Meet The Tacit Project. It’s Sonar For The Blind.

It’s wrist mounted and senses objects from about 1 inch to 10 feet. It has generally fast response time (fractions of a second) to quickly navigate complex environments. It’s designed to help a vision impaired person to navigate complex environment.

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INTRODUCTION

This is a project I’m calling Tacit. No, I didn’t bother making an awkward backronym for it, it just seemed like an appropriate name that’s a lot shorter (though less descriptive) than “Hand-Mounted Haptic Feedback Sonar Obstacle Avoidance Assistance Device”. It measures the distance to things and translates that into pressure on the wrist.

It’s wrist mounted and senses objects from about 1 inch (2 cm) to 10 feet (3.5m). It has generally fast response time (fractions of a second) to quickly navigate complex environments. It’s designed to help a vision impaired person to navigate complex environments. Mounted to the back of the hand, the force feedback means it doesn’t interfere with other assistance devices that mount elsewhere and use audio feedback cues. The learning curve is measured in seconds, everyone who has worn it has figured it out immediately.

Here’s a short video that give more information and shows it in action.

http://vimeo.com/27675622

PARTS:

- (1) Arduino Mini Pro 5v (1)
- (2) Parallax PING))) ultrasonic sensors. (1)
- (2) small hobby servo like a Turnigy TG9 or Hextronix HXT900 (1)
- (1) 9v battery connector (1)
- (1) slide switch (1)
- Shapelock or other Polycaprolactone plastic to build solid mounts for the sensors and servos. (1)
- Small pieces of polyester sheeting, heat formed (1)
- 6” (15cm) of 1” (2.5cm) wide rubber (1)
- (4) 2.5mm x 8mm bolts with matching nuts and washers to hold the rubber in place. (1)
- (1) 12”x12” (30cmx30cm) piece of 3mm neoprene. (1)
- 12&amp;Prime; (30cm) of hook and loop fastener (Velcro) (1)
- 4” (10cm) of bias tape. (1)
Neoprene is a big challenge to sew. It likes to drop stitches like crazy on a sewing machine. Use the biggest needle you can, thick thread, and if possible place a non-neoprene strip where you sew.

When sewing the gauntlet here’s a couple things to keep in mind:

1) Don’t attach the electronics permanently to the neoprene. Use snaps or velcro or something so that it can be easily removed and laundered. Stuff that is near the hand can get dirty surprisingly fast. When attaching velcro to the electronics or plastic supports, super glue worked better than any other adhesive or epoxy.

2) Be serious about ruggedized connections and strain relief. Sewing electronics into flexible cloth means they have to flex and not break. No matter how much work you put into this, it could use more durable flexibility. Wire can take a lot of bending, but joints and connections can’t.
Everywhere I could manage to I looped the wire through a hole or two to relieve the flex strain before making the final connection. (This lesson courtesy of the Rock Paper Scissors Playing Glove, which
rippled its self apart every 500 uses despite a fair amount of effort put into ruggedization.

Step 2

- The basic connections look like this, though this is mostly to keep things modular and accessible during the prototype stage and can be improved.

- The circuits are pretty simple. Here’s a rough diagram and schematic (See Image 1 & Image 2)
Step 3

- Arduino pins:
- RAW: Positive (+) side of the 9v battery and power pins on the servos.
- GND: Battery ground (-) and grounds for servos, ultrasonic sensors.
- VCC: Ultrasonic sensors +5V
- 2: Right ultrasonic sensor SIG
- 3: Left ultrasonics sensor SIG
- 7: Right Servo signal.
- 8: Left Servo signal.
Step 4

- Here’s the original & latest version of the source code from GitHub at this link

- And lastly here is a link to a PDF outline of the gauntlet. It fits most size of hands.

- A huge thanks to the design professionals attending Device Design Day who were among the first to see it in action and who gave tons of positive feedback. As mentioned there are a number of improvements and changes left to be made. I’m curious to see what happens.