ABSTRACT

The security of home, laboratory, office, factory and building is important to human life.We develop an intelligent multi sensor based security system that contains a fire fighting robot in ourdaily life. The destructive burnt cause by electrical is the highest source. It is because security systemcan't detect abnormal and dangerous situation and notify us. Besides, user had difficulties to detect thesmall burnt cause by electrical appliances.

User may take a late time to extinguish fire like finding thewater source to extinguish fire when want to extinguish the fire. The fire difficulties to detect the smallburnt area and location that is hard to be reach by the user Sometimes tough fire extinguished forexample spaces are hard to see. So, "Autonomous Fire Protection Robot With Notification" design withextinguisher for the intelligent building to controlled by microcontroller PIC18F4550 and supported byautonomous board CYTRON SK40C board and another additional circuit. This robot equipped with 3flame sensor where each sensors has its own function and commanded control by PIC18F4550.

Thisrobot will move to the fire source when the flame sensor detected the fire and it will send message to anyphone of the GSM network through the modem connected to the programmable device. This robot alsoprogrammed to stop before the robot hit the flame. This robot also can extinguish fire at 45 degree forupper side and 45 degree for lower side. This robot implicated the function of finger to clip the fireextinguisher clipper.

TABLE OF CONTENTS

LIST OF TABLE

LIST OF FIGURE

FIGURE	TITLE	PAGE

LIST OF ABBREVIATIONS

° - Degree

A - Ampere

BC - Before Christ

C - Capacitor

DC - Direct Current

I/O - Input/Output

Kg - Kilogram

LDR - Light Dependent Resistor LED

- Light Emitting Diode

Nm -Newton per meter

PC - Private Computer PCB

- Printed Circuit Board

PIC - Peripheral Interface

ControllerPWM –Pulse-width

Modulation

R - Resistor

RPM - Rotation per Meter TR

- Transistor

USB - Universal Serial bus UV

- Ultraviolet

V - Voltage

ZIF - Zero Insertion Force

LIST OF APPENDICES

CHAPTER I

INTRODUCTION

Project Overview

Nowadays, machinery and robotic design become important in helping human. ThisFire Protection Robot was design to help people in any destructive burnt situation where thisrobot can extinguish burnt area immediately using autonomous system. This autonomoussystem will be designed using programming in PIC18F4550 and others additional circuit.

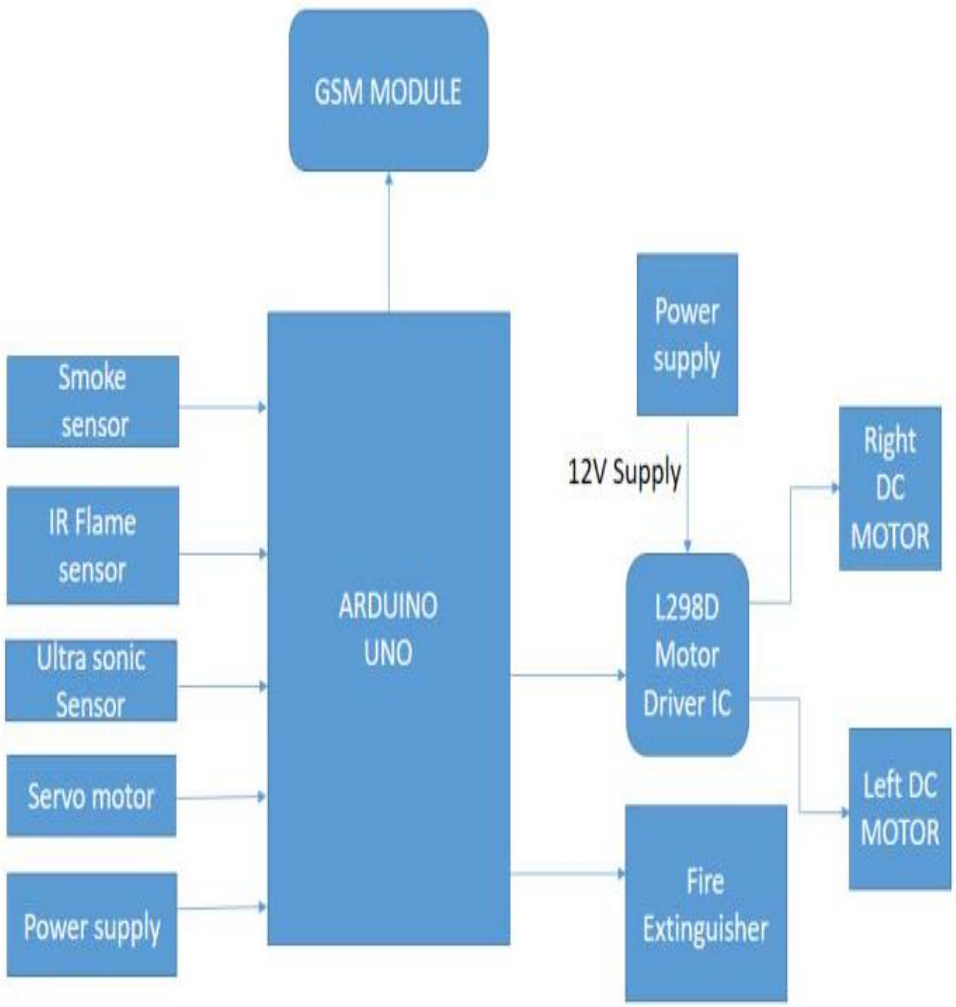
In real life, destructive burnt area often happens without our realization. Therefore,this type of robot will require a high demands in the market because of its usefulness to thehuman as well as the environment transmit fire information to cell phone using GSM modern.

The objective of the project will be to design a SMS electronic Fire Protection Robottoolkit which can replace the traditional Fire Protection Robot. The toolkit send the fire andsend SMS to owner of the house.

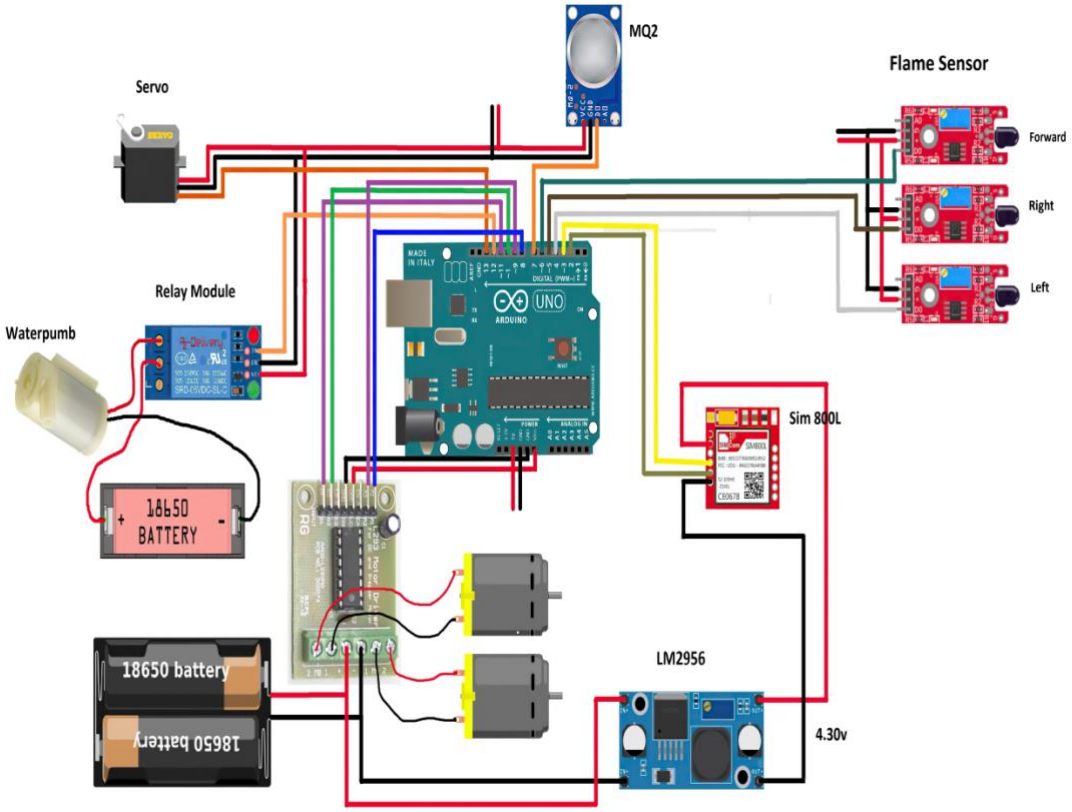
The system is made efficient by SIMs so that the SMS can be received by number of devices boards in a locality usingtechniques of time division multiple access.

The GSM modem receives the SMS. The AT commands are serially transferred tothe modem. In return the modem transmits the stored message through the wireless link. Themicrocontroller validates the SMS and then perform specific task on the device.

1.1 Project Block diagram



1.1.1 Circuit diagram



1.2 Project Scope

The project scopes for this project are:

i. The robot detecting burnt area in 0m ~ 2m in radius.
ii. Robot detect fire event, and use extinguish to fight the fire source andthe modem connected to the programmable

iii. The robot can turn 360° and than robot can extinguish fire at angle30° from the fire extinguisher nozzle.

iv. The robot can extinguish fire from petrol, gasses and electricalappliance.

1.3 Problem Statement

The security of home, laboratory, office, factory and building is important to humanlife. We develop security system that contains a fire protection robot using sensor. Thesecurity system can detect abnormal and dangerous situation and notify us. First, we designa fire protection robot with extinguisher for the intelligent building. Besides, Human haddifficulties to detect the small burnt cause by electrical appliances. The late time user takesto extinguish the fire. User may take a late time to extinguish fire like finding the watersource to extinguish fire when want to extinguish the fire. The fire difficulties to detect thesmall burnt area and location that is hard to be reach by the user. Sometimes tough fireextinguished for example spaces are hard to see. Besides is cost the loss suffered in the event offire slow to act.

PUNCA KEBAKARAN BANGUNAN NEGERI PULAU PINANG

BULAN JANUARI - OGOS TAHUN 2006

KOD	PUNCA	JUMLAH PANGGILAN	KERUGIAN (RM)	DISELAMATKAN (RM)
PK 1	LETRIK	76	95,584,070.00	180,271,030.00
PK 2	PUNTUNG ROKOK	7	204,000.00	1,234,000.00
PK 3	PERCIKAN API	6	2,542,000.00	51,421,000.00
PK 4	MERCUN / BUNGA API	2	5,000.00	20,000.00
PK 5	UBAT NYAMUK / COLOK / LILIN	21	1,317,700.00	7,387,957.70
PK 6	DAPUR GAS / MINYAK	19	944,460.00	73,061,450.00
PK 7	REAKSI SPONTAN	3	225,000.00	5,105,000.00
PK 8	SENGAJA DIBAKAR - NIAT BAIK	3	200.00	0.00
PK 8	SENGAJA DIBAKAR - NIAT JAHAT	17	900,500.00	2,920,500.00
PK 9	TIDAK DIKETAHUI	7	3,900,000.00	2,798,400.00
PK 10	TINDAK BALAS KIMIA	1	8,000,000.00	10,100,000.00
PK 11	BUDAK BERMAIN MANCIS	2	7,500.00	217,500.00
PK 12	LAIN-LAIN PUNCA	34	3,961,500.00	6,916,200.00
	JUMLAH	**198**	**117,591,930.00**	**341,456,037.70**

Figure 1.1 : Destructive burnt source for Penang

From figure 1.1, the destructive burnt cause by electrical is the highest source. Fromthis table, the designing of Autonomous Fire Protection Robot with Notification must besuitable with this type of destructive burnt

1.4 Expected Results

The expected results for this project are:

i. Autonomous searching, detecting and extinguish burnt area.
ii. Extinguish fire on the wall (315°) and 45° upper side.
iii. The robot can turn 360°.
iv. Send notification by Short Message Service (SMS) using GSM modem.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

This chapter are discussing about a study on the previous project based on fire fighterrobot project and thesis. The entire project had been studied and analyzed their principles,method and applications.

2.2 Robot

Robotisamachinethatlookslikeahumanbeingandperformsvariouscomplextasks. Now, let's have a good look at existing firefighting robots.

Virtual Reality Simulation of Fire Fighting Robot [9] (Indonesia) is a virtual adaptationof competition robot, that took part in PanitiaKontes Robot Cerdas Indonesia competition in2006. This system was developed in MATLAB/Simulink with the help of «Virtual RealityToolbox» plug-in. It is oriented for initial testing of controlling algorithms. Its important tonotice, that even the robot itself doesn't have enough level of functionality, because of low-detailed formalization of environment.

The robot could operate only in corridor-room environment, without strange objects. Onlyone fire source is meant and there are auxiliary marks on floor, that mean for example roomentrance.

Pokey the Fire-Fighting Robot [10] (USA) is the firefighting robot, that made its wayoutofcompetitions,andbecamemore“serious”thanothersystems.In[10]therear edetailed description of used equipment and basic algorithms of operating. Robots operatingenvironment is a building, so the robot is equipped with necessary sensors, for example, witha line sensor, that could be unuseful in conditions of dense smoke. The main advantages ofrobot are:

- using of two types of fire sensors, working in different ways;
- usingofcomplexfirefightingtool;The

main disadvantages are:

- shortdistanceofsensor’swork.thefirecouldberecognizedatthedistancenotm orethan 1.5m. at longer distances the sensors works bad, ad developers say
- lowefficiencyofonboardcomputer,ableonlytocarrymaintasks,withoutitsext ension and complexization;
- absence of optical means of environment perception.

The device is described as autonomous mean of firefighting in houses and any civilbuildings.FireProtectionRobot[11](USA)– anothercompetitionproject,developedfor «15th Annual Trinity College Fire Fighting Robot Competition». Robot has more complexorganization, than one, shown above and is oriented for solving larger variety of tasks. Themain system’s advantages are:

- more complex algorithms, used for fire detection.
- using of sound sensor for activating.

- presence of some additional navigation sensors.

Previous Robot Overview

DESIGNER	YEAR	DESCRIPTION
Archytas	(347 BC)	Abird-shapedmodelpropelledbyajetofwhatwasprobablysteam,said tohaveactuallyflownsome200yards. This machine, which its inventor called The Pigeon,may havebeensuspended onawireor pivotforitsflight.A boat with four automatic musicians that floated on a laketo entertain guests at royal parties.
Al-Jazari	(1206)	
Leonardoda Vinci	(1519)	Furtheranalysisoftheplanshasledsometobelievethat therobotwouldhavebeenabletositup,waveitsarmsandmove its head and jaw. It is not known whether heattempted to build the robot.
Jacques de Vaucanson	(1782)	A mechanical duck that was able to eat and digest grain, as well as flap its wings. Vaucanson gained celebrity acrossEurope for his constructs.

The robot below shows the characteristic of the previous robot that have been similar withthis robot project and used in the literature reviews:

2.3.1 Rolly Firefighter Robot by William Dubel, Hector Gongora, KevinBechtold, and Daisy Diaz

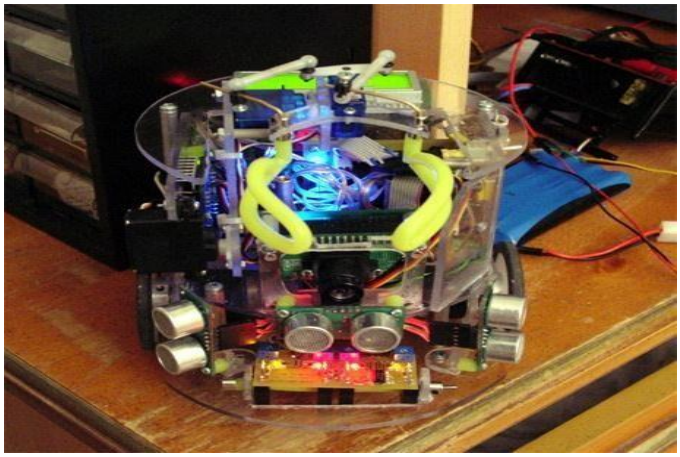


Figure 2.1 : Rolly Firefighter Robot by William Dubel, Hector Gongora, Kevin Bechtold,and Daisy Diaz

This firefighting robot is designed to search for a fire in a small floor plan

of a house,extinguishthefire(byplacingacupovertheLEDs),andthenreturntothefrontof thehouse. The navigation of the robot throughout the house is achieved by data provided by alinetrackerandultrasoundtransducers.Thedeploymentoftheextinguishingdevicei simplemented with a custom arm controlled by servos.

2.3.2 Fire Protection Robot by Viet Do, Ryan Norder, and Ryan Spraetz

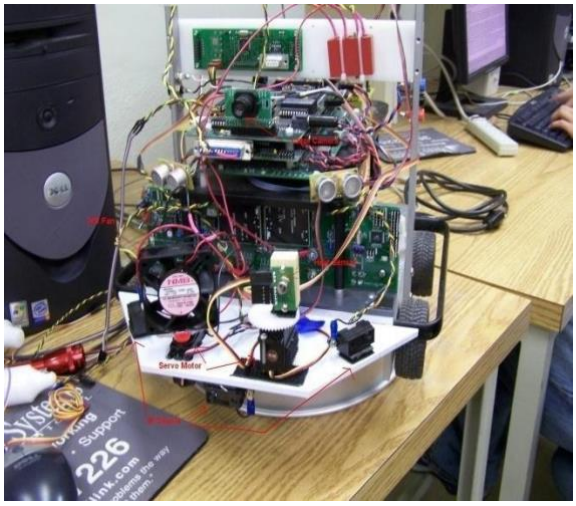


Figure 2.2 : Fire Protection Robot .

This robot designed to enter a room and seek out a spot where there is extreme heatpossiblyduetoafire.Uponenteringtheroom,therobotwillonceagainusethecolor camera to pinpoint a spot where there is a large concentration of light. Once the robot hasdriven up to the light source, the heat sensor is activated to check and see if there is a largeamount of heat being generated. If there is an excessive amount of heat generated, the fan isturned on and rotated quickly with a servo motor to put out the flame. If the flame is not putoutthefanwillturnonagainandcontinuetoblowontheflame.Oncetheflameisextinguished, the robot leaves the home.

2.3.3 Autonomous Mobile Robot: Recognize and Response to fire

Figure 2.3 : Autonomous Mobile Robot: Recognize and Response to fire

This project will discuss about the development of a mobile robot which is can betrain and control an autonomous robot that has a multifunction. The robot acquires basicnavigation skills as well as the ability to detect a fire and to extinguish it. This robot iscontrolled by a microcontroller PlC16F84A and supported by RC circuits as driver for Dcmotors and other electronic components. This robot equipped with fire sensor that can beexpand and attract so it can recognize and response to fire to operating water pump system.The battery monitoring circuit also equipped in this robot to make an easier to monitoring theoverall robot battery power.

2.3 GSM Modem

GSMisacellularnetwork,whichmeansthatmobilephonesconnecttoitbysearching for cells in the immediate vicinity. Table 2.1 show the types of GSM Modem andused technology.

Table 2.2 : The type of GSM Modem and Technology

YEAR	STANDARD	MOBILE TELEPHONE SYSTEM	TECHNOLOGY	PRIMARY MARKETS
1981	NMT540	NORDIC MOBILE TELEPHONY	ANALOG UE	EUROPE,MIDDLE EAST
1985	TACS	TOTAL ACCESS COMMUNUNICATION SYSTEM	ANALOG UE	EUROPE AND CHINA
1986	NMT900	NORDIC MOBILE TELEPHONY	ANALOG ue	EUROPE, MIDDLE EAST
1991	GSM	GLOBAL SYSTEM FOR MOBILE COMMUNICATION	DIGITAL	WORLD-WIDE
1991	TDMA	TIME	DIVISION DIGITALMULTIPLEACCESS	AMERICA
1993	CDMA	CODE	DIVISION DIGITALMULTIPLEACCESS	NORTH AMERICA, KOREA
1992	GSM 1800	GLOBAL SYSTEM FOR MOBILE COMMUNICATION	DIGITAL	EUROPE
1994	PDC	PERSONAL DIGITAL CELLULAR	DIGITAL	JAPAN
1995	PCS 1900	PERSONAL COMPUTER SERVICES	DIGITAL	NORTH AMERICA

2001	GSM 800	GLOBAL SYSTEM FOR MOBILE COMMUNICATION	DIGITAL	NORTH AMERICA
2006-TILL 450DATE	GSM	GLOBAL SYSTEM FOR MOBILE COMMUNICATION	DIGITAL	WORLD-WIDE

CHAPTER III

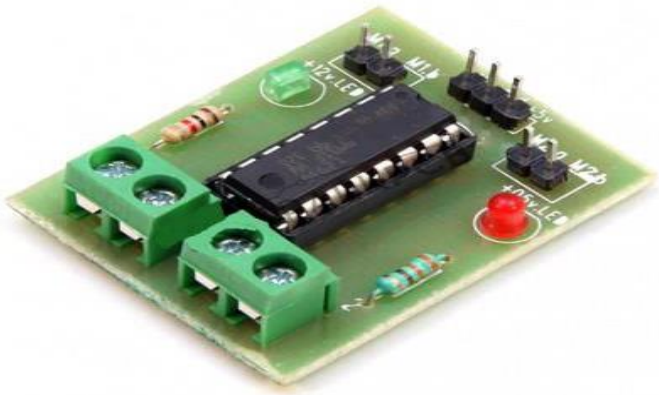
SYSTEM REQUIREMENTS AND SPECIFICATIONS

3. HARDWARE REQUIREMENTS

3.1.1 L293D DRIVER MODULE

The Motor Driver is a module for motors that allows you to control the working speed and direction of two motors simultaneously .This Motor Driver is designed and developed based on L293D IC.L293D is a 16 Pin Motor Driver IC. This is designed to provide bidirectional drive currents at voltages from 5 V to 36 V.

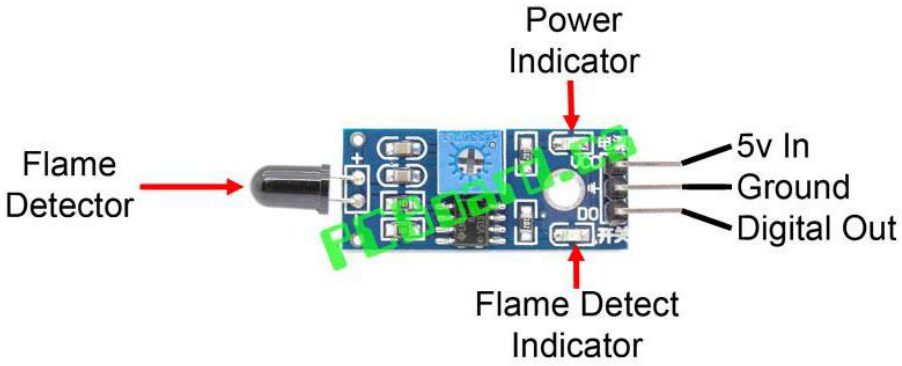
L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors.L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop



3.1.2 FLAME SENSOR MODULE

A flame sensor module that consists of a flame sensor (IR receiver), resistor, capacitor, potentiometer, and comparator LM393 in an integrated circuit. It can detect infrared light with a wavelength ranging from 700nm to 1000nm.The far-infrared flame probe converts the light detected in the form of infrared light into current changes. Sensitivity is adjusted through the onboard variable resistor with a detection angle of 60 degrees.

Working voltage is between 3.3v and 5.2v DC, with a digital output to indicate the presence of a signal. Sensing is conditioned by an LM393 comparator.



3.1.3 ULTRA SONIC SENSOR

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object.

3.1.4 DC MOTOR

Motors convert electrical energy into mechanical energy.A DC motor **is an electric motor that runs on direct current (DC) electricity.**

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

3.1.5 WATER PUMP

The water pump is operated at 5v which can be interfaced with Arduino

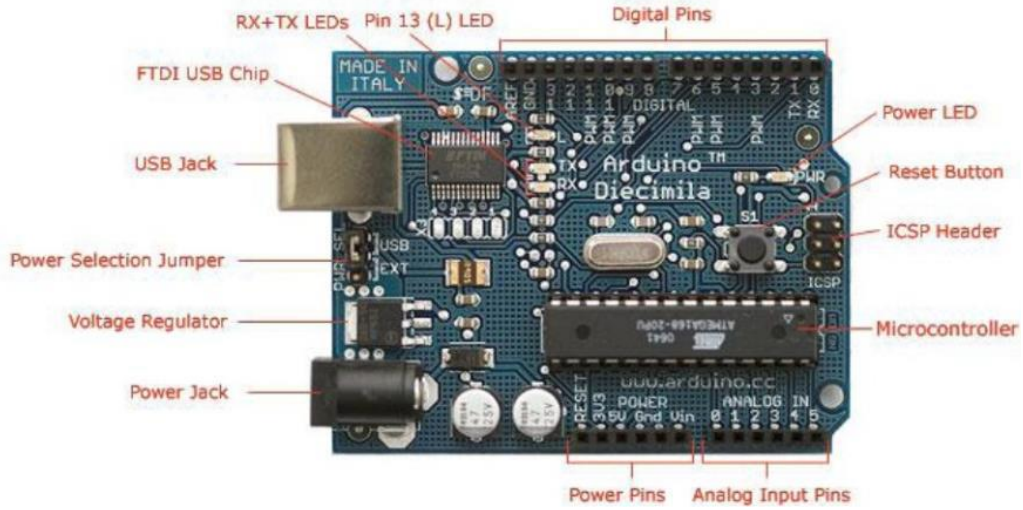
3.1.6 SERVO MOTOR

A servo is a small DC motor with the following components added: some gear reduction, a position sensor on the motor shaft, and an electronic circuit that controls the motor's operation. In other words, a servo is to a DC motor what the Arduino is the Atmega microcontroller---components and housing that make the motor easy to use. This will become abundantly clear when we work with unadorned DC motors next week.

The gear reduction provided in a servo is large; the basic hobby servo has a 180:1 gear ratio. This means that the DC motor shaft must make 180 revolutions to produce 1 revolution of the servo shaft. This large gear ratio reduces the speed of the servo and proportionately increases its torque. What does this imply about small DC motors? Servo motors are typically used for angular positioning, such as in radio control airplanes. They have a movement range of 0 up to 180 degrees, but some extend up to 210 degrees. Typically, a potentiometer measures the position of the output shaft at all times so the controller can accurately place and maintain its position.

- **MICRO CONTROLLER ATMEGA 328**

The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughputs approaching 1 MIPS.



Power Supply

The **Arduino Uno power supply** can be done with the help of a USB cable or an external power supply. The external power supplies mainly include AC to DC adapter otherwise a battery. The adapter can be connected to the Arduino Uno by plugging into the power jack of the Arduino board. Similarly, **the battery** leads can be connected to the Vin pin and the GND pin of the POWER connector. The suggested voltage range will be 7 volts to 12 volts.

Input & Output

The 14 digital pins on the Arduino Uno can be used as input & output with the help of the functions like pinMode(), digitalWrite(), & Digital Read().

Pin1 (TX) & Pin0 (RX) (Serial): This pin is used to transmit & receive TTL serial data, and these are connected to the Atmega8U2 USB to TTL Serial chip equivalent pins.

Pin 2 & Pin 3 (External Interrupts): External pins can be connected to activate an interrupt over a low value, change in value.

Pins 3, 5, 6, 9, 10, & 11 (PWM): This pin gives 8-bit PWM o/p by the function of analogWrite().

SPI Pins (Pin-10 (SS), Pin-11 (MOSI), Pin-12 (MISO), Pin-13 (SCK): These pins maintain SPI-communication, even though offered by the fundamental hardware, is not presently included within the Arduino language.

Pin-13(LED): The inbuilt LED can be connected to pin-13 (digital pin). As the HIGH-value pin, the light emitting diode is activated, whenever the pin is LOW.

Pin-4 (SDA) & Pin-5 (SCL) (I2C): It supports TWI-communication with the help of the Wire library.

AREF (Reference Voltage): The reference voltage is for the analog i/ps with analogReference().

Reset Pin: This pin is used for reset (RST) the microcontroller.

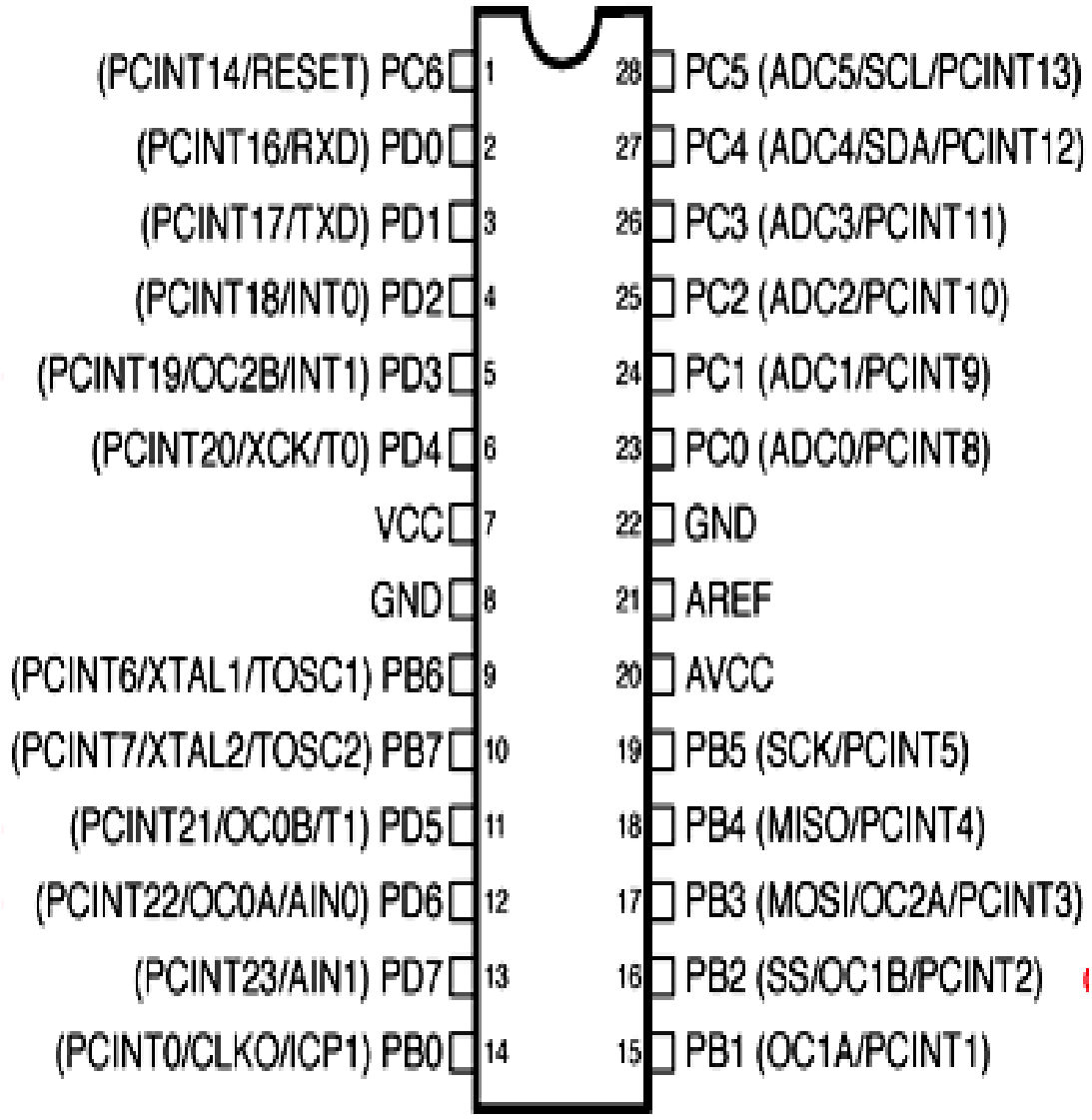
3.2.1 Applications

Today the Atmega328 is commonly used in many projects and autonomous systems where a simple, low-powered, low-cost micro-controller is needed. Perhaps the most common implementation of this chip is on the popular Arduino development platform, namely the Arduino Uno and Arduino Nano models.

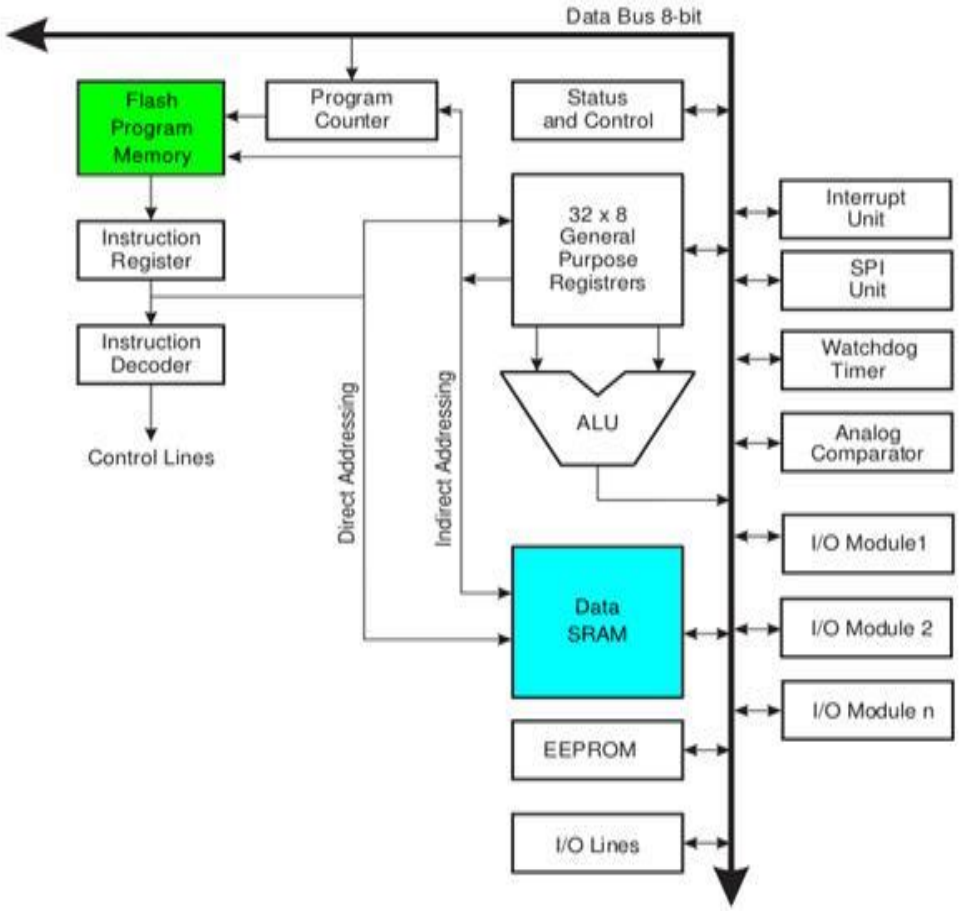
3.2.2 Features

- 28-pin AVR Microcontroller
- I/O Pins: 23
- Timers: Two 8-bit / One 16-bit
- A/D Converter: 10-bit Six Channel
- PWM: Six Channels
- MSSP: SPI and I²C Master and Slave Support
- USART: Yes
- External Oscillator: up to 20MHz

PIN DIAGRAM OF AUDRINO UNO



3.3 **ARCHITECTURE**



Chapter- IV

SOFTWARE SPECIFICATION

ARDUINO INTEGRATED DEVELOPMENT ENVIRONMENT

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttonsfor common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

WRITING SKETCHES

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

NB: Versions of the Arduino Software (IDE) prior to 1.0 saved sketches with the extension

.pde. It is possible to open these files with version 1.0, you will be prompted to save thesketch with the .ino extension on save.

File

• *New* creates a new instance of the editor, with the bare minimum structure of a sketchalready in place.

• *Open* Allows to load a sketch file browsing through the computer drives and folders.

• *Open Recent* Provides a short list of the most recent sketches, ready to be opened.

• *Sketchbook* Shows the current sketches within the sketchbook folder structure; clicking onany name opens the corresponding sketch in a new editor instance.

• *Examples* Any example provided by the Arduino Software (IDE) or library shows up in this menu item. All the examples are structured in a tree that allows easy access by topic or library.

SKETCH

Verify/Compile

• Checks your sketch for errors compiling it; it will report memory usage for code and variables in the console area.

Upload

• Compiles and loads the binary file onto the configured board through the configured Port.

Upload Using Programmer

- This will overwrite the bootloader on the board; you will need to use Tools > Burn

Bootloader to restore it and be able to Upload to USB serial port again. However, it allows you to use the full capacity of the Flash memory for your sketch. Please note that this command will NOT burn the fuses. To do so a *Tools -> Burn Bootloader* command must be executed.*Export Compiled Binary*

Saves a .hex file that may be kept as archive or sent to the board using other tools.

Show Sketch Folder

- Opens the current sketch folder.

Include Library

- Adds a library to your sketch by inserting #include statements at the start of your code.

menu item you can access theLibrary Manager and import new

libraries from .zip files.

Add File...

Adds a source file to the sketch (it will be copied from its current location). The new file appears in a new tab in the sketch window. Files can be removed from the sketchusing the tab menu accessible clicking on the small triangle icon below the serial monitor one on the right side o the toolbar.

LIBRARIES

Libraries provide extra functionality for use in sketches, e.g. working with hardware or manipulating data. To use a library in a sketch, select it from the Sketch > Import Library menu. This will insert one or more #include statements at the top of the sketch and compile the library with your sketch. Because libraries are uploaded to the board with your sketch, they increase the amount of space it takes up. If a sketch no longer needs a library, simply delete its #includestatements from the top of your code.

There is a list of libraries in the reference. Some libraries are included with the Arduino software. Others can be downloaded from a variety of sources or through the Library Manager. Starting with version 1.0.5 of the IDE, you do can import a library from a zip file and use it in an open sketch. See these instructions for installing a third-party library.

Chapter- V

5.1. CODING

```
/*------ Arduino Fire Fighting Robot ver 2.0 Code by hobby project---- */

#include <Servo.h>            //include servo.h library
#include <SoftwareSerial.h>  //include SoftwareSerial.h library

Servo myservo;

int pos = 0;
39oolean fire = false;


const String PHONE = "+919493670109"; //use your number with country
code

#define rxPin 2
#define txPin 3
SoftwareSerial sim800L(rxPin,txPin);
#define Left 4          // left sensor
#define Right 5         // right sensor
#define Forward 6       //front sensor
#define GAS_SENSOR 7    //Gas sensor
#define LM1 8           // left motor
#define LM2 9           // left motor
#define RM1 10          // right motor
#define RM2 11          // right motor
#define pump 12         //water pumb



void setup()
{

  Serial.begin(115200);

  sim800L.begin(9600);
```

```
 sim800L.println("AT");
 delay(1000);
 sim800L.println("AT+CMGF=1");
 delay(1000);

 pinMode(Left, INPUT);
 pinMode(Right, INPUT);
 pinMode(Forward, INPUT);
 pinMode(GAS_SENSOR, INPUT);
 pinMode(LM1, OUTPUT);
 pinMode(LM2, OUTPUT);
 pinMode(RM1, OUTPUT);
 pinMode(RM2, OUTPUT);
 pinMode(pump, OUTPUT);

 myservo.attach(13);
 myservo.write(90);

  while(sim800L.available()){
 Serial.println(sim800L.readString());
  }

}

void put_off_fire()
{



   digitalWrite(LM1, HIGH);
   digitalWrite(LM2, HIGH);
   digitalWrite(RM1, HIGH);
   digitalWrite(RM2, HIGH);
   digitalWrite(pump,HIGH);
   delay(500);


   for (pos = 50; pos <= 110; pos += 1) {
   myservo.write(pos);
   delay(10);
  }
  for (pos = 110; pos >= 50; pos -= 1) {
   myservo.write(pos);
```

```
    delay(10);
  }
  digitalWrite(pump,LOW);
  myservo.write(90);
  fire=false;
}

void loop()
{


  myservo.write(90); //Sweep_Servo();

  if (digitalRead(Left) ==1 && digitalRead(Right)==1 &&
digitalRead(Forward) ==1)
    {
    delay(500);
    digitalWrite(LM1, HIGH);
    digitalWrite(LM2, HIGH);
    digitalWrite(RM1, HIGH);
    digitalWrite(RM2, HIGH);
    }
    else if (digitalRead(Forward) ==0)
    {
    digitalWrite(LM1, HIGH);
    digitalWrite(LM2, LOW);
    digitalWrite(RM1, HIGH);
    digitalWrite(RM2, LOW);
    fire = true;

    }

    else if (digitalRead(Left) ==0)
    {
    digitalWrite(LM1, HIGH);
    digitalWrite(LM2, LOW);
    digitalWrite(RM1, HIGH);
    digitalWrite(RM2, HIGH);
    }

    else if (digitalRead(Right) ==0)
    {
    digitalWrite(LM1, HIGH);
    digitalWrite(LM2, HIGH);
```

```
    digitalWrite(RM1, HIGH);
    digitalWrite(RM2, LOW);
    }
    delay(400);//change this value to change the distance

     if(digitalRead(GAS_SENSOR)== 0)
    {
     Serial.println("Gas is Detected.");
      send_sms();
    }

     while (fire == true)
     {
      put_off_fire();
      Serial.println("Fire Detected.");
      make_call();
     }}
     void make_call()
{
    Serial.println("calling….");
    sim800L.println("ATD"+PHONE+";");
    delay(20000); //20 sec delay
    sim800L.println("ATH");
    delay(1000); //1 sec delay
}

void send_sms()
{
    Serial.println("sending sms….");
    delay(50);
    sim800L.print("AT+CMGF=1\r");
    delay(1000);
    sim800L.print("AT+CMGS=\""+PHONE+"\"\r");
    delay(1000);
    sim800L.print("Gas Detected");
    delay(100);
    sim800L.write(0x1A);
    delay(5000);
}
```

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