CHAPTER -1

INTRODUCTION

Internet of things (IOT) consists of two words: Internet & things. The term Things in IOT refers to various IOT devices having unique identities & has capabilities to perform remote sensing, actuating & live monitoring of certain sort of data. IOT devices are also enabled to have live exchange of data with other connected devices & applications either directly or indirectly, or collect data from other devices & process the data & send the data to various servers. The other term Internet is defined as Global Communication Network connecting Trillions of computers across the planets enabling sharing of information. Thus the IOT can be defined as " A Dynamic Global Network Infrastructure with self configuring capabilities based on standard and interoperable communication to protocol where physical & virtual things have identities, physical attributes & virtual personalities & use intelligent interfaces & are seamlessly integrated into the information networks, often communicate data associated with user & their environment."

Nowadays, we have remote controls for our television sets and other electronic systems, which have made our lives really easy. Have you ever wondered about home automation which would give the facility of controlling tube lights, fans and other electrical appliances at home using a remote control? Off-course, yes! But, are the available options cost-effective? If the answer is No, we have found a solution to it. We have come up with a new system called Arduino based home automation using Bluetooth. This system is super-cost effective and can give the user, the ability to control any electronic device without even spending for a remote control. This project helps the user to control all the electronic devices using his/her smartphone. Time is a very valuable thing. Everybody wants to save time as much as they can. New technologies are being introduced to save our time. To save people's time we are introducing Home Automation system using Bluetooth. With the help of this system, you can control your home appliances from your mobile phone. You can turn on/off your home appliances within the range of Bluetooth.

CHAPTER- 2

LITRETURE SURVEY

A project proposed home automation by implementing Arduino to control the home appliances. This system controls small home appliances by using various till date technological sensors. Users are able to check the status of their home appliances using a web server.

Paper proposed shows how intelligent home automation is operated and controlled. In this paper the intelligent home automation system with low cost is presented by implementing Arduino UNO microcontroller. There are two main modules that are software communication module and hardware interface module. Arduino UNO microcontroller is used which works as micro web servers and interface of hardware modules and different sensors also used to sense the environment.

A project developed a home portal structure for interconnecting home components with IEEE 1394 AV framework and X10 control line interface with Internet. This gave remote access limits from the Web for cutting edge AV mechanical components like Digital Video Camera, Digital VCR related with IEEE 1394 framework and home machines like TV, work zone light, electric fan related to X10 controller. A Java based home automation structure by using World Wide Web .The home devices were controlled from ports of embedded structure boards related to the PC based server at home. Author in 2005 proposed Internet based remote control system where home digital devices are related with slave center point.

The home devices were controlled from ports of embedded structure boards related to the PC based server at home. Author in 2005 proposed Internet based remote control system where home digital devices are related with slave center point.

The slave center points talk with expert center point through RF and pro center has successive RS232 interface with PC server. The center points rely upon PIC 16F877μc. Author in [27] proposed a framework for controlling home electrical components over the Internet by using Bluetooth remote advancement to give an association from the machine to the Internet and Wireless Application Protocol (WAP) to give a data interface between the Internet and a phone.

CHAPTER -3

PROBLEM IDENTIFICATION

The project is designed to build an home automation using iot for the automation of Light, Door lock and Smart dustbin in home. A microcontroller (ATmega328) is used to achieve the desired operation. Home automation is the project that can perform tasks automatically or with guidance. The project proposes automatic home automation that has intelligence built in such a way that it directs itself whenever the sensors pass the signals. This project is built using a microcontroller of the AT mega 328 family.

A growing topic in modern society is the concept of smart homes, which consist of smart automated devices, such as home appliances, that interact with each other and users. These devices could, however, be quite expensive, and automating a home could thus become an economical setback. This Bachelor's thesis examines how a home-automation system could be developed to automate existing devices, providing them with smart technology, in a more cost-effective way rather than replacing them entirely. The resulting home-automation system consists of adapters that enable existing no smart devices to be automated. Adapters have the ability to control power supply to an existing device and interact with each other through a Bluetooth mesh network, allowing for an extensible system. A user can control these adapters with an Android application, either directly connected to the network of adapters, or through the Internet with the help of a gateway installed in the network. Furthermore, the application provides several utilities for managing the home-automation system and increasing user convenience. Several features of the resulting home-automation system were evaluated by test groups, and considered to be an improvement in their homes. Other features were considered to be of less importance and possibly causing inconvenience. The overall assessment of the system was considered to be positive. However, there is room for improvement.

CHAPTER- 4

COMPONENTS REQUIRED

1. ARDUINO UNO
2. 4 CHANNEL RELAY(5v)
3. BLUETOOTH MODULE HC05
4. POWER SUPPLY
5. LOAD (BULB 220V)
6. CONNECTING WIRES
7. SERVO MOTOR
8. ULTRASONIC SENSOR
9. BREAD BOARD
10. SMARTPHONE (BLUETOOTH ENABLED)

CHAPTER- 5

SYSTEM SPECIFIC REQUIREMENT

5.1 ARDUINO UNO

Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself (DIY) kits. Arduino board designs use a variety of microprocessors and controllers.

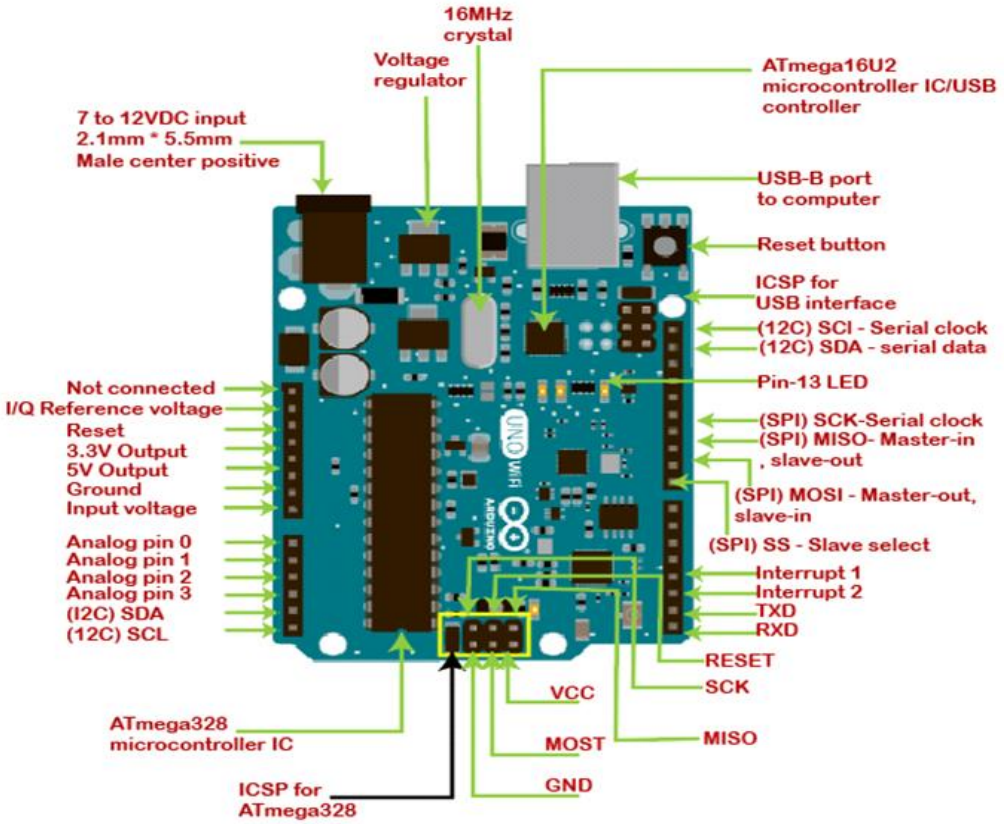

Fig 5.1 Arduino Uno

5.1.1 Features of the Arduino UNO:

Microcontroller: ATmega328

Operating Voltage: 5V Input Voltage (recommended): 7-12V

Input Voltage (limits): 6-20V

Digital I/O Pins: 14 (of which 6 provide PWM output)

Analog Input Pins: 6

DC Current per I/O Pin: 40 Ma

DC Current for 3.3V Pin: 50 mA

Flash Memory: 32 KB of which 0.5 KB used by bootloader

SRAM: 2 KB (ATmega328)

EEPROM: 1 KB (ATmega328)

Clock Speed: 16 MHz

5.1.2 Arduino Hardware Part

Arduino is open-source hardware. The hardware reference designs are distributed under a Creative Commons Attribution Share-Alike 2.5 license and are available on the Arduino website. Layout and production files for some versions of the hardware are also available. Although the hardware and software designs are freely available under copyleft licenses, the developers have requested the name Arduinoto be exclusive to the official product and not be used for derived works without permission. The official policy document on use of the Arduino name emphasizes that the project is open to incorporating work by others into the official product. Several Arduino-compatible products commercially released have avoided the project name by using various names ending in -duino. Most Arduino boards consist of an Atmel 8-bit AVR microcontroller (ATmega8, ATmega168, ATmega328, ATmega1280, ATmega2560) with varying amounts of flash memory, pins, and features. The 32-bit Arduino Due, based on the Atmel SAM3X8E was introduced in 2012. The boards use single or double-row pins or female

headers that facilitate connections for programming and incorporation into other circuits. These may connect with add-on modules termed shields. Multiple and possibly stacked shields may be individually addressable via an I²C serial bus. Most boards include a 5 V linear regulator and a 16 MHz crystal oscillator or ceramic resonator. Some designs, such as the LilyPad, run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions. Arduino microcontrollers are pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory. The default bootloader of the Arduino UNO is the optiboot bootloader. Boards are loaded with program code via a serial connection to another computer. Some serial Arduino boards contain a level shifter circuit to convert between RS232 logic levels and transistor–transistor logic(TTL) level signals. Current Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips such as the FTDI FT232. Some boards, such as later-model Uno boards, substitute the FTDI chip with a separate AVR chip containing USB-to-serial firmware, which is reprogrammable via its own ICSP header.

Other variants, such as the Arduino Mini and the unofficial Boarduino, use a detachable USB-to-serial adapter board or cable, Bluetooth or other methods. When used with 14 traditional microcontroller tools, instead of the Arduino IDE, standard AVR in-system programming (ISP) programming is used. The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits. The Diecimila, Duemilanove, and current Uno provide 14 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs, which can also be used as six digital I/O pins. These pins are on the top of the board, via female 0.1-inch (2.54 mm) headers. Several plug-in application shields are also commercially available. The Arduino Nano, and Arduino-compatible Bare Bones Board and Boarduino boards may provide male header pins on the underside of the board that can plug into solderless breadboards. Many Arduino-compatible and Arduino-derived boards exist. Some are functionally equivalent to an Arduino and can be used interchangeably. Many enhance the basic Arduino by adding output drivers, often for use in school-level education, to simplify making buggies and small robots. Others are electrically equivalent but change the form factor, sometimes retaining compatibility with shields, sometimes not. Some variants use different processors, of varying compatibility.

5.2 ARDUINO IDE

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. 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 toolchain, also included with the IDE distribution.

The Arduino IDE employs the program avrdude 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.

5.3 RELAY

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. A type of relay that can handle the high power required to directly control an electric motor or other loads is called a contactor. Solid-state relays control power circuits with no moving parts, instead using a semiconductor device to perform switching. Relays with calibrated operating characteristics and sometimes multiple operating coils are used

to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called "protective relays". Magnetic latching relays require one pulse of coil power to move their contacts in one direction, and another, redirected pulse to move them back. Repeated pulses from the same input have no effect. Magnetic latching relays are useful in applications where interrupted power should not be able to transition the contacts.

Fig 5.3Relay

5.3.1 Application of relay

Relays are used wherever it is necessary to control a high power or high voltage circuit with a low power circuit, especially when galvanic isolation is desirable. The first application of relays was in long telegraph lines, where the weak signal received at an intermediate station could control a contact, regenerating the signal for further transmission. High-voltage or high-current devices can be controlled with small, low voltage wiring and pilots switches. Operators can be isolated from the high voltage circuit. Low power devices such as microprocessors can drive relays to control electrical loads beyond their direct drive capability. In an automobile, a starter relay allows the high current of the cranking motor to be controlled with small wiring and contacts in the ignition key. Electromechanical switching systems including Strowger and Crossbar telephone exchanges made extensive use of relays in ancillary control circuits. The Relay Automatic Telephone Company also manufactured telephone exchanges based solely on relay switching techniques designed by Gotthilf Ansgarius Betulander. The first public relay based telephone exchange in the UK was installed in Fleetwood on 15 July 1922 and remained in service until 1959.

The use of relays for the logical control of complex switching systems like telephone exchanges was studied by Claude Shannon, who formalized the application of Boolean algebra to relay circuit design in A Symbolic Analysis of Relay and Switching Circuits. Relays can perform the basic operations of Boolean combinatorial logic. For example, the boolean AND function is realised by connecting normally open relay contacts in series, the OR function by connecting 30 normally open contacts in parallel. Inversion of a logical input can be done with a normally closed contact. Relays were used for control of automated systems for machine tools and production lines. The Ladder programming language is often used for designing relay logic networks. Early electro-mechanical computers such as the ARRA, Harvard Mark II, Zuse Z2, and Zuse Z3 used relays for logic and working registers. However, electronic devices proved faster and easier to use. Because relays are much more resistant than semiconductors to nuclear radiation, they are widely used in safety-critical logic, such as the control panels of radioactive waste-handling machinery. Electromechanical protective relays are used to detect overload and other faults on electrical lines by opening and closing circuit breakers.

5.4 SERVO MOTOR

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. [1] It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

Servomotors are not a specific class of motor, although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system.

Fig 5.4 Servo Motor

5.5 HC-05 BLUETOOH MODULE

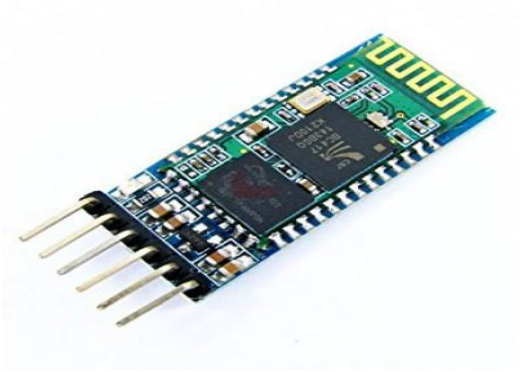

Fig 5.5 HC-05 Bluetooth Module

HC-05 Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Usually, it is used to connect small devices like mobile phones using a short-range wireless connection to exchange files. It uses the 2.45GHz frequency band.To setup Wireless Serial Communication, HC-05 Bluetooth Module is most demanding and popular due to its low price and extremely high features.

This module can be used in Master or Slave Mode and easy switchable between these two modes, By default Slave mode is configured. Modes can be changed using AT Commands.

The slave mode in HC05 cannot initiate a connection to another Bluetooth device, but can accept connections. Master mode can initiate a connection to other devices.

5.5.1 HC-05 Applications

- Embedded Projects
- Industrial Applications
- Computer and portable Devices
- GPS receiver

5.6 BLUETOOH TERMINALMOBILE APLICATION

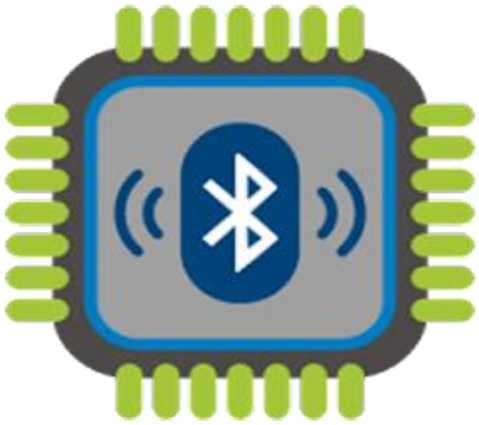

Fig 5.6.1 Bluetooth Terminal Mobile Application

One-of-a-kind App that gives you compatibility with all microcontrollers. All you need is a HC-05 serial adapter connection with serial ports of the controllers. Control any Micro-controller that uses a Bluetooth Module HC 05 or HC 06 through your smart phone.

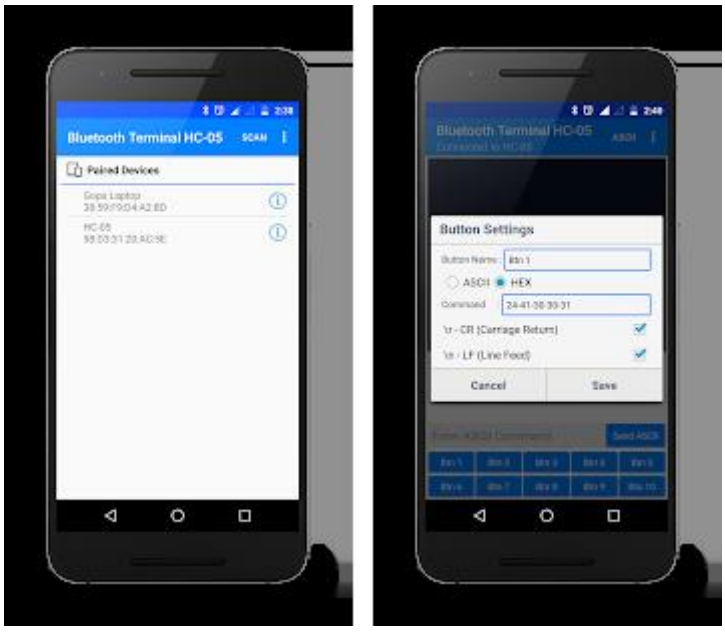

Fig 5.6.2 Bluetooth terminal HC-05 App

The prototype on which this project is based can be controlled from a customized mobile application. A mobile application is a computer application designed to be executed on smartphones, tablets and other mobile devices which allows the user to perform specific tasks of any kind, like professional, educational or social. Apps are usually available through distribution platforms operated by companies that own mobile operating systems such as Android, iOs, Blackberry or Windows Phone. Frist mobile applications dates back to the 90's, it can place in the first videogames, ring-tones, calendars and agendas implemented in second generation mobile phones.

The popular Tetris game was the first game installed in 1994 and three years later Nokia launched the most widely accepted game named Snake. By the year 2000 the technological breakthrough of the WAP (Wireless Application Protocol) allowed a greater capacity for the downloading of games distributed by the telephony operators. But the App real boom came in 2008 with the launch of the Apple Store of Apple corporation, the release of the first Android SDK and the later Android Market, renamed as Google Play as a new strategic approach of Google. Currently, due to the applications, all functions are centralized in a small mobile device: calls, mail, social network, alarm clock, bank account, photography, GPS and a multitude of other utilities. The trend is on the raise as more and more users want to carry their life in the pocket: information, communication and personal and professional resources, all accessible at any time.

5.7 WIRES

Element that allows closing an electrical circuit. It has to be combined with soldering.

Fig 5.7 Wires

CHAPTER -6

METHODOLOGY

Home automation is a method of controlling home appliances automatically for the convenience of users. This technology makes life easier for the user, and saves energy by utilizing devices according to strict requirements.

Prediction Algorithm helps in prediction of next probable state of the occupant and is a key component in developing an active Smart Home

The simplest home automation design and installation approach is to use plug-in automation control. This design involves small control hub boxes that plug into wall sockets and then communicate with appliances and lighting to determine when they'll turn on and off.

Fig 6: Methodology

6.1 Circuit description and working principle

The basic block diagram for the implementation of the project is as shown in figure 5.1.1.

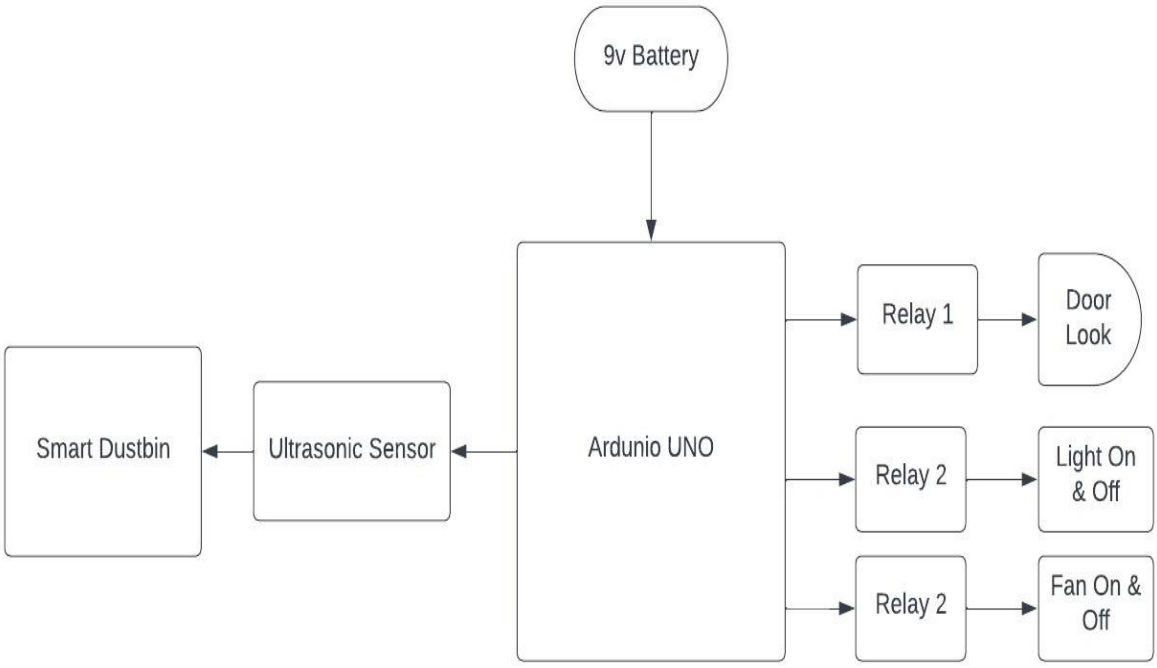

Fig 6.1 Block Diagram

In this circuit there is a programmed ARDUINO which is connected with sensors, three relays and an ultrasonic sensor. The working principle of the model is based on storing data from the sensors with the help of ARDUINO. In this model the Arduino is programmed and the door lock is automated based on the relay. It also has the light ON/OFF based on the relay. It also has the Smart dustbin using an ultrasonic sensor; the open and close of the dustbin is automated. And all the connections are made as above in fig 6.1

6.2 Embedded C

Embedded C is a set of language extensions for the C programming language by the C standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires non standard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks and basic I/O operations.

6.3 Embedded Programming

Embedded refers to the combination of hardware and software. Embedded systems programming is the programming of an embedded system in some device using the permitted programming interfaces provided by that system. Embedded Java is a example of a development environment for programming embedded systems that will execute Java programs. Arduino is a very minute part of embedded systems; in fact we can call it an application product of embedded systems. Arduino is just any other microcontroller board with a specifically designed API and software which makes programming it very easy. Arduino is just a drop of water in the embedded system ocean.

6.4 Proposed Work

In order to address the mentioned issues of functionality and flexibility, we designed and implemented a standalone, novel, flexible and low cost home monitoring and controlling system using Arduino uno.

The given home automation system has the ability to control the following components in the user's home:

1. Lights on/off
2. Automatic Door Lock
3. Smart Dustbin

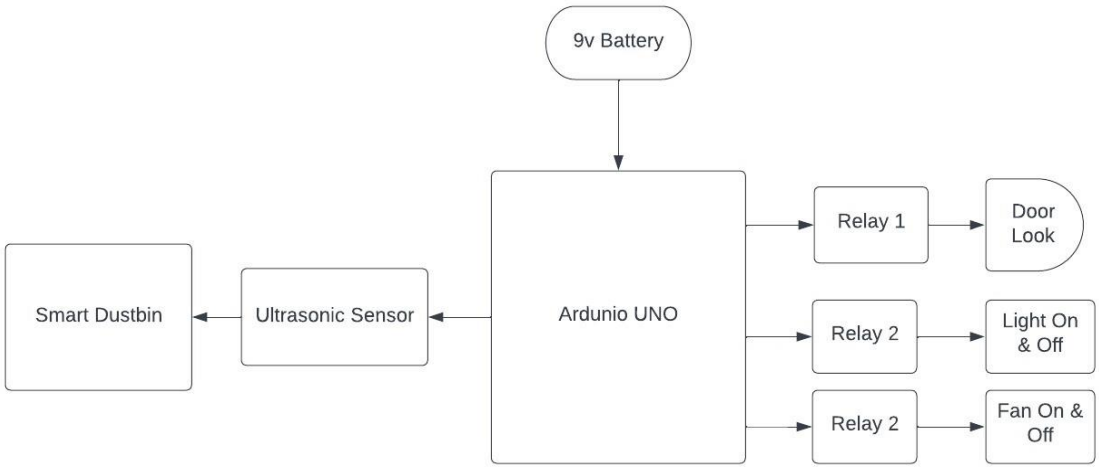

Fig 6.4 Block Diagram of Proposed system

Day by day, the field of automation is blooming and these systems are having great impact on human beings. The project which is to be implemented is a home automation using Easy IOT Webserver and WIFI and has very good future development. In the current system webserver is installed on a windows PC so the home appliances can be controlled using only by using the device on which webserver is installed.This can be further developed installing webserver on cloud . Advantage of installing webserver on the cloud is that home can be controlled by using any device which has WIFI 802.1 and a web browser. By visiting the IP address of the cloud the control actions can be taken.

6.5 Features of IOT

Intelligence

IOT comes with the combination of algorithms and computation, software & hardware that makes it smart. Ambient intelligence in IOT enhances its capabilities which facilitate the things to respond in an intelligent way to a particular situation and supports them in carrying out specific tasks. In spite of all the popularity of smart technologies, intelligence in IOT is only concerned as a means of interaction between devices, while user and device interaction are achieved by standard input methods and graphical user interface

Connectivity

Connectivity empowers the Internet of Things by bringing together everyday objects. Connectivity of these objects is pivotal because simple object level interactions contribute towards collective intelligence in the IOT network. It enables network accessibility and compatibility in the things. With this connectivity, new market opportunities for the Internet of things can be created by the networking of smart things and applications

Dynamic Nature

The primary activity of Internet of Things is to collect data from its environment, this is achieved with the dynamic changes that take place around the devices. The state of these devices change dynamically, example sleeping and waking up, connected and/or disconnected as well as the context of devices including temperature, location and speed. In addition to the state of the device, the number of devices also changes dynamically with a person, place and time

Enormous Scale

The number of devices that need to be managed and that communicate with each other will be much larger than the devices connected to the current Internet. The management of data generated from these devices and their interpretation for application purposes becomes more critical. Gartner (2015) confirms the enormous scale of IOT in the estimated report where it stated that 5.5 million new things will get connected every day and 6.4 billion connected things will be in use worldwide in 2016, which is up by 30 percent from 2015. The report also forecasts that the number of connected devices will reach 20.8 billion by 2020

Sensing

IOT wouldn’t be possible without sensors that will detect or measure any changes in the environment to generate data that can report on their status or even interact with the environment. Sensing technologies provide the means to create capabilities that reflect a true awareness of the physical world and the people in it. The sensing information is simply the analog input from the physical world, but it can provide a rich understanding of our complex world.

Heterogeneity

Heterogeneity in Internet of Things as one of the key characteristics. Devices in IOT are based on different hardware platforms and networks and can interact with other devices or service platforms through different networks. IOT architecture should support direct network connectivity between heterogeneous networks. The key design requirements for heterogeneous things and their environments in IOT are scalabilities, modularity, extensibility and interoperability.

Security

IOT devices are naturally vulnerable to security threats. As we gain efficiencies, novel experiences, and other benefits from the IOT, it would be a mistake to forget about security concerns associated with it. There is a high level of transparency and privacy issues with IOT. It is important to secure the endpoints, the networks, and the data that is transferred across all of it means creating a security paradigm.

6.5 Objectives

The main objective of this project is to design and develop a prototype of a home automation controllable from an Android mobile application. Application must be able to perceive and act and to have various types of operation in order to obtain the purpose for which this technology was invented: maximizing user's comfort offering an easy way to personalize home. The steps that should be taken to achieve the expected result are the following:

1) Determine the scope of the application and delimit the points that each mode of operation must deal with.

2) Select the components and software.

3) Electronic design.

4) Program the board.

5) Program the mobile application.

6) Build the house model.

7) Place and weld the components in the model.

8) Test and debug the application.

CHAPTER-7

CODING

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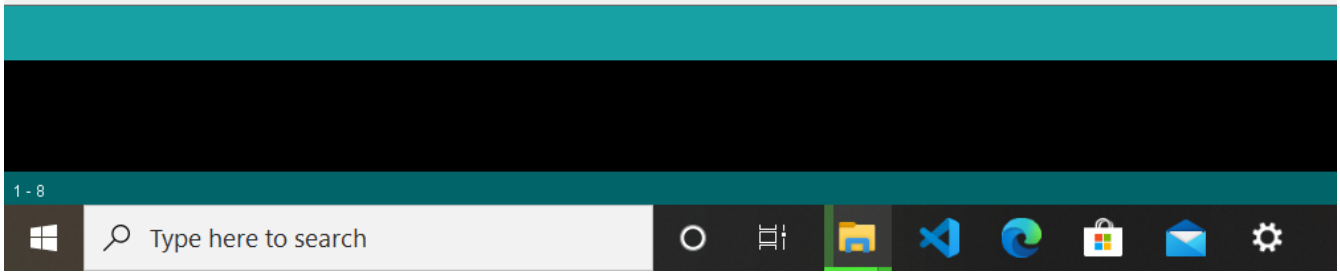
```
#include <SoftwareSerial.h>
#include <Servo.h>

const int trigPin = 7;
const int echoPin = 6;

const int trigPinbin = 13;
const int echoPinbin = 12;

long duration;
int distance;

long duration2;
int distance2;

Servo servo1;

SoftwareSerial bleserial(8,9); //tx rx

int relay = 2;
int relay2 = 3;
int relaylight = 4;

int relaydoor = 10;


void setup() {

  Serial.begin(9600); //Initialize serial port - 9600 bps

  pinMode(relay, OUTPUT);
  pinMode(relay2, OUTPUT);
  pinMode(relaydoor, OUTPUT);
  bleserial.begin(9600);
```



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```
  servo1.attach(5);
  servo1.write(0);
  delay(2000);

  pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPin, INPUT); // Sets the echoPin as an Input

   pinMode(trigPinbin, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPinbin, INPUT); // Sets the echoPin as an Input



  Serial.print("Welcome to Home Automation Project");
}


void loop() {
  // Clears the trigPin
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro seconds
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  // Reads the echoPin, returns the sound wave travel time in microseconds
  duration = pulseIn(echoPin, HIGH);
  // Calculating the distance
  distance = duration * 0.034 / 2;


   digitalWrite(trigPinbin, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro seconds
  digitalWrite(trigPinbin, HIGH);
  delayMicroseconds(10);
```

1 - 8

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```
  digitalWrite(trigPinbin, LOW);
  // Reads the echoPin, returns the sound wave travel time in microseconds
  duration2 = pulseIn(echoPinbin, HIGH);
  // Calculating the distance
  distance2 = duration2 * 0.034 / 2;

//if (distance2 < 50)

  {

//Serial.println("distance2");
//Serial.println(distance2);
  if (distance2<20){
   servo1.write(180);
  // Serial.println("open");
  delay(3000);
   }
   else{
    servo1.write(0);
    //Serial.println("close");

   //delay(3000);
   }
  }

  if (distance < 50)
  {

    if (distance >= 19)
    {
      Serial.println("Bin Empty:");
    }
    else if (distance >= 10)
    {
```

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```
    {

      Serial.println("halfFilled:");

    }
    else if (distance >= 0)
    {

      Serial.println("AlmostFull:");


    }

    Serial.print(distance);

  }


 // home automation

  if(bleserial.available()){

    char char1 = bleserial.read();

    Serial.println(char1);
//    Serial.println(char2);


    if(char1=='1'){
      Serial.println("ON");
      digitalWrite(relay,LOW);
      }

      else if (char1=='0'){
      Serial.println("Off");
```

1 - 8

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```
      Serial.println("Off");
      digitalWrite(relay,HIGH);
       }

   else if (char1=='2'){
      Serial.println("ON");
      digitalWrite(relay2,HIGH);
    }

    else if (char1=='3'){
      Serial.println("Off");
      digitalWrite(relay2,LOW);
    }

    // door lock

    else if (char1=='4'){
      Serial.println("ON");
      digitalWrite(relaydoor,HIGH);
    }

    else if (char1=='5'){
      Serial.println("Off");
      digitalWrite(relaydoor,LOW);
    }

      else if (char1=='6'){
      Serial.println("ON");
      digitalWrite(relaylight,HIGH);
    }

    else if (char1=='7'){
      Serial.println("Off");
      digitalWrite(relaylight,LOW);
    }
```

1 - 8

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CHAPTER -8

RESULTS

- The main objective of this project is to develop a home automation system using an Arduino board with Bluetooth being remotely controlled by any Android OS smart phone.
- As technology is advancing so houses are also getting smarter.
- Remote controlled home automation system provides a most modern solution with smart phones
- In order to achieve this, a Bluetooth module is interfaced to the Arduino board at the receiver end while on the transmitter end, a GUI application on the cell phone sends ON/OFF commands to the receiver where loads are connected.
- Home automation or domotics is building automation for a home, called a smart home or smart house.
- A home automation system will monitor and/or control home attributes such as lighting, climate, entertainment systems, and appliances.
- It may also include home security such as access control and alarm systems.

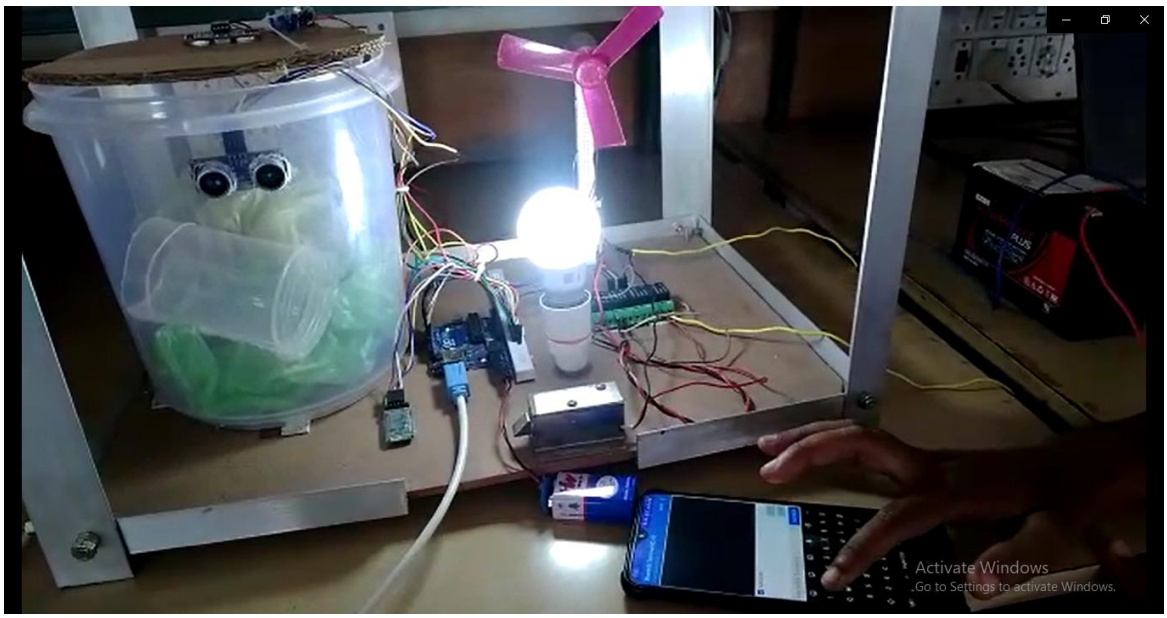

Fig 8.1: Output

Fig 8.2: Output

CHAPTER- 9

ADVANTAGES AND APPLICATIONS

Home Is Where the Smart Is

Evmachine-to-machine communication, and you understand you're not the most tech-savvy consumer, it's impossible that you've missed the abundance of home automation products filling the shelves and ads of every home improvement store. Suddenly an ordinary errand for light bulbs will leave you wondering if your lamp could send you a message alerting you that the light bulb needs to be replaced. Furthermore, if your lamp is talking to you, could your refrigerator and sprinkler system be too? Experts say: Yes, the possibilities are endless. If that's the case, where do you begin? Any day-to-day, repeatable process is automatable with smart home applications. The greater the control and flexibility of these processes, the more energy and cost savings the resident experiences, which are factors anyone who pays utilities strives to moderate. The smart home revolution is likely to be more of an evolution, with the incorporation of one or two home systems at a time, gradually automating our households through smart mobile devices. However, with these elements of efficiency comes the question of ease of use. Will it bring you enjoyment or exasperation? With so many brands and models already available in an evergrowing market, how do you know which is best for you?

Lighting Control:

Leaving the Dark Ages and Stepping Into the Light Smart lighting allows you to control wall switches, blinds, and lamps, but how intuitive is a lighting control system? It turns out, quite; its capabilities are extensive. You're able to schedule the times lights should turn on and off, decide which specific rooms should be illuminated at certain times, select the level of light which should be emitted, and choose how particular lights react through motion sensitivity, as seen with Belkin's WeMo Switch + Motion, which is both affordable and easy to use with its plug-and-play simplicity.

HVAC Regulation:

No Longer Burned by Your Heating Bill As fuel costs rise and the availability and sustainability of our resources becomes a greater concern, heating/cooling our homes efficiently is less a budgetary bonus and more of a necessity. Over the past year, smart thermostats and automated home heating systems have become more readily available and easily incorporate into any home. Heating and cooling our homes consumes an average of 50% of energy costs yearly, making daily HVAC regulation progressively rewarding. Maintaining a substantial lead among the nearly non-existent competition, the Nest Learning Thermostat, learns your heating and cooling preferences over time, eliminating the need for programming and is accessible from your smartphone app. With automated HVAC you are able to reduce the heat when a room is unoccupied, and increase or decrease it at specific times based on your schedule and occupancy.

Lawn Irrigation Systems: The Grass is Always Greener

A lush and healthy lawn is a source of pride for most homeowners, but the weather doesn't always cooperate and provide the adequate elements for a flourishing landscape. For decades we've relied on sprinkler systems to keep our yards at peak presentation, but at what cost? The average American home spends approximately 30% of their daily water usage on lawn and garden maintenance. Nearly half of that amount is wasted due to inefficiency. If you apply that statistic to the national average, up to 4.5 billion gallons of water is wasted per day through ineffective watering methods. If we reflect upon the monetary impact of this, it results in

Americans spending over a thousand dollars a year in water, with a portion of that being waste. The global effects are even greater when you consider the growing concern over climate change and the dramatic decrease in agricultural natural resources. However, sprinkler control systems, like Skydrop, are providing water regulation through real-time communication with local weather data. If a rainstorm develops and deposits two inches of rainwater on your lawn, the automated sprinkler detects the saturation and disables its scheduled watering. Conversely, the system will be alerted to dry conditions and supply the necessary amount of nourishment, without over-watering.

Smart Appliances: What's for Dinner?

Will smart kitchen appliances actually make you a better cook? Maybe. Smart refrigerators, such as LG's Smart ThinQ, allow you to scan grocery store receipts and keep an inventory of your items, and alerts you if an item is about to expire. More impressively, it suggests recipes based on your refrigerator's contents and lets you know when you need to replace items. Smart ovens synch with your smartphone and automatically preheat to the correct temperature based on a recipe selected from your database. While these appliance options seem a bit superficial and convenience based, there is a conservation factor as well. By automating your kitchen appliance and making them accessible from your smart device, you're able to sever the electricity supplied to unused appliances and reduce your energy consumption and costs. Considering the number of appliances the average household owns; this could save a substantial amount of money over time.

Security Systems: Knock, Knock

Who's there? The Internet of Things. While efficiency and conservation are certainly IoT benefits, its potential to have improved control over home security is a primary focus. Smart locks, like Kwikset's Kevo, a Bluetooth enabled electronic deadbolt, and various connected home security systems, such as iSmartAlarm, offer a variety of features including door and window sensors, motion detectors, video cameras and recording mechanisms. All of which are connected to a mobile device and accessible via the cloud, thus enabling you to access real-time

information on the security status of your home. Naturally, there is a great deal of scrutiny regarding the level of trust in controlling your home's security system via a mobile device, but it begs earnest exploration when weighing the potential benefits and peace of mind it provides homeowners.

Benefits of Home Automation using IOT

1. Lighting Control: Leaving the Dark Ages and Stepping Into the Light

2. Lawn Irrigation Systems: The Grass is Always Greener

3. Lighting control.

4. Lawn/Gardening management.

5. Enhanced Security

6. Better Home Management.

7. Home air quality and water quality monitoring.

8. Natural Language-based voice assistants.

9. It can be controlled remotely.

10. It does not require Man Power.

11. Better Infotainment delivery.

CONCLUSION

Home automation using the Internet of Things has been experimentally proven to work by connecting simple appliances to it. These appliances were successfully controlled remotely through the internet. The designed system instigates a process according to the user's requirements, for example switching on a fan when it gets hot. Sensors can be implemented to store data which can later be used to analyze the system at hand.

The IoT device market has undergone radical changes in only a few short years. Starting with disparate devices and no ecosystems to speak of, the market has now grown to encompass enterprise players working together to create ecosystems, tailored for mobile technology, which allows IoT devices to become interconnected.

Automaton of the home may have once seemed like a peculiar and unlikely concept, but as our devices become smarter and more investment is poured into the development of ioT consumer products, we are likely to see increased competition spur on further innovation in the field.

From the above research paper, it is concluded that all the home automation system techniques uses wireless technology.Arduino, GSM and Android based home automation techniques have been implemented in order to provide ease to the people to control their home appliances. Different home automation techniques using Arduino, GSM and Android are given with their design, implementation and flowcharts which gives the successful layout of their strengths and weaknesses

FUTURE SCOPE

As we already see there are lots of issues in previous existing approaches. In this section we present primarily focusing on the use of lot for the advanced, energy efficient and self-learning home automation system. The main objective is to design and implement a cost effective and smart home automated system. We are using a Wi-Fi based approach for communication between Server and Home appliances. This smart home automated system will be designed with the implementation of related software and hardware. The project proposes an implementation of IoT (Internet of Things) based smart home automated system for remotely controlling the home appliances using Wi-Fi. Low cost Wi-Fi module ESP8266 is used to build Smart Units. The user will operate home appliances like lights; fans and TV are International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 03 Issue: 05 | May-2016 www.irjet.net p-ISSN: 2395-0072 © 2016, IRJET | Impact Factor value: 4.45 | ISO 9001:2008 Certified Journal | Page 1190 remotely controlled through Android App. The server will be interfaced with relay hardware circuits that control the appliances running at home.

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