Ultrasound cane for the blind
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Electronic Travel Aid (ETA) is a form of assistive technology having the purpose of enhancing mobility for the blind traveler. A Successful ETA should enable blind people to travel more independently, efficiently and safely when they are in an unfamiliar surrounding.

However, the research problem of designing a better ETA is a tough one. Despite 50 years of effort, no one has been able to design an electronic device that can replace the long cane.

Our project “Ultrasound Cane for the Blind” is aimed to design such an ETA that involves the Ultrasound technology and to be more useful and reliable than the classical cane.

This tool will provide a clear definition of the surrounding to the user, including the distance between the user and the object. The ultrasound device used in the ETA will then replace the swinging process of the classical cane.

We aim to design an ETA prototype that consume low power, portable in size, and also has an acceptable accurate performance in object distance detection, in order to provide fully automatic obstacle avoidance with audible notification.

Our project included three components: a user interface implemented in the PDA, the 8051 microcontroller, and the ultrasound transmitter and receiver circuits.
Project Overview

System block diagram

1. User interface
   Obtain user commands to start and end the program.

2. PDA Program
   Send the user command to 89C52. Starting / ending the whole program.

3. 89C52
   received the command from PDA. Tell the transmitter to send out a signal.

4. Ultrasound Transmitter
   Transmitter convert the signal generate by the 40kHz oscillator into 40kHz ultrasound signal.

5. Receiver
   convert the received signal back into electronic signal.

6. Low Pass Filter
   Pass out the background noise.

7. Amplifier
   Amplify the signal to certain level for processing.

8. 89C52
   After calculation, send back the result to the PDA.

9. 89C52
   obtains the amplified signal, calculating the obstacle size and its distance from the user.

10. PDA
    According to the data, notify the user about obstacle.

Product Appearance
Our product using ultrasound to detect objects and measure the distance by calculates the reflection delay. The effective detection distance is depends on the shape of the object, it can detect flat board more than 3 meters and detect rigid body for 2 meters.

Our product can choose for 8 detection levels for lesser accuracy or 4 detection levels for higher accuracy, the different accuracies is shown below:

<table>
<thead>
<tr>
<th>Distance</th>
<th>50cm</th>
<th>100cm</th>
<th>150cm</th>
<th>200cm</th>
<th>250cm</th>
<th>300cm</th>
<th>350cm</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8 levels</strong></td>
<td>100%</td>
<td>100%</td>
<td>97.5%</td>
<td>77.5%</td>
<td>87.5%</td>
<td>82.5%</td>
<td>77.5%</td>
</tr>
<tr>
<td><strong>4 levels</strong></td>
<td>100%</td>
<td>94%</td>
<td>90%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>