Senior Design 55:089

The Dowsing Cane

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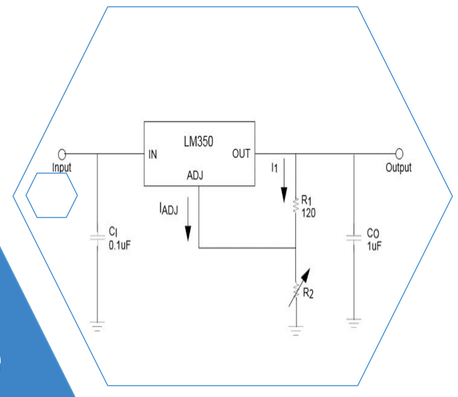
Abstract

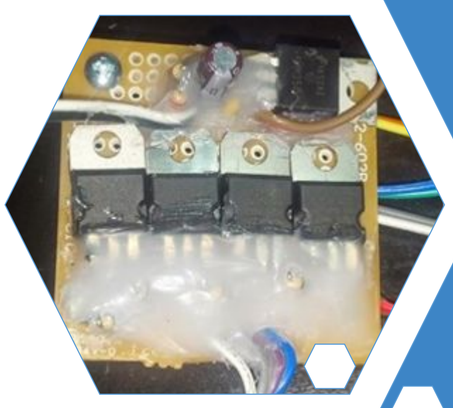
The Dowsing Cane is an Android/microcontroller based project designed to assist a visually impaired user in general walking navigation via a microcontroller which sends directions to the user in the form of haptic feedback presented through the cane's handle.

Introduction

Our project was spawned off the need for a simplified solution to a serious problem: How can a visually impaired user get from point A to point B confidently when they have never been to point B from point A? After consulting with a visually-impaired student, we determined that instead of having the user depend on the device, have it be something that gives them a sense of independence while still guiding them to their destination.

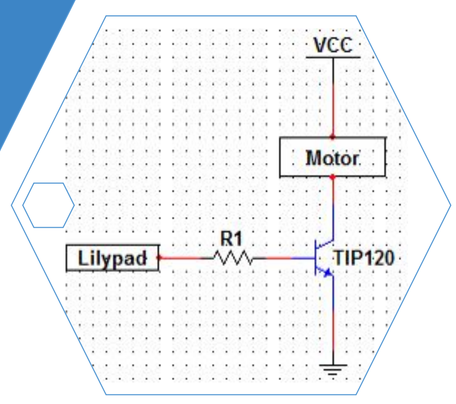


LM350 voltage regulator circuit



Motor control circuit

Concatenated hardware (voltage regulator and motor control circuits)



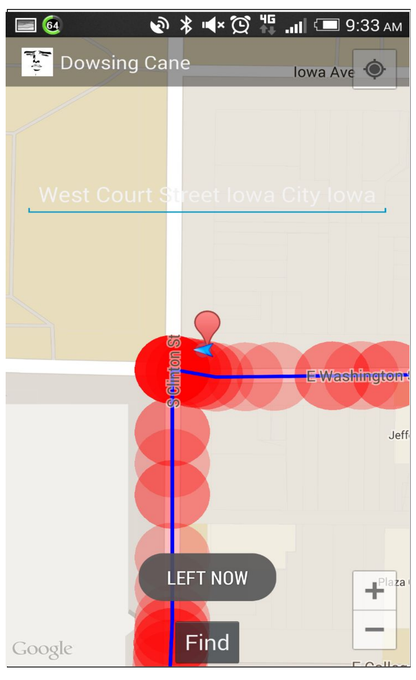
Hardware

The main hardware components for our projects consist of an LM350 voltage regulator circuit, and four motor control circuits.

The voltage regulator circuit was made following a schematic found on the LM350 datasheet. The regulator takes in a 6V signal and reduces it to a consistent 4V, which the LilyPad can safely tolerate.

Each 1.3V, 80mA vibration motor is directly connected to the 6V power source, and then to ground through a TIP120 transistor, which is controlled by one of the LilyPad's digital pins. This allows us to power the motors at nominal current and voltage, while still controlling them through the microcontroller.

Software



An instance of the application telling the user to turn left.

For software, we developed an Android turn-by-turn GPS navigation application that sends directional indicators to the LilyPad-powered cane over a Bluetooth connection.

The user can interact with it by holding down the volume-down side key on the phone. This activates the voice input that the user can then speak their destination address in. Once they do, the application routes the path between the users current location and their target destination.

The application updates the users current location every 5 seconds; once the user is within 40 and then 15 meters of the next shift, the application sends a directional indicator to cane. Once the user is within 10 meters of their final destination, the application sends that the user is at their desired location to the cane.

Results

The user is able to receive directions to a destination of their choosing.

Our product works by first having the user launch the Android application and speak an address into their phone. The address is then confirmed and a route is created from the user's current location to their target address.

The Android application then sends directions to the cane's microcontroller via a Bluetooth connection.

Vibration motors then pulse in specific patterns based on future direction changes the user will need to make. These direction notifications are sent both 40 meters before, and 15 meters before the next directional shift

Conclusion

The project was successful in it's goal of guiding the user from point A to point B without the user of sight. The user is able to interface the application without the use of sight relatively easy, and allows for the vision impaired to visit new places by walking much more easily than before.

Estimated Prototype cost:

Building materials:$65
Electronic components:$95
Total prototype costs: $160

If it were to be sold commercially, the costs would go down dramatically, and ideally the application/came combination would be able to be sold for around 50-60 dollars.

Acknowledgments

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