

## Intellistick: The eye of the blind

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### Abstract

This is a simple and low component count project based on Motorola MC68HC908QT4 8-bit microcontroller. The premise of the design was to provide more independence and freedom for visually impaired persons by enabling the detection of obstacles by a walking stick. This project uses the principle of ultrasonic ranging for detecting the obstacle.

An ultrasonic transmitter and receiver pair is used to detect the obstacle. The time from the time of transmit and the reflected signal received time is compared and using the formula below, the distance from the obstacle calculated:

$$2d = 343m/s * t$$

Where d = distance from the reflected object

t = difference in time from transmit and reception of the pulse

An audible warning is produced using a buzzer of varying beeping sound to indicate the distance of the obstacle.

In the future, if time permits, it is purposed to introduce a voice chip, which gives recorded voice warning messages to the user.

The block diagram of the Intellistick is shown in Fig 1.

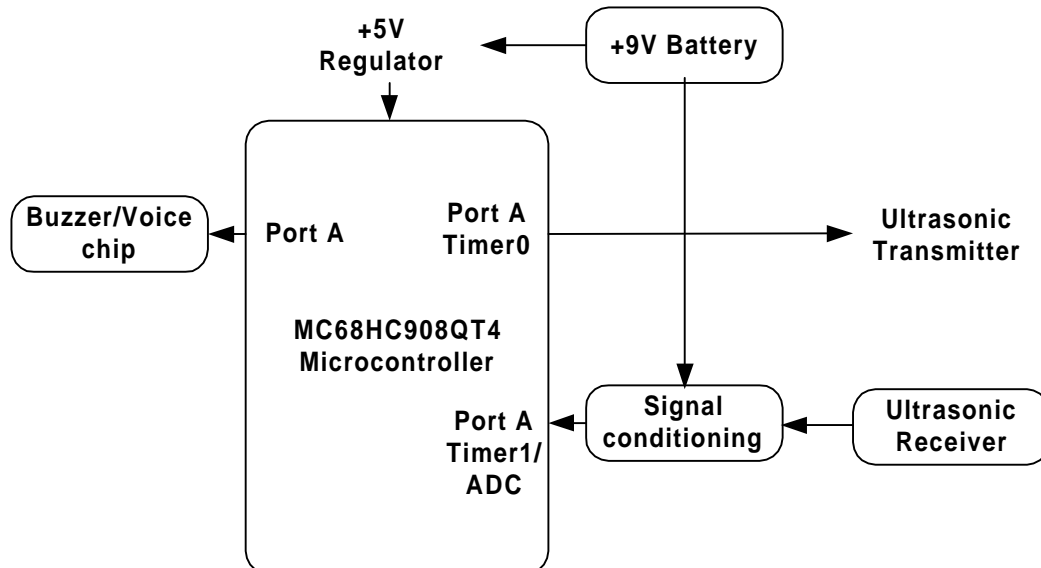


Figure 1. Block diagram of Intellistick

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The timer in the device is used in capture mode. The timer counter is enabled as soon as the pulse burst is transmitted. The counter is stopped as soon as the return pulse is received at the receiver. Then the count value in the counter is used to calculate the distance from the obstacle.

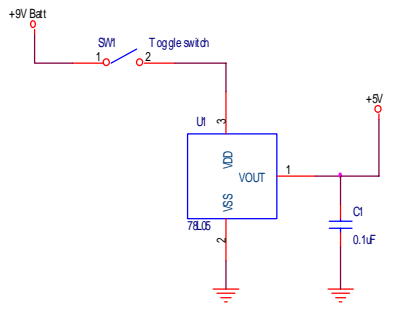
Two op-amps are used in the signal conditioning circuit, one is used to amplify the weak received signal to the required level and the other is used as the comparator. Two Schottky diodes are used for rectification of the received signals after amplification. This signal is fed to the comparator to get a square pulse, which is given to the timer input pin of the device.

A buzzer is connected to one of the output pins of the device, which is used to give the audible warning to the user.

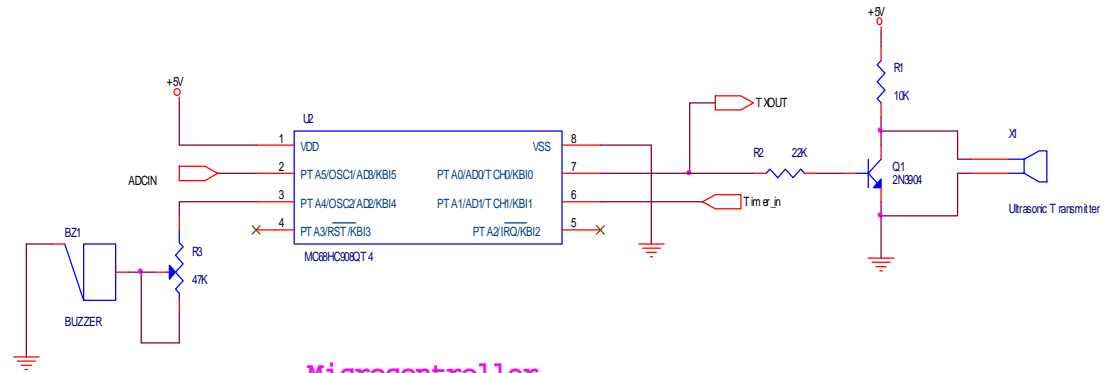
Due to the non-availability of the ultrasonic sensors in time, the ADC approach of measuring the distance is used. The output of the signal conditioner before the comparator stage will be an analog signal whose voltage is proportional to the distance. I have used the ADC input to find the approximate distance from the obstacle.

The other approach, which is accurate, uses the counter in the timer1. The counter starts when the signal is transmitted and is stopped when the reflected pulse appears on timer1 pin. The counter value is used to detect the accurate distance of the obstacle from the user. Since the time was short, this is not implemented.

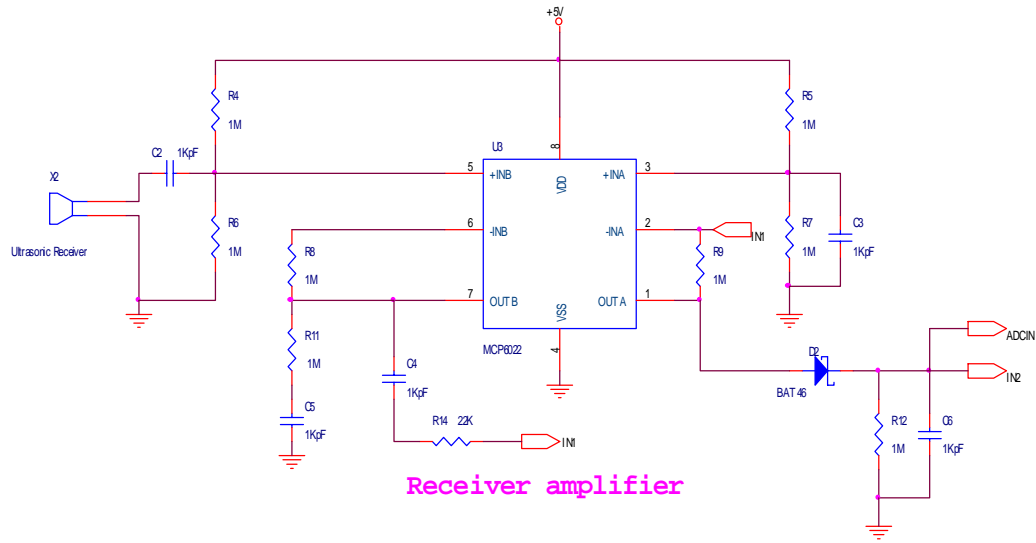




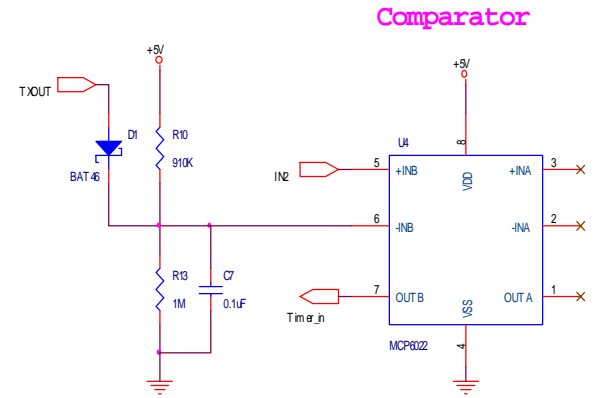
Voltage Regulator



Microcontroller



Receiver amplifier



Comparator

Title		
Intelligence: the eye of the bird		
Size	Document Number	Rev
B	F174	0
Date:	Sunday, June 29, 2008	Sheet 1 of 2