Boston University
Electrical & Computer Engineering
EC463 Capstone Senior Design Project

First Prototype Test Report

Augmented Reality Climbing Wall

by

Team 14
Augmented Reality Climbing Wall

Team Members

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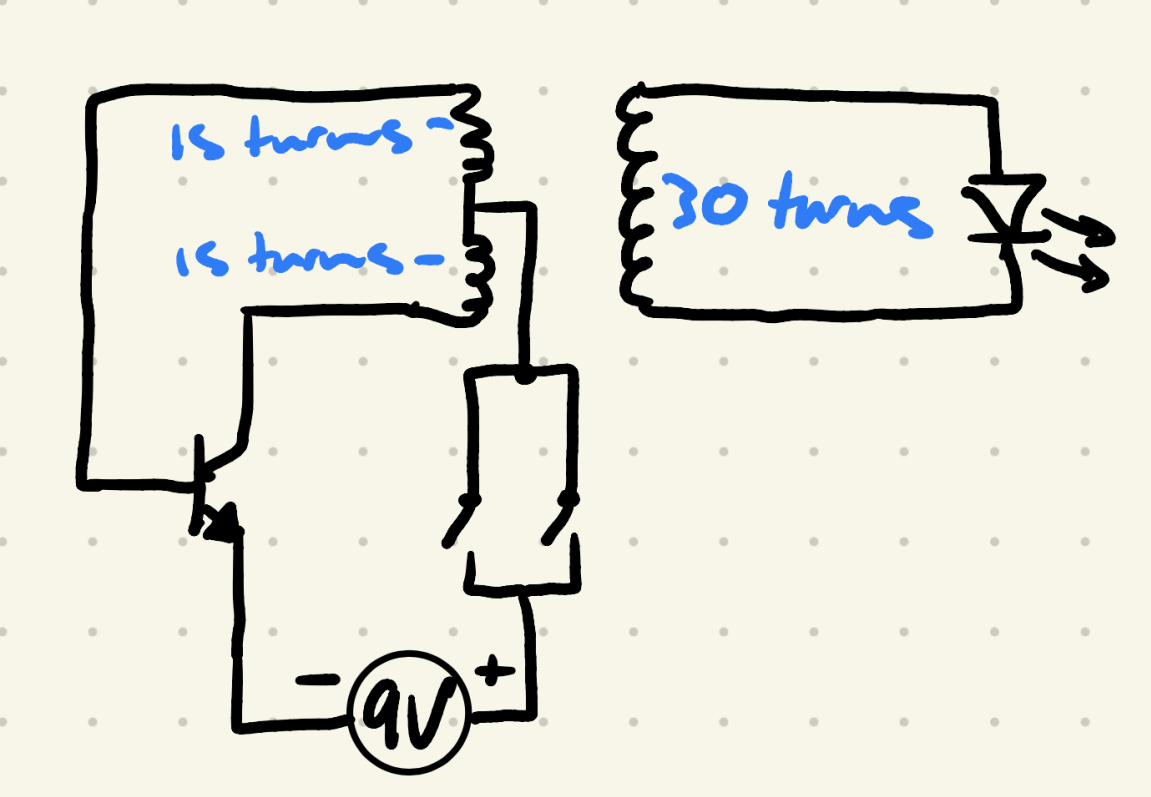
Equipment

- Circuitry
  - 2 - 1.35 inch coils
  - 1 - 2222 transistor
  - 1 - 9V battery
  - 1 - 9V battery connector
  - 1 - Red LED
  - 2 - Push buttons
- Hardware
  - 1 - Rock climbing hold
  - 1 - Bolt (⅜ - 16 inch)
  - 1 - Nut (⅜ -16 inch)
  - 1 - Front facing coil enclosure
  - 1 - Battery enclosure
  - 1 - Hardware Button
  - 1 - Back facing coil clip
  - 1 - Square wood cutout

Setup

The electronics are built using the following circuit:



The transistor in combination with the coil creates oscillations which allows the coil to transmit power wirelessly. The battery is connected with the 9V battery snap on connector. The circuit is complete when either of the two buttons is depressed (one is located on each side of the larger hardware button). The magnetic field from the coil transmits power through the wall and lights the LED on the opposite side.

After assembly, the electronics are housed in the 3D printed enclosure, the battery is housed in the battery box, and they are all attached via the same bolt that supports the hold. This bolt is screwed through a hole that has been drilled in the center of the board and secured with a nut. Between the nut and the back of the board, a clip fastens the rear coil into place.

For setup on the day of testing, we 3D printed and assembled all of the required components for the prototype, including all of the circuit and power components. We secured the assembled enclosure onto the board with the bolt and proceeded with testing after confirming that everything was functioning as expected.

Measurements Taken

Here is the completed score sheet that was used to track results based off the test procedure in our Test Plan:

Action	Correct? (1/0)
Button successfully depresses	1
LED lights when button pressed directly	1
LED turns off when button released	1
LED lights up within 1 second of button being pressed	1
LED lights when hand on hold	1
LED lights when foot on hold	1
Coil is not noticeably hot after 10 seconds of activation	1
Total	7/7

For the measurements taken during the testing, we were able to accurately meet all the Measurement Criteria we set in the Test Plan, specifically the lighting of the LED, the response time, and the prototype temperature. For the LED, our teammates, Professor Pisano, and the TAs were able to observe the LED turns on and off when the tester grabbed onto the hold and released it. Additionally, the response time after hitting the button while grabbing onto the hold was less than one second and no noticeable delay was detected. Lastly, the coil never reached a temperature that was hot to the touch in the various steps we tested, even when we held the button down for ten consecutive seconds.

Conclusions

Our testing went as hoped, and we successfully scored a 7/7 on our measured objectives. This indicates that our LED, button, coils, and battery all worked together successfully. The main thing we noticed during testing was: it was a bit difficult to grasp the hold with the battery obstructing it. This solidified our next step of removing or condensing the battery. Some ways that we brainstormed accomplishing this is either using smaller batteries that press out from the wall less or using more coils to pass power from behind the wall to the front of it. Some additional observations we made were that the switch is definitely a fine option for testing if pressure is applied to the climbing hold. We discussed possibly switching to a pressure sensors, and that is still on the table, but if we stick with the switch approach we can add a larger one above the hold and one below it so that the hold can be grabbed from multiple angles and with different hand sizes while still noticing that pressure has been applied to the hold.