

Title Slide

Before I start, I would like to thank my mentor, Dr. James Jonza for guiding me. I would also like to thank my dad, and Ted Markson from Nova Labs for helping me build what is now known as STRIDE.

Motivation

I entered the Camera Centering Tripod Mount, however, I wanted to create a product with a wider impact. I chose to create a mobility aid for the visually impaired, and originally I wanted to put it on the cane. Dr. Jonza helped me with patent searches, and we realized that my idea had been taken. So we built on that, and we chose to adapt the CCTM technology into STRIDE.

What does STRIDE stand for?

STRIDE stands for Simple Technological Reconnaissance Interface for Distance Estimation. Basically STRIDE is a device that helps the visually impaired gain more knowledge of their surroundings and helps them estimate distance.

STRIDE Development Lifecycle (SDLC)

To develop STRIDE I followed standards set by the FDA, and the International IEC standard, which start with defining the Target Users and Requirements. Then you design the parts, and integrate them into one unit, which is followed by verification.

Target Users (1)

Dr. Joanne Crenshaw, Dr. Aunrag Gupta and Dr. Fredric Schroeder helped define STRIDE's target users. They lead me to...

Target Users (2)

...hemianopsia patients. Imagine if you had half of your vision blocked...

Target Users (3)

If you had Retinitis Pigmentosa, all you could see would be what is directly in front of you.

Target Users (4)

If you had Parkinson's Disease, it would be like seeing with your side view mirror, all the time. Patients with visual impairment due to diabetic retinopathy can also be assisted by STRIDE. In total STRIDE can help about 20.3 million people in the US alone.

Requirements

Requirements for STRIDE include the ability to do calculations, notify the user, give them time to process the information before the next step is taken. It should complement the remaining vision of the user, be unobtrusive, work in rain or shine, fit onto any shoe, and most of all, be cost effective.

Design – Hardware Used

To build STRIDE, I used an Arduino microcontroller, which is the power house of the STRIDE. I also utilized a proximity sensor, vibrator, LiPo battery, a battery charger, and accelerometer, bringing the cost to under \$100.

Design – Accelerometer

I chose an accelerometer over a gyroscope, because I wanted for STRIDE to be cost effective. It also consumes less power, making it last longer.

Design – Proximity Sensor

The proximity sensor uses a wide ultrasonic pulse to measure distance with a range of six inches, to 512 inches while still being easy to mount.

Design – Vibrator

Pulse Width Modulation is used to control the intensity of the vibration. The closer the object, the more intensely it vibrates. After a pre-determined threshold the vibrator does not alert the user.

Design – Software

I use the Arduino IDE for writing and testing firmware, KiCAD for PCB design, Git for version control, and SketchUp for 3D Design.

Design – PCB

For documentation I drew schematics in KiCAD, which I later transferred to a PCB.

Integration – Flow

The code flows in an order, as you can see above. However, let me show you it.

[Insert Demo here]

Integration – Hardware

The left shows the current hardware design, in which I use 3M electrical tape to hold the wires in place. It also uses 3M heatshrink for stress relief. Had the PCB worked as planned, it will look like the picture on the right streamlining the design.

Integration – Step Check Code

This code snippet, which was written and developed in the Arduino Integrated Development Environment, is the one of most important part of the code as it measures the change in acceleration between two consecutive accelerometer readings and then compares it against an adjustable threshold. This helps make sure that when you are sitting at a desk, STRIDE isn't constantly active. This also helps save battery.

Integration – 3D Casing

I had built designs for encasing STRIDE in SketchUp. However, they were designed to house the PCB and when that failed, I ended up taking a pre-fabricated box, and fitting STRIDE into it.

Integration – Shoe Mount

Mounting STRIDE to the shoe posed a challenge. The human foot naturally is inclined, yet STRIDE needed to point forward. I decided to design and laser cut a mount that screwed on to STRIDE with a custom anchoring mechanism to attach it to the shoe securely and angle it correctly.

Demonstration

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Verification

To verify that STRIDE works, I developed 4 specific pieces of code that test STRIDE's individual components and the complete prototype. I am getting ready for field testing, during which I will verify that STRIDE works for 12 hours, and is long lasting.

Looking to the Future

Mr. Riccobono and Dr. Schroeder stated, that the blind could use STRIDE more effectively if it was kept on the head. Studies have shown that the blind are prone to bumping into objects above their heads, and if kept on a cap or lapel. (By repositioning the proximity sensor) For the visually impaired with ambulation challenges STRIDE can be mounted on a walker. In dim lit situations, such as mines, STRIDE could be used to avoid bumping into objects. All this will bring STRIDE to more users, that the aforementioned 20.3 million users

Thanks To

Questions?