

# **ASSISTIVE COLLISION AVOIDANCE DEVICE FOR VISUALLY IMPAIRED**

**Under the guidance of**

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# Overview

- Introduction
- Block diagram & description
- Hardware and software description
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# **INTRODUCTION**

# Introduction

- Vision is the most important of all human senses.
- Blindness is the condition of poor visual perception.
- People with visual impairment are facing the following challenges
  - Mobility
  - Reading and magnification
- We focus mainly the mobility aspect of the challenges faced by the blind.

# Mobility Challenges and current solutions

- The oldest mobility aid for persons with visual impairments are the walking cane. A white cane is used by many people who are blind or visually impaired.
- The other option that provides the best travel aid for the blind is the guide dogs. Based on the symbiosis between the disabled owner and his dog, the training and the relationship to the animal are the keys to success.

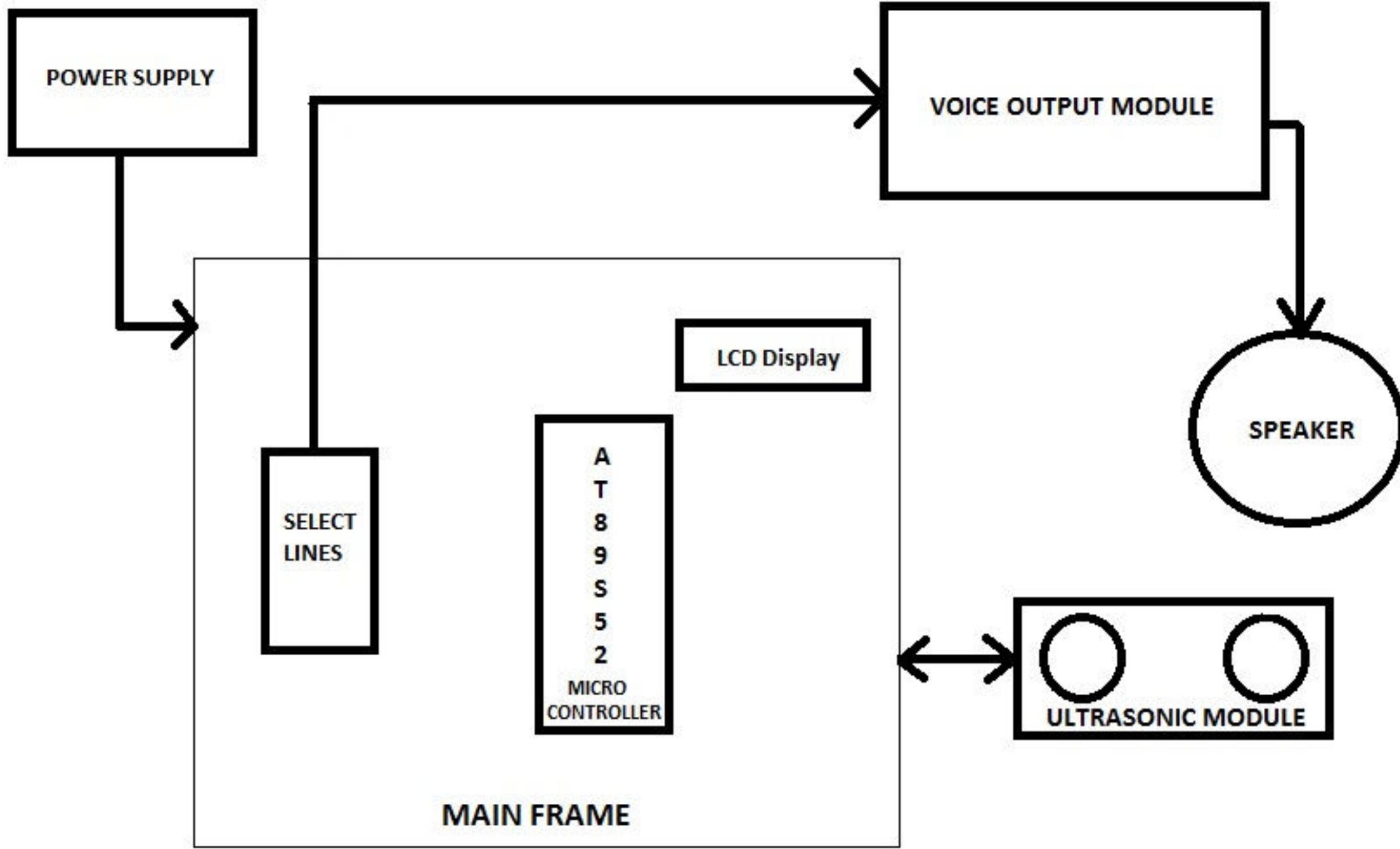
# Drawbacks of traditional mobility aids

- The most important drawbacks of these aids are necessary skills and training phase, range of motion and very little information conveyed.
- With the rapid advances of modern technology, both in hardware and software front has brought potential to provide intelligent navigation capabilities using Assistive Technology.

# Aim of the work

- The problem of navigation assistance has been addressed primarily from the angle of human-computer interactions and in the industry, by proposing some commercially viable systems.
- The main objective of this project is to provide artificial guidance regarding the obstacles ahead to the visually impaired people with the help of a microcontroller, ultrasonic sensor, and speaker and finally make the instrument available at an affordable price for all the visually impaired people.

# BLOCK DIAGRAM



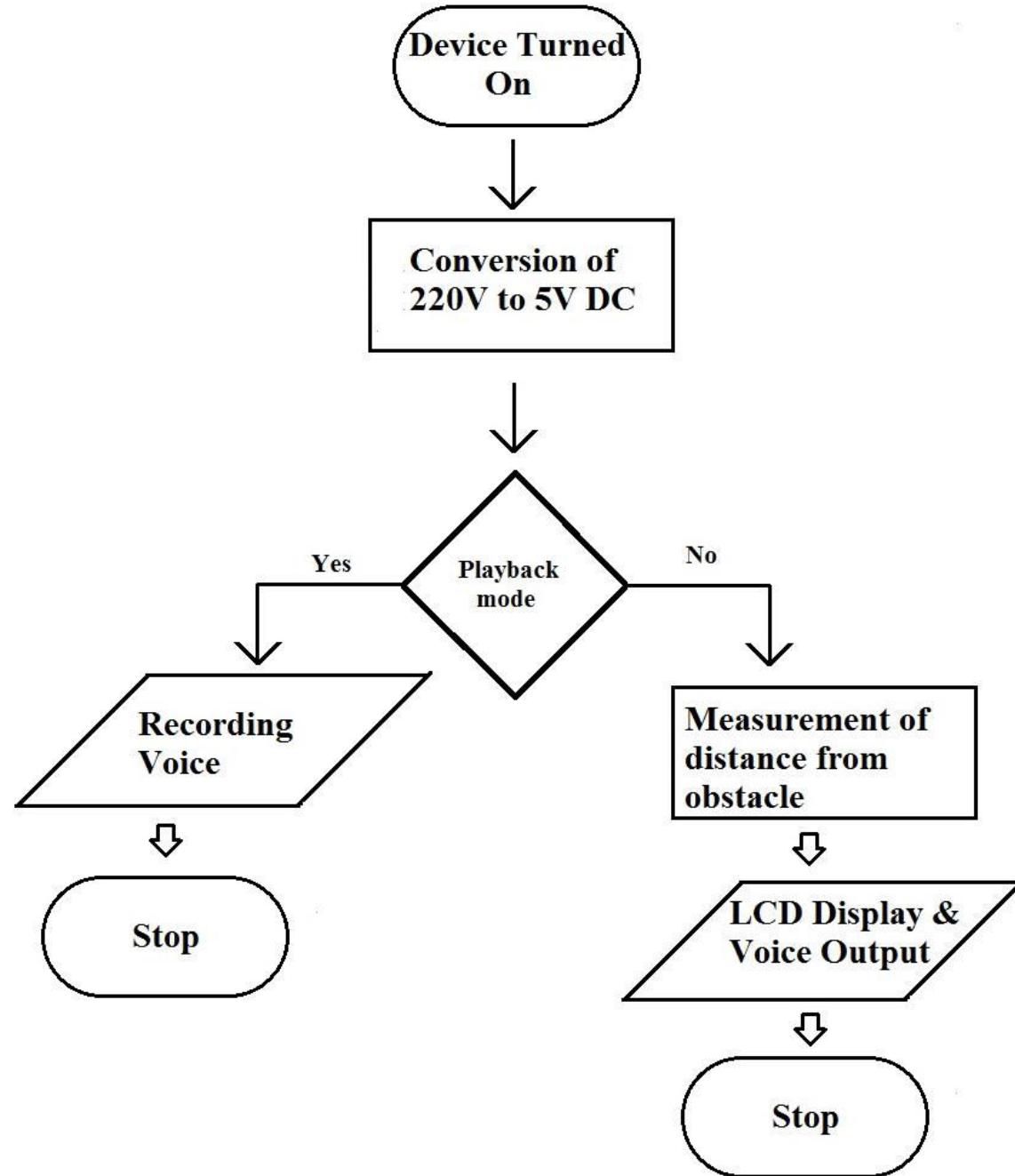
# Main Blocks

- 1. Microcontroller Block
- 2. Ultrasonic Ranging Module
- 3. LCD Module
- 4. Voice Output Module
- 5. Speaker
- 6. Power Supply Block

# Functionality

- 5V DC is supplied by the power supply block
- Ultrasonic Ranging Modules measures the distance
- Microcontroller receives inputs from Ultrasonic ranging module and selects the appropriate sound track for play back using speaker for spoken feedback purposes
- It is also connected to an LCD for displaying the distance for calibration of Voice Output Module.

# Flowchart



# **HARDWARE AND SOFTWARE TECHNICALITIES**

# Microcontroller ATMEL AT89C52

- The main features of the microcontroller are:
- Compatibility with MCS 51 family
- 8-bit CPU at a frequency of up to 33MHz
- RAM: 256 Bytes
- Flash memory: 8K Bytes
- 32 lines of programming for input / output general
- 8 Interrupt sources organized in two levels of priorities
- 3 timers / counters of 16 bits
- Watchdog Timer
- supports up to 10 000 rewrites

# Ultra Sonic Ranging Module

- Ultrasonic ranging module HC - SR04 provides 2cm - 350cm non-contact measurement function.
- The ranging accuracy can reach to 3mm.
- The modules includes
  - Ultrasonic transmitters
  - Receiver
  - Control circuit



# The basic working principle (Ultrasonic Ranging Module)

- Using IO trigger for at least 10us high level signal. The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
- IF the signal back, through high level , time of high output IO duration is the time is noted from sending ultrasonic to returning.
- Test distance =  $(\text{high level time} \times \text{velocity of sound (340M/S)}) / 2$

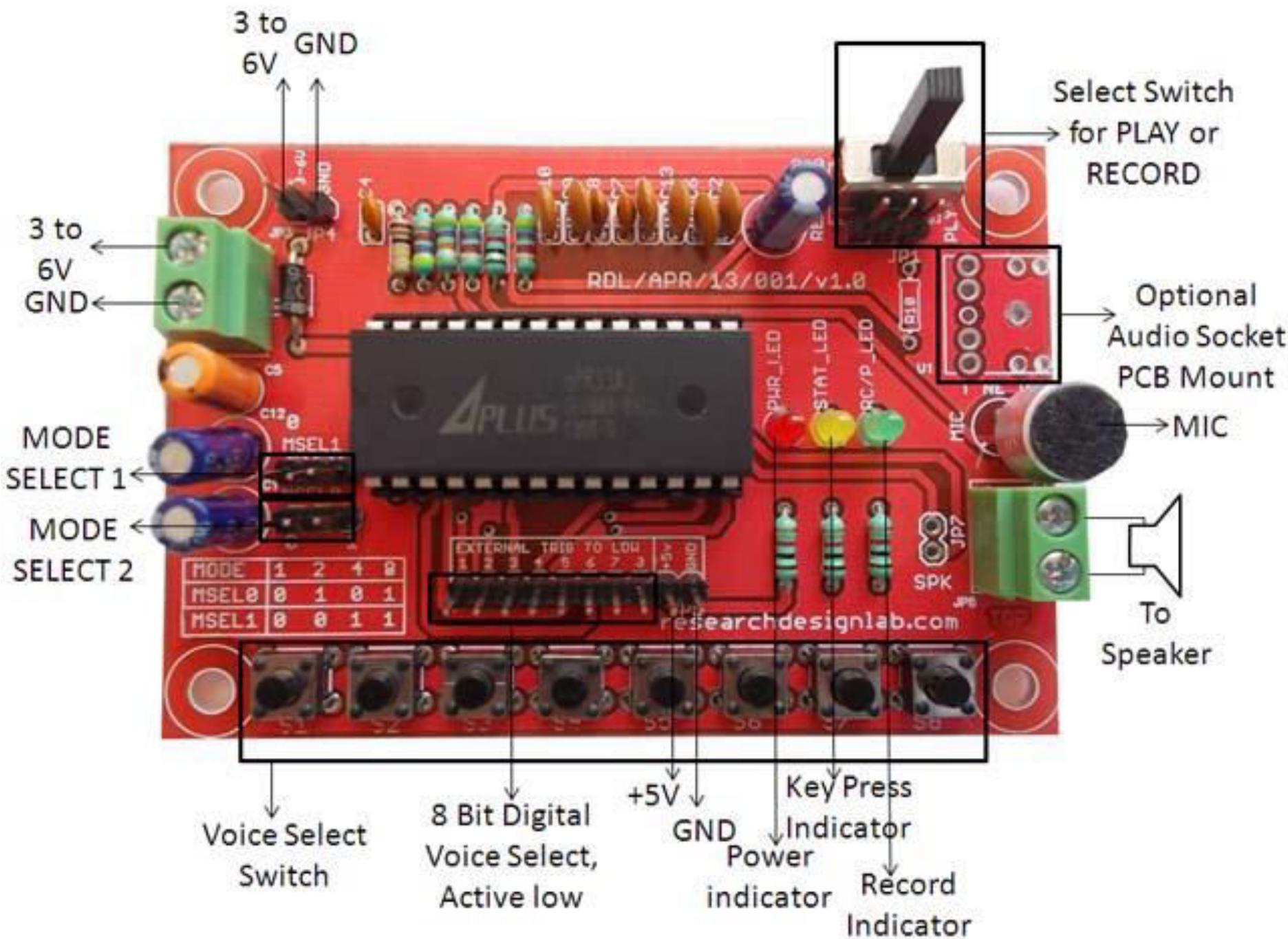
# LCD Display

- LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications.
- A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits.
- LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.



# Voice Output Module

- This module consists of various pre-recorded voices and select lines to select the appropriate alert message based upon the distance
- It consists of playback and record function
- It also consists of a mic for playback function
- A speaker loud enough is connected externally



# Power Supply

The important components employed in the power supply are

- Step Down Transformer
- MIC DB 107 Bridge Rectifier
- L7805 Voltage Regulator
- They convert 220V AC power to 5V DC

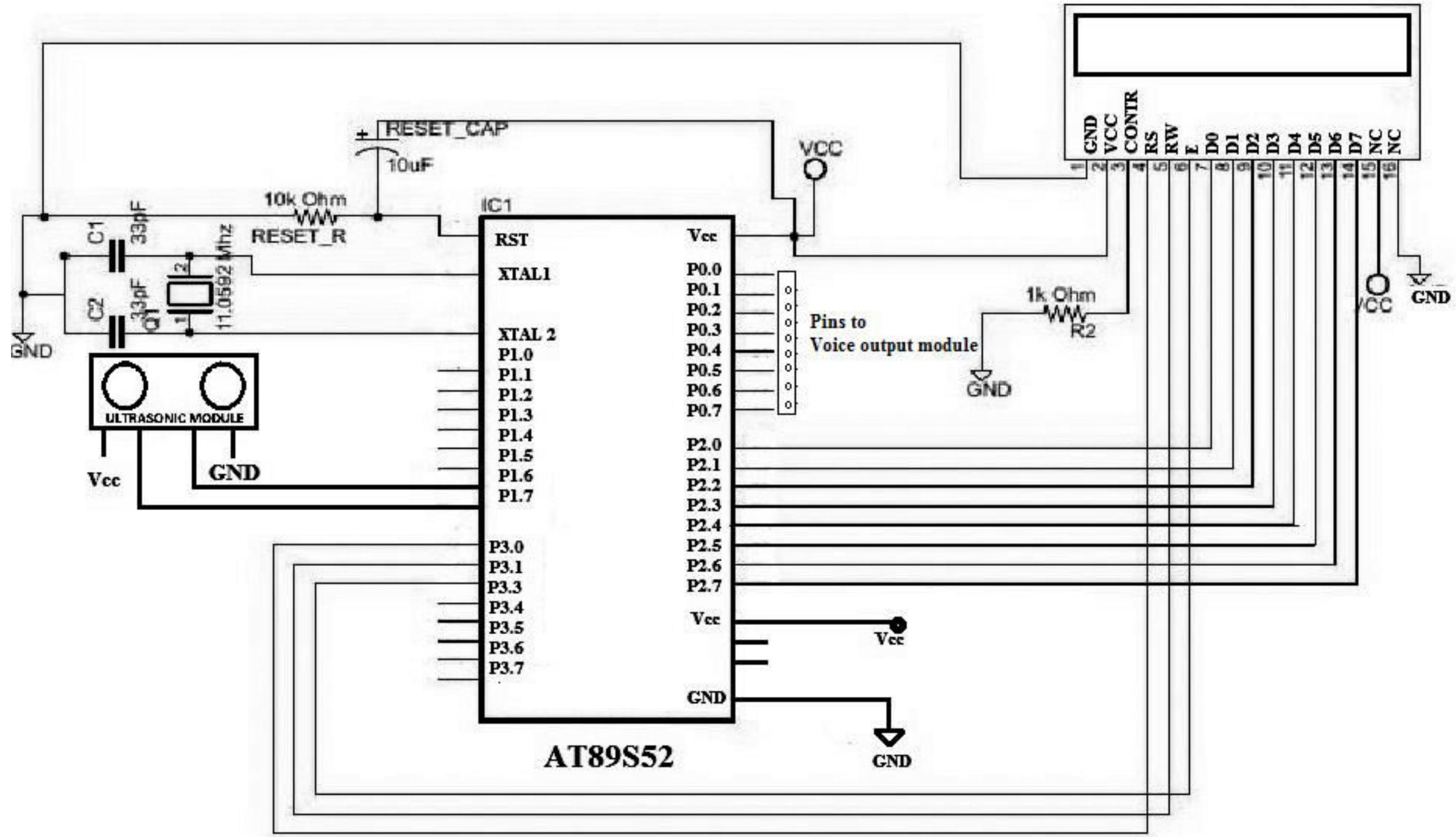
# Software Packages Used

- Keil development tools for the 8052 Microcontroller Architecture support every level of software developer from the professional applications engineer to the student just learning about embedded software development.
- Flash Magic is an application developed by Embedded Systems Academy to allow you to easily access the features of a microcontroller device. With this program you can erase individual blocks or the entire Flash memory of the microcontroller. This application is very useful for those who work in the electronics field.

# CIRCUIT DIAGRAMS

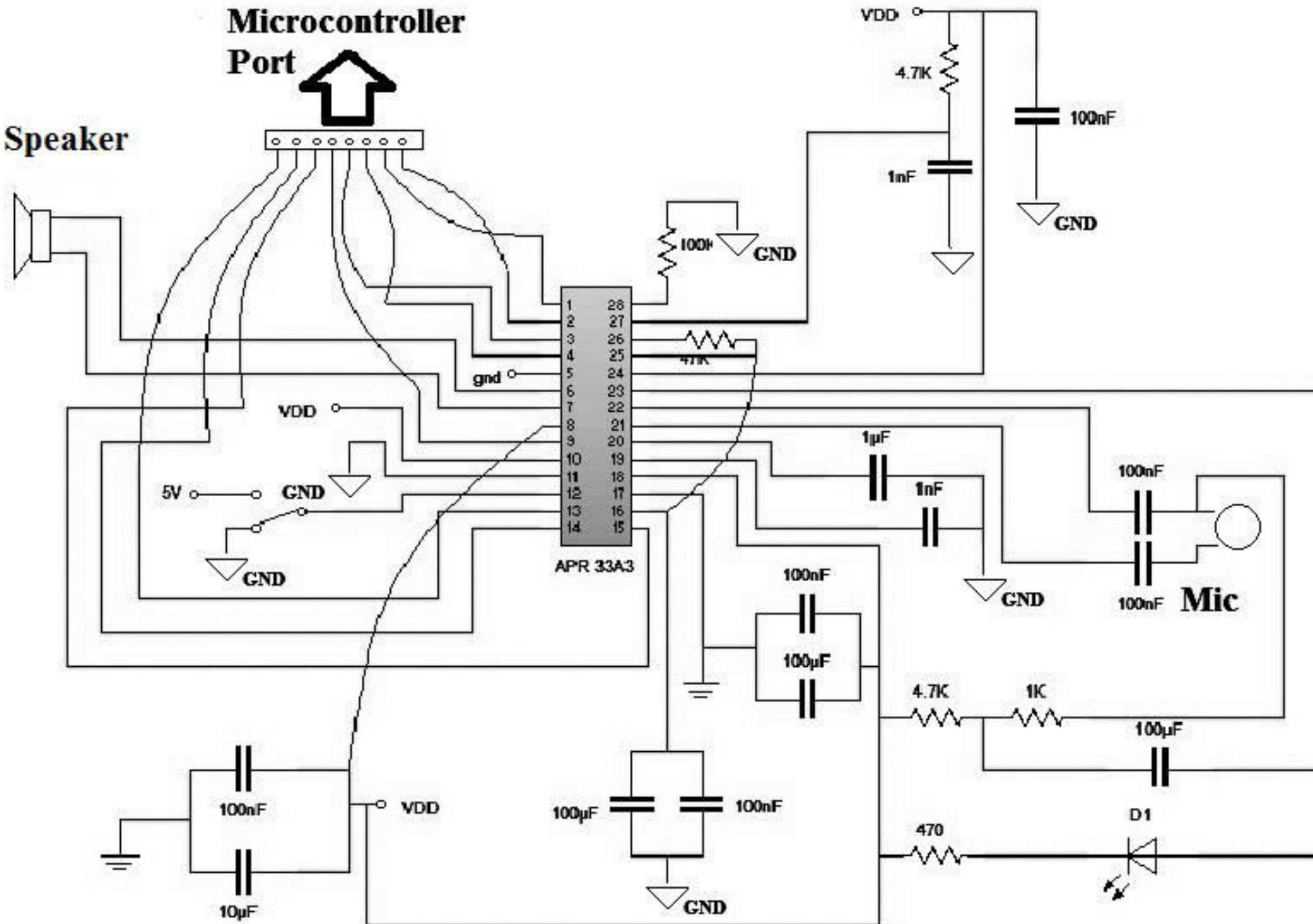
# Pin Diagram of AT89C52 Microcontroller

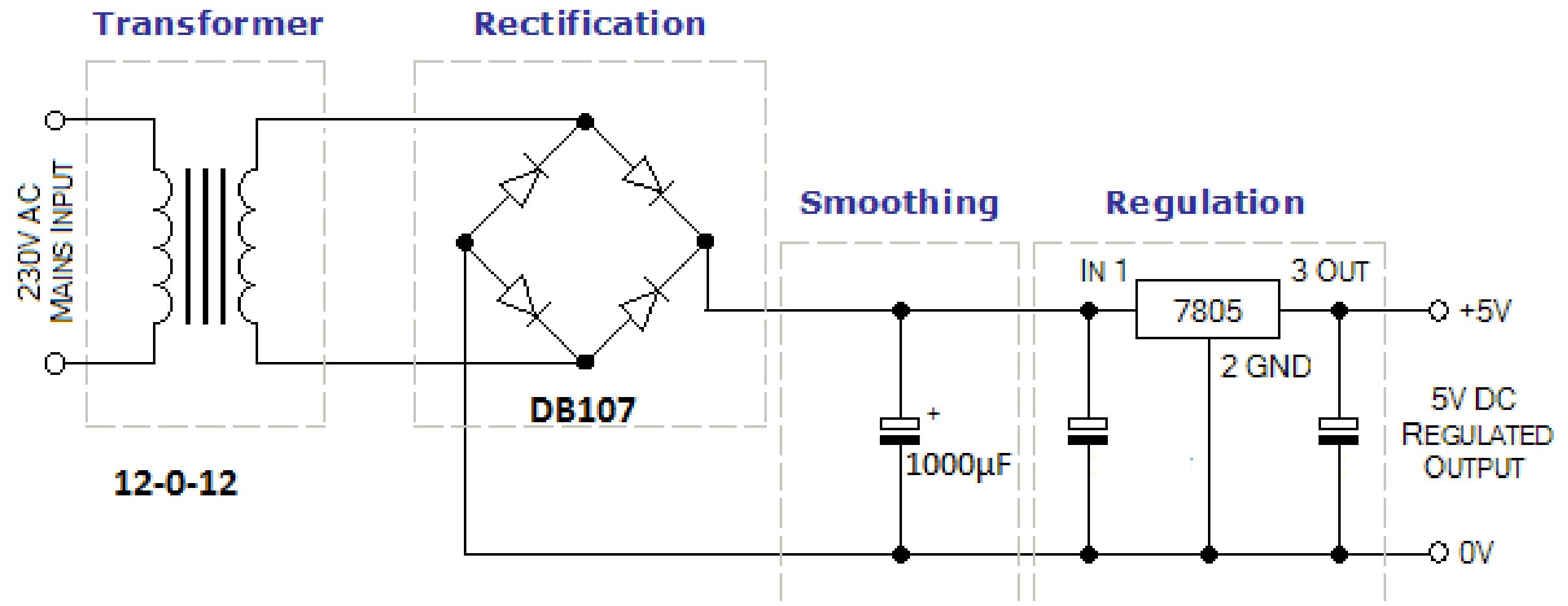
(T2) P1.0	1	40	VCC
(T2 EX) P1.1	2	39	P0.0 (AD0)
P1.2	3	38	P0.1 (AD1)
P1.3	4	37	P0.2 (AD2)
P1.4	5	36	P0.3 (AD3)
(MOSI) P1.5	6	35	P0.4 (AD4)
(MISO) P1.6	7	34	P0.5 (AD5)
(SCK) P1.7	8	33	P0.6 (AD6)
RST	9	32	P0.7 (AD7)
(RXD) P3.0	10	31	$\overline{EA}/VPP$
(TXD) P3.1	11	30	ALE/ $\overline{PROG}$
(INT0) P3.2	12	29	$\overline{PSEN}$
(INT1) P3.3	13	28	P2.7 (A15)
(T0) P3.4	14	27	P2.6 (A14)
(T1) P3.5	15	26	P2.5 (A13)
(WR) P3.6	16	25	P2.4 (A12)
(RD) P3.7	17	24	P2.3 (A11)
XTAL2	18	23	P2.2 (A10)
XTAL1	19	22	P2.1 (A9)
GND	20	21	P2.0 (A8)



## Microcontroller Port

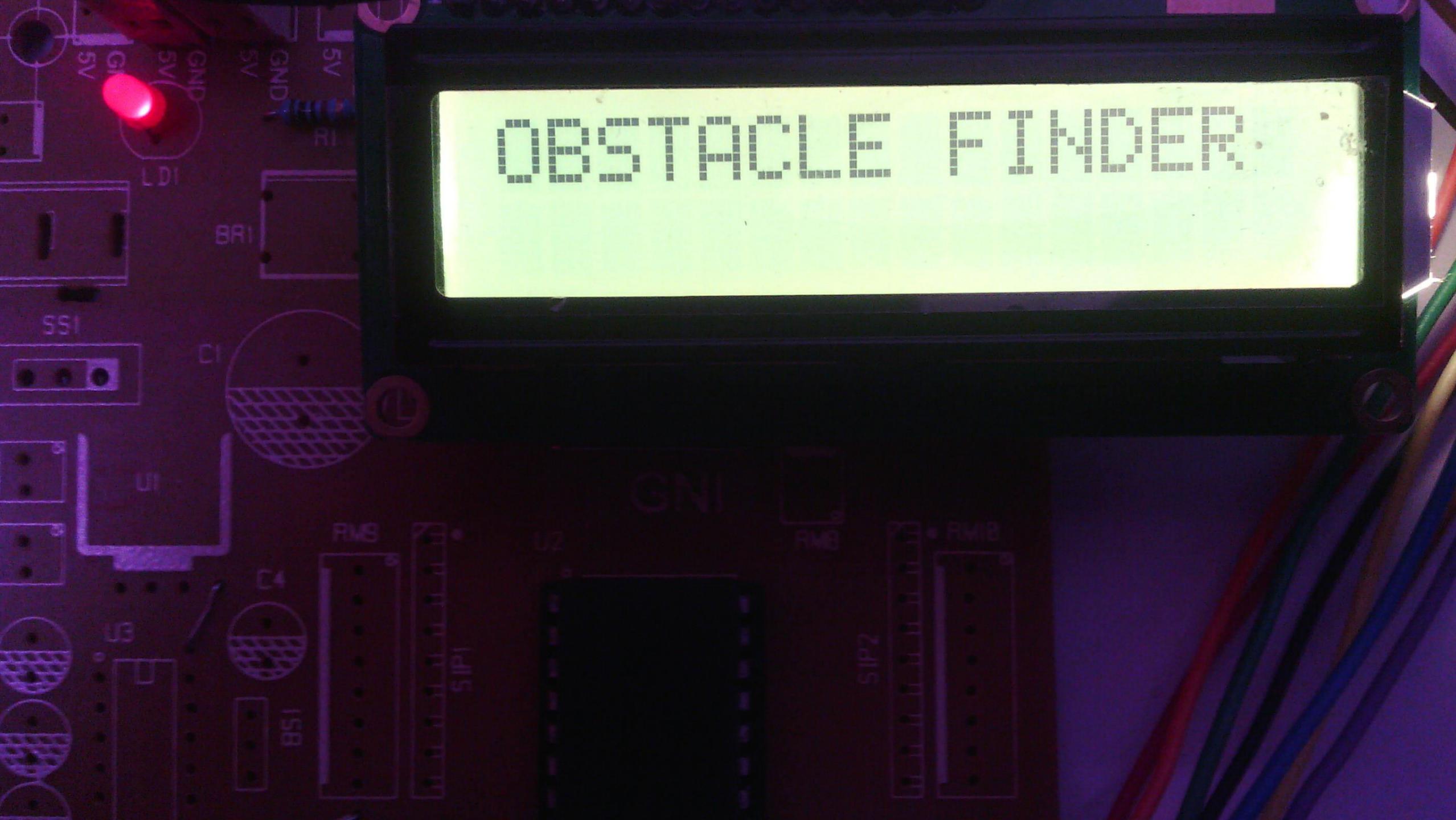
## **Speaker**





# **OUTPUTS**

# OBSTACLE FINDER



# **Obstacle is under 50 centimeters**

**Condition:** The distance of the obstacle is 44 centimeters from the Ultrasonic Ranging Module.

## **Output on LCD**

Obj at 44 Cm

## **Vocal Feedback**

“Object under 50 centimeters”



# **Obstacle is under 100 centimeters**

**Condition:** The distance of the obstacle is 83 centimeters from the Ultrasonic Ranging Module.

## **Output on LCD**

Obj at 83 Cm

## **Vocal Feedback**

“Object under 100 centimeters”



# **Obstacle is under 150 centimeters**

**Condition:** The distance of the obstacle is 129 centimeters from the Ultrasonic Ranging Module.

**Output on LCD**

Obj at 129 Cm

**Vocal Feedback**

“Object under 150 centimeters”



# **Obstacle is under 200 centimeters**

**Condition:** The distance of the obstacle is 181 centimeters from the Ultrasonic Ranging Module.

## **Output on LCD**

Obj at 181 Cm

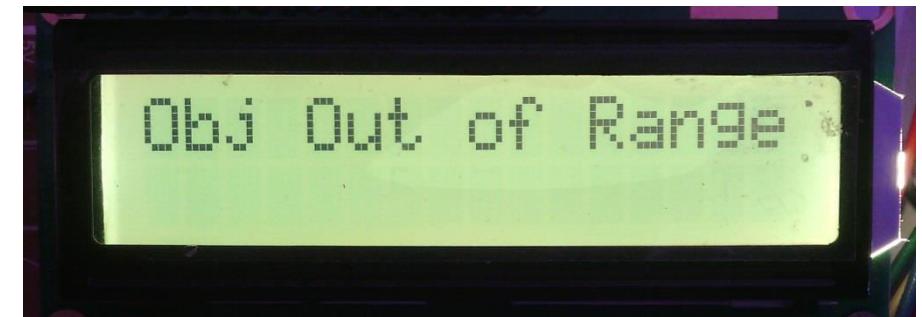
## **Vocal Feedback**

“Object under 200 centimeters”



# **SUMMARY OF ALL POSSIBLE OUTPUTS**

Distance	LCD Display	Vocal Feedback
44 Centimeters	Obj at 44 Cm	“Caution! Object under 50 centimeters”
83 Centimeters	Obj at 83 Cm	“Caution! Object under 100 centimeters”
129 Centimeters	Obj at 129 Cm	“Object under 150 centimeters”
181 Centimeters	Obj at 181 Cm	“Object under 200 centimeters”
218 Centimeters	Obj at 218 Cm	“Object under 250 centimeters”
284 Centimeters	Obj at 284 Cm	“Object under 300 centimeters”
322 Centimeters	Obj at 322 Cm	“Object under 350 centimeters”
353 Centimeters	Obj at 353 Cm	“Obstacle is out of range”
500 Centimeters	Obj at 500 Cm	“Obstacle is out of range”



# Advantages

- Assistive Collision Avoidance Device for the Visually Impaired is a hands-free and a hassle-free pedestrian navigation system. It integrates several technologies including wearable computers, sound navigation and ranging.
- This device focuses on bringing about an approach which would make a visually impaired person to walk through busy roads and help identify obstacles without any trouble.

# Conclusion

- The same technology can be used to prevent collision between containers during their placement in cargo ships.
- They can also be used in smart breaking systems and reverse parking alarms and also to alert about proximity of an obstacle.

# References

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**Thank You!**