JQ2A-04
ULTRASONIC BLIND CANE

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Project Overview

This project presents a portable electronic travel aid system, intended for use by blind people. It is an ultrasonic based system. The system derives visual information using multiple ultrasonic sensors, and transforms it to binaural auditory information using suitable techniques. The user can recognize the position of obstacles and the surrounding environment. Two operation modes are introduced in our system, the distance detection mode and the size detection mode.

This System contains three main parts, namely:

- The PDA (Pocket PC 2002)
- The Transmitter Module (Including 89C52)
- The Receiver Module
From the figure above, when $d$ is small when compare with distance $D$, the path travel by the ultrasonic wave is approximately equal to $2*D$. Therefore the distance of the obstacle can be calculated from the following formula:

$$\text{Distance}(D) \approx \frac{(\text{Ultrasonic Speed} \times \text{rtt})}{2}$$
**Block Diagram & Results**

**Transmitter Module**
- **Transmitter (for positioning)**: Convert the electrical signal to 40kHz Ultrasound wave.
- **Transmitter (for sizing)**: Convert the electrical signal to 40kHz Ultrasound wave.
- **Switch**: Switch between transmitter.
- **Signal Generator**: A circuit that generates 40kHz electrical sine wave.

**Receiver Module**
- **Left Receiver**: Detect ultrasound wave pulses and convert them to electrical signal.
- **Right Receiver**: Detect ultrasound wave pulses and convert them to electrical signal.
- **Amplifier**: Amplify the signal for further processing.
- **Rectifier**: Serve to cut off the negative voltage.

**PDA**
- Analyse the signals received.
- Convert information of obstacle into audible sound pulse.
- Provide User interface.

**MAX232 Voltage Regulating Circuit**

**Fig. 4 Block diagram of Ultrasonic Blind Cane**

**Fig. 5 Signal Received**

**Fig. 6 Signal output from Amplifier**

**Fig. 7 Wave pulse output from Comparator**

**Fig. 8 Threshold at different distance levels**

**Fig. 9 RTT at different distance levels**