

Thermoduino Instructions

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1 Introduction

People with spinal cord injuries or diseases such as Multiple Sclerosis are often unable to perceive or self-regulate body temperature changes in their extremities. Our temperature warning device reduces the risk of severe problems associated with hot or cold extremities by notifying the user of significant changes in body temperature.

The device uses a thermistor connected to the user's ankle to measure temperature. The thermistor communicates with an Arduino, which turns on a discreet red light when the temperature becomes too hot, and a blue light when it becomes too cold. If action is not taken and the temperature continues to move out of range, a servo motor rotates to ring a bell to alert the user that their body temperature is dangerously out of normal range.

This device was created for Jim Wice by Sara Vannah and Jenny Gubner as part of a final project for ENGR160 at Wellesley College.

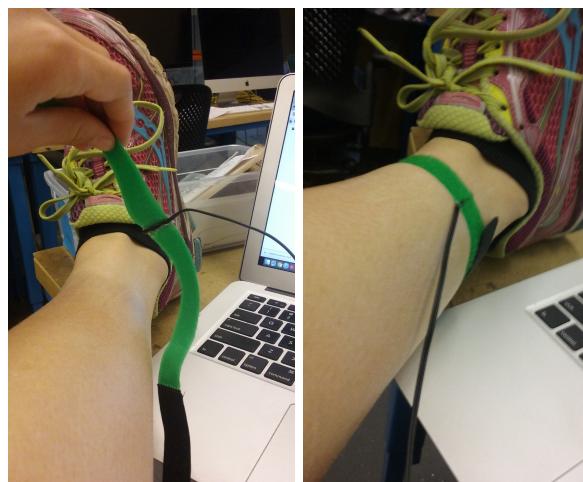
2 Instructions for Use

Your Thermoduino has two main parts. It has a box, which houses the Arduino computer and the circuit board, with the battery pack, bell, motor, and LEDs mounted on the outside. The box has a Velcro strap on the bottom, which can be used to wrap around the arm of the chair to mount the box on the chair for easy access. The second part is a thermistor, attached to a Velcro strap which can be worn around the ankle. A thermistor is a resistor whose resistance varies with temperature, so the thermistor acts as a temperature sensor. The thermistor is connected to the box via long yellow and black wires, which can be fastened to the chair using a twist-tie.

- Step 1: Use Velcro strap on bottom of box to fasten box tightly to arm of chair. The battery box should be facing out for easy view of the LEDs.

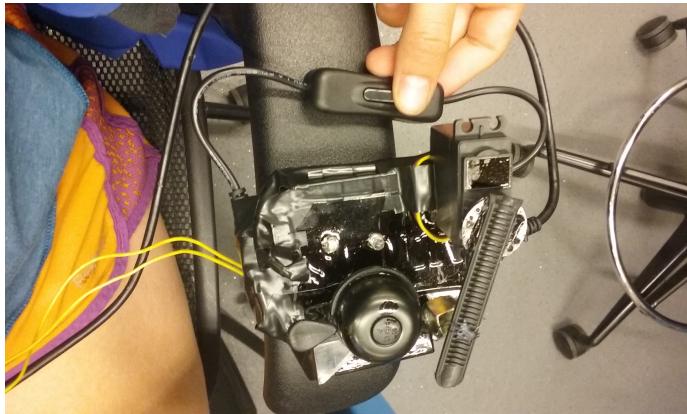


- Step 2: Use Velcro strap to attach thermistor to ankle

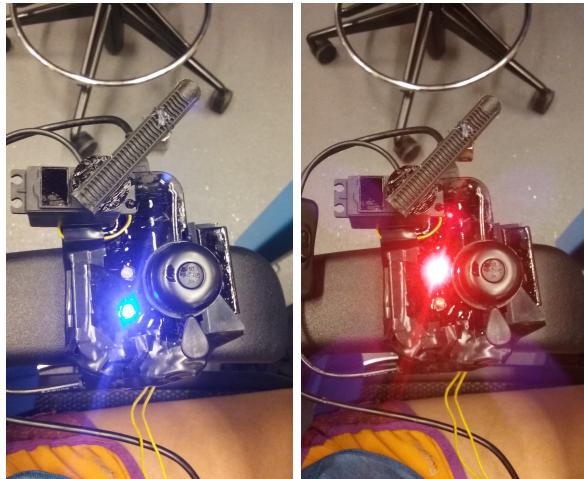


Ensure that the strap is attached with the thermistor (the round, black knob at the end of the wires) adjacent to the skin.

- Step 2: When you are in an environment with variable temperature, turn the device on by flipping the switch. Be sure that the thermistor has been fastened to your ankle for adequate time to allow the thermistor equilibrate to your body temperature.



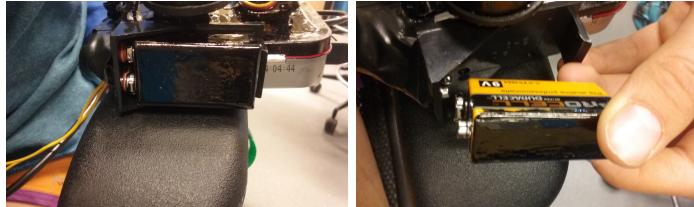
- Step 4: The device will now notify you if your body temperature gets out of range. When body temperature is slightly too cold, a blue light will turn on. When temperature is slightly too warm, a red light will turn on.



- Step 5: To stop device, flip the switch to turn it off. Be sure to turn off your device when you are inside, or anywhere you are confident your temperature will stay within its normal range in order to preserve battery life.

3 Maintenance and Troubleshooting

- The Thermoduino takes a single 9V battery. To avoid running down the batteries unnecessarily quickly, be sure to turn off the Thermoduino when it is not in use - when your body temperature is regulated by your environment (i.e. when you are inside).



- Be sure that you do not turn on the Thermoduino as soon as it is attached to your ankle. The thermistor needs a couple minutes to equilibrate to your body temperature. If it reads a temperature too low, the bell will go off and the Thermoduino will stop reading your temperature for another hour while it waits for you to warm your temperature back to its normal temperature.
- The box is not waterproof! Do not leave it exposed in the rain.
- The ranges of temperatures were calculated from measurements with our own ankles at uncomfortably warm, uncomfortable cold, and neutral body temperatures and with your (Jim's) neutral body temperature. If the values are unsatisfactory in any way (i.e. the bell or lights are notifying you too often or not enough, or if someone other than Jim with a different neutral body temperature) is using it, then the values can be adjust from the code found here:

<https://github.com/saracha413/Thermoduino>

Note that The code is written in Arduino, which you will need to download to use. The download is free, and available here

<https://www.arduino.cc/en/Main/Software>

The Thermoduino is connected to the computer via the included USB cable, which connects in the port next to the power cord. We have covered this port with electrical tape to make the device more weatherable, but the tape can easily be peeled away.

Best wishes,
Sara and Jenny

This document was written in LaTeX, and created using ShareLaTeX