

```
        x=r*10
        d(chaine1,r,can1,vx)
        new_value =ser2.save_value({'value':x})
        print (x)
        #print ("\n ")
        return u
def rightkey (event):
        #print("R key pressd")
        global r
        r=r+1
        x=r*10
        d(chaine1,r,can1,vx)
        new_value =ser2.save_value({'value':x})
        #print ("\n ")
        print(x)
def uptkey (event):
        #print("u key pressd")
        global l
        l=l+1
        x=l*10
        c(chaine,l,bnz,can2)
        #chaine.configure(text = "power = " + str(l))
        new_value =my_variable.save_value({'value':x})
        #print ("\n ")
        #print(l)
def downtkey (event):
        #print("d key pressd")
        global l
        l=l-1
        x=l*10
        c(chaine,l,bnz,can2)
        new_value =my_variable.save_value({'value':x})
```

```
            #print ("\n ")
            #print(l)
def space (event):
    if event.char ==' ':
        #print("s key pressd")
        global A
        A=A-1
        x=A*10
        c(chaine,A,bnz,can2)
        dac =my_new.save_value({'value':x})
        #print (s)
    elif event.char =='b':
        global A
        A=A+1
        x=A*10
        c(chaine,A,bnz,can2)
        dac =my_new.save_value({'value':x})

def c (l,m,xq,v):
        l.grid(row=0,column=0)
        if (int (m) >0):
                print(int (m))
                l.configure(text = "forward = " + str(m),bg='gray')
                v.create_image(100,100, image =xq[1])
                v.grid(row=2,column=2)
        elif(int(m)< 0):
                l.configure(text = "forward = " + str(m),bg='gray')
                v.create_image(100,100, image =xq[2])
                v.grid(row=2,column=2)
        else:
                v.create_image(100,100, image =xq[0])
                v.grid(row=2,column=2)
```

```
def d (l,m,s,d):

    fr="right="
    op="left="
    if(int(m)<0):
        s.create_image(80,80, image =d[int(m)+12])
        s.grid(row=1,column=0)
    if(int(m)>11):
      s.create_image(80,80, image =d[int(m)-12])
      s.grid(row=1,column=0)
    else:
      s.create_image(80,80, image =d[int(m)])
      s.grid(row=1,column=0)
      l.grid(row=0,column=3)
    if(int(m) >0):
        l.configure(text = fr + str(m),bg='gray')
    else:
        l.configure(text = op + str(m),bg='gray')

def lo():
    #iu =lat.get_values()
    #gn =lng.get_values()
    #dr=float(iu[0]['value'])
    #br=float(gn[0]['value'])
    writemp(1540.3032,3234.4137)
def ma():
    na='file:///G:/python/New folder/nsd.html'
    webbrowser.open(na)
def cam ():
    va='C:\\Program Files (x86)\CyberLink\YouCam\YouCam.exe'
    webbrowser.open(va)
```

```
main.bind('<Left>', leftkey)
main.bind('<Key>', space)
can1 = Canvas(main, width =160, height =160, bg
='gray',bd=0,highlightthickness=0)
can2 = Canvas(main, width =160, height =160, bg
='gray',bd=0,highlightthickness=0)
can3 = Canvas(main, width =290, height =200, bg
='gray',bd=0,highlightthickness=0)
phot3 = PhotoImage(file ="download.gif")
can3.create_image(80,80, image =phot3)
can3.grid(row=0,column=0)
xs=[]
vx=[]
for i in range(0,12):
    xs.append(str(i+1)+".gif")
    vx.append("d")
    vx[i]=PhotoImage(file =xs[i])
#print(xs)
#print(vx)
#for i in range(0,9):
can1.create_image(80,80, image =vx[0])
can1.grid(row=1,column=0)
photo = PhotoImage(file ="no.gif")
#im= Image.open('mod.jpg')
#canvas.image=Image.PhotoImage(im)
photo1 = PhotoImage(file ="bn.gif")
photo2 = PhotoImage(file ="bre.gif")
bnz=[photo,photo1,photo2]
chaine = Label(main)
can2.create_image(100,100, image =bnz[0])
can2.grid(row=2,column=2)
chaine1 = Label(main)
Button(main,text='locate car',command=lo).grid(row=3, column=0)
```

```
Button(main,text='open map',command=ma).grid(row=3, column=1)
Button(main,text='open camera',command=cam).grid(row=3, column=2)
main.bind('<Right>', rightkey)
main.bind('<Up>', uptkey)
main.bind('<Down>', downtkey)
main.configure(background='gray')
main.title("car controller")
main.focus_set()
main.mainloop()
```

- **Reciever Code:**

```
from ubidots import ApiClient
import serial
global ser
ser= serial.Serial("COM11", 9600)
api =ApiClient(token='Q0eTx8D9cAZu25yJxXDqOnryFBEtn7')
my_variable=api.get_variable('5762de327625424e17dd6db2')

ser2=api.get_variable('580b41d476254205e5ff5d42')
c=10
p=20

w="RR"
v="R"
pm="LL"
kl="L"
qs="UU"
sa="U"
xa="uu"
za="u"
def d (l,o,n,dx,hb,no):

    if(no<l):
        h=l-no
        s=int(h/10)
        if((s%2)==0):
            q=int(s/2)
            for i in range(0,q):
                print(o)


                ser.write(o)
        else:

            q=int(s/1)
```

```
            for i in range(0,q):

                ser.write(n)
                print(n)
        else:
            wt=no-l
            s=wt/10
            if((s%2)==0):
                er=int(s/2)
                for i in range(0,er):
                    ser.write(dx)
                    print(dx)
            else:
                q=int(s/1)
                for i in range(0,q):
                    ser.write(hb)
                    print(hb)
        c=l
        #return c

while True:
    try:

        we=my_variable.get_values(1)
        j=int(we[0]['value'])
        rt=ser2.get_values(1)
        k=int(rt[0]['value'])
        for i in range(0,2):
            if(i==0):
                d(j,pm,kl,w,v,c)
                print(c)
                c=j
            else:
                d(k,qs,sa,xa,za,p)
                d(k,"YY","Y","FF","F",p)
                print(p)
                p=k
    except:
        print("no")
```