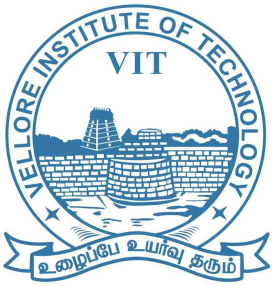

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CONTROL SYSTEMS

ECE 2010

CONTROL SYSTEMS PROJECT (J COMPONENT)

SUBMITTED TO FACULTY: PROF. MALAYA KUMAR HOTA

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Automatic Mobile Call Indicator using LM358

CONTENTS:

ABSTRACT:

This mobile phone detector can sense the presence of an activated mobile phone from a distance of four to five metres. So it can come handy in an examination hall or meetings where mobile phones are not permitted.

Consider a situation where you don't want to be disturbed by the phone rings or messages or SMSes,etc but at the same time you expect important calls at times. In this case this device is also very useful.

The circuit can detect incoming and outgoing calls, SMSes, Internet and video transmissions even if a mobile phone is kept in silent mode. When it detects an RF signal from an activated mobile phone, its LED starts blinking and continues to blink until the signal stops.

INTRODUCTION:

We are primarily using LM358 IC whose details are given below

LM358 IC:

The IC or integrated circuit is a little black chip, it is a root of modern electronics, and also an essential component in many electronic circuits. The applications of integrated circuits involve in each and every electronic circuit board, embedded systems and various electronic projects. An integrated circuit is a set of various electrical and electronic components like resistors, capacitors, transistors. All these components are integrated onto a single chip. They are available in various forms like 555 timers, single circuit logic gates,

microprocessors, microcontrollers, voltage regulators and op-amps like IC 741, LM324 IC, LM358 IC, LM339 IC and many more.

The LM358 IC is a great, low power and easy to use dual channel op-amp IC. It is designed and introduced by national semiconductor. It consists of two internally frequency compensated, high gain, independent op-amps. This IC is designed for specially to operate from a single power supply over a wide range of voltages. The LM358 IC is available in a chip sized package and applications of this op amp include conventional op-amp circuits, DC gain blocks and transducer amplifiers. LM358 IC is a good, standard operational amplifier and it is suitable for our needs. It can handle 3-32V DC supply & source up to 20mA per channel. This op-amp is apt, if one wants to operate two separate op-amps for a single power supply. It's available in an 8-pin DIP package.

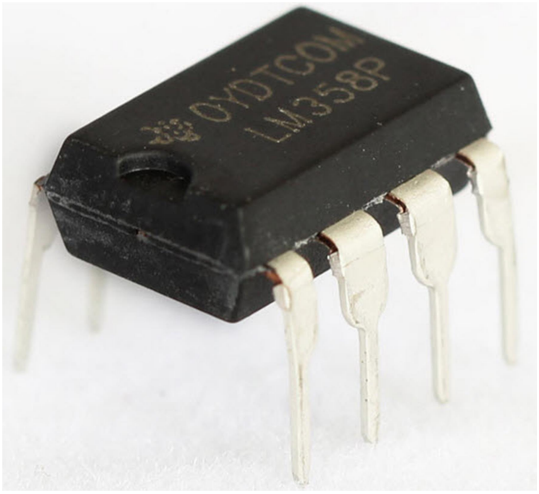


Figure 1 : LM358 8-pin IC

Pin Configuration of LM358 IC

The pin diagram of LM358 IC comprises of 8 pins, where

- Pin-1 and pin-8 are o/p of the comparator
- Pin-2 and pin-6 are inverting i/ps
- Pin-3 and pin-5 are non-inverting i/ps
- Pin-4 is GND terminal
- Pin-8 is VCC+

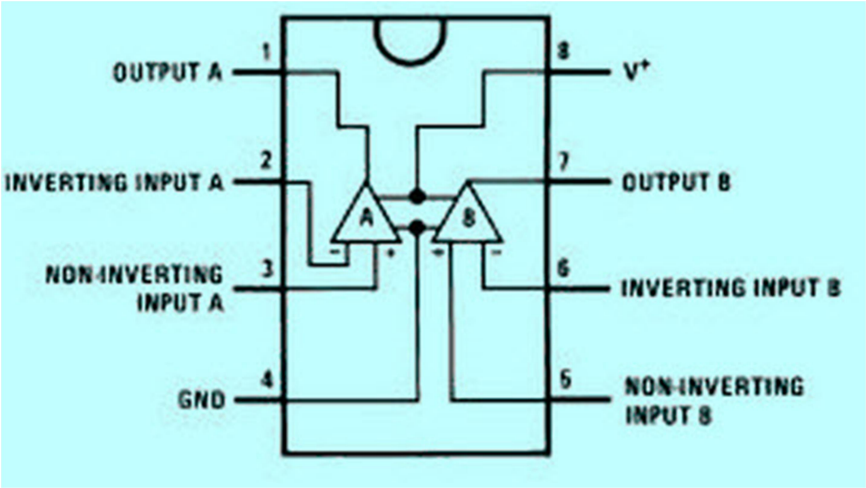


Figure 2 : LM358 IC pin configuration

Features of LM358 IC

- It consists of two op-amps internally and frequency compensated for unity gain
- The large voltage gain is 100 dB
- Wide bandwidth is 1MHz
- Range of wide power supplies includes single and dual power supplies
- Range of Single power supply is from 3V to 32V
- Range of dual power supplies is from + or -1.5V to + or -16V
- The supply current drain is very low, i.e., 500 µA
- 2mV low i/p offset voltage
- Common mode i/p voltage range comprises ground
- The power supply voltage and differential i/p voltages are similar
- o/p voltage swing is large.

Advantages of LM358 IC

- Two operational amplifiers are compensated internally
- Two internally compensated op amps
- Removes the necessity of dual supplies
- Permits direct sensing close to GND & VOUT
- Well-suited with all methods of logic

- Power drains appropriate for the operation of the battery

Arduino:

There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard, and many others offer similar functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package. Arduino also simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems:

- Inexpensive - Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than $50
- Cross-platform - The Arduino Software (IDE) runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.
- Simple, clear programming environment - The Arduino Software (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with how the Arduino IDE works.
- Open source and extensible software - The Arduino software is published as open source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into your Arduino programs if you want to.
- Open source and extensible hardware - The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module in order to understand how it works and save money.

Arduino Piezo Buzzer

A "**piezo buzzer**" is basically a tiny speaker that you can connect directly to an **Arduino**. "Piezoelectricity" is an effect where certain crystals will change shape when you apply electricity to them. By applying an electric signal at the right frequency, the crystal can make sound.

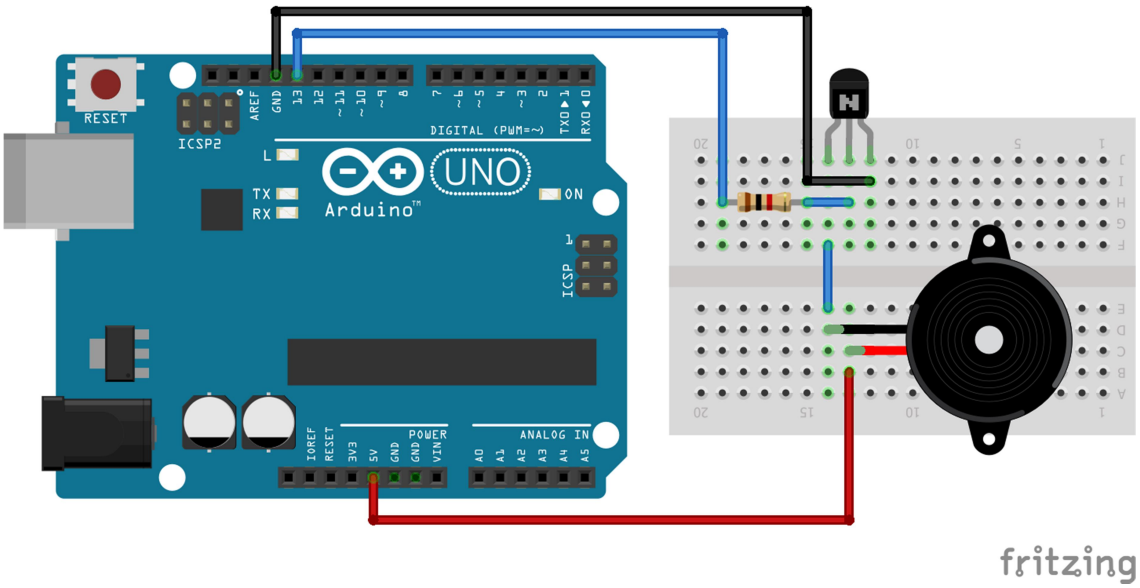
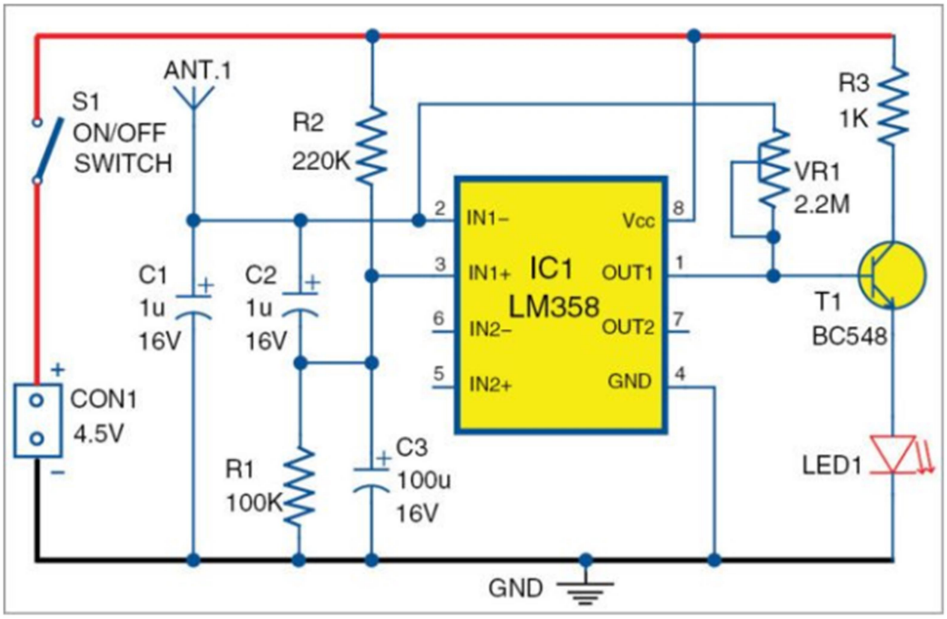


Figure 3 : Piezo buzzer integrated with Arduino

Figure 4 : Piezo Buzzer

Circuitry and Working:

Shown below is the circuit diagram of the device that is automatic call indicator that we built:



When a mobile phone is active, it radiates RF signal that passes through nearby space. The signal contains electromagnetic RF radiation from the phone.

Capacitor C1 is used in the circuit to detect the RF signal from the mobile phone. When the mobile phone radiates energy in the form of RF signal, C1 absorbs it and passes on to the inputs of IC1. This is indicated by the flashing of LED1. Preset VR1 (2.2M) is used to vary the range of the circuit. Transistor T1 is used to amplify the signal obtained at pin 1 of IC1. The circuit is applicable for 2G networks, GPRS and network search (manual/automatic). It does not detect 3G, WCDMA and HSDPA network signals so well.

Construction and testing

An actual-size, single-side PCB layout for the mobile phone detector circuit is shown in Fig. 3 and its component layout in Fig. 4. After assembling the circuit on the PCB, enclose it in a suitable plastic box.

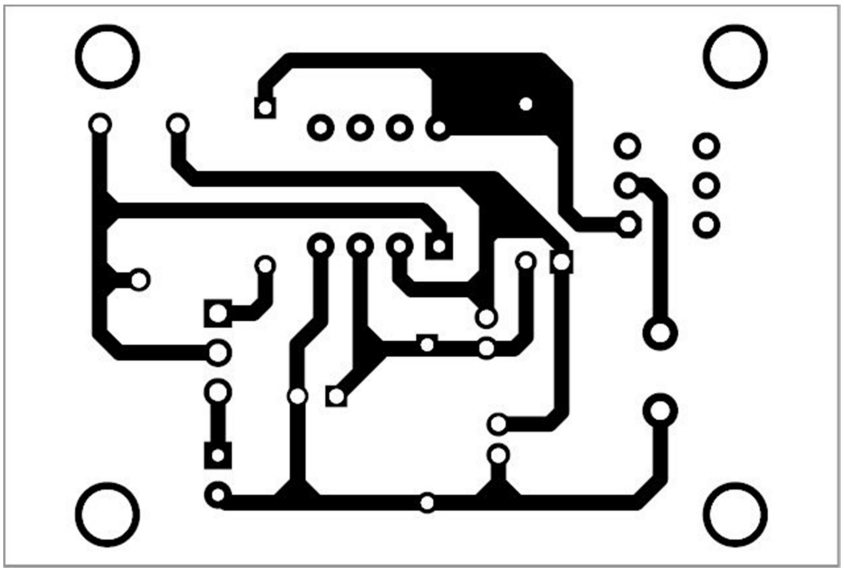


Figure 5 : Actual-size PCB layout for the mobile phone detector circuit

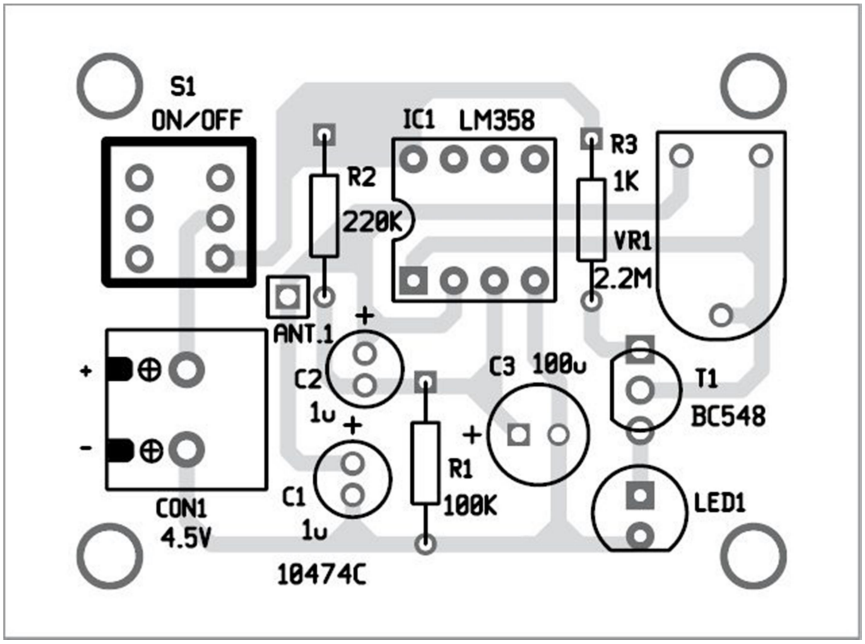


Figure 6 : Block Circuit Diagram

We also integrated our circuit with arduino, applying a peizo buzzer which beeps everytime there is a phone call or a text message is being sent.

Arduino Code :

```
const int analog = A0;

const int buzzer = 5;

int LED = 1;

int a,x;

void setup() {

  // put your setup code here, to run once:

pinMode(LED,OUTPUT);

pinMode(buzzer,OUTPUT);

Serial.begin(9600);

}


void loop() {

  // put your main code here, to run repeatedly:

x = analogRead(analog);


Serial.print(x);

Serial.println();

delay(1000);


if(x<300)

{

  digitalWrite(buzzer,HIGH);

  Serial.println("Phone Detected");
```

```
}


else
{
  digitalWrite(buzzer,LOW);
  Serial.println("Phone Not Detected");
}


}
```

Results

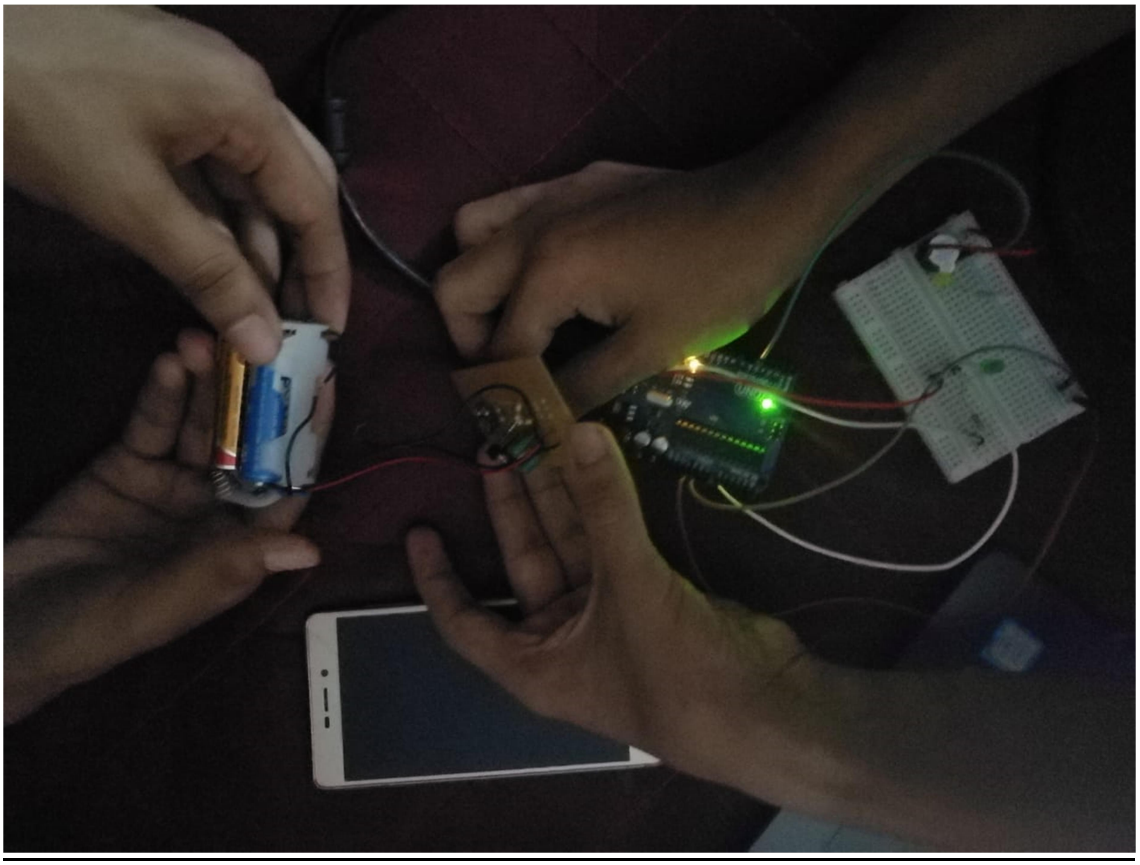


Figure 7 : When there is no incoming call

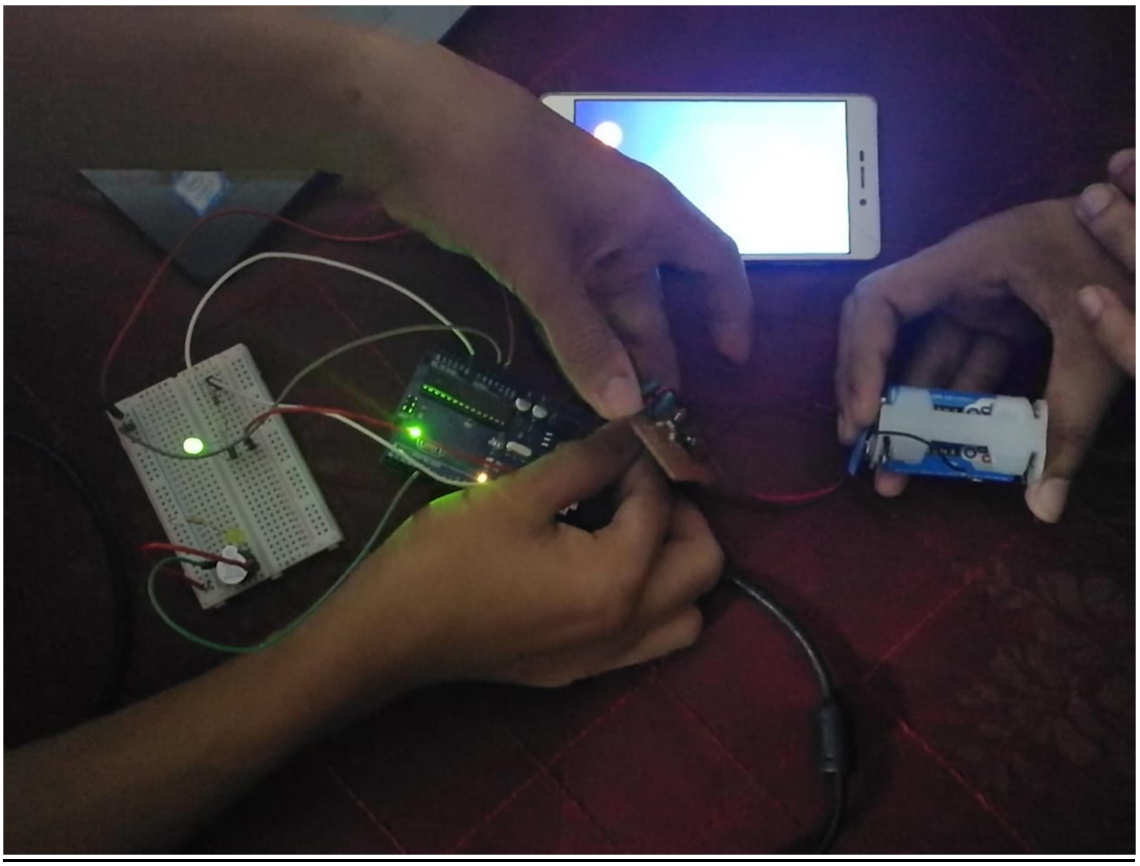


Figure 8 : When there is an incoming call with buzzer beeping

Conclusion

This project was carried out successfully and as we have seen above Reinforcement Learning has successfully helped in solving the maze problem efficiently.