AM5011 - Course Project
VR Gloves with Interface

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Review 1
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VR Gloves with Thermal Interface

- The goal is the make an affordable VR gloves with thermal interface that provides thermal sensation when the user interacts with the virtual world.
- I will be only focusing on providing the sensation to the finger pad as they are one of the most sensitive part of our body.
  - Ruffini cells and Nerve endings detect **warmth**
  - Krause end bulb detect **cold**
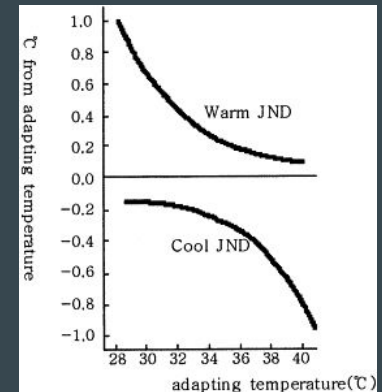
[1] Development of a temperature control procedure for a room air-conditioner using the concept of just noticeable difference (JND) in thermal sensation
[2] Thermal display glove for interacting with virtual reality

System block diagram

Unity / Unreal

WiFi / Bluetooth

Thermal interface gloves

Oculus Hand tracking

Need to finalise

Tested & works

Oculus hand-tracking :

The OVR Skeleton and OVR Hand APIs provide information required to render a fully articulated representation of the user's real-life hands in VR without the use of controllers, including:

- Bone information
- Hand and finger position and orientation
- Pinch strength
- Pointer pose for UI raycasts
- Tracking confidence
- Hand size
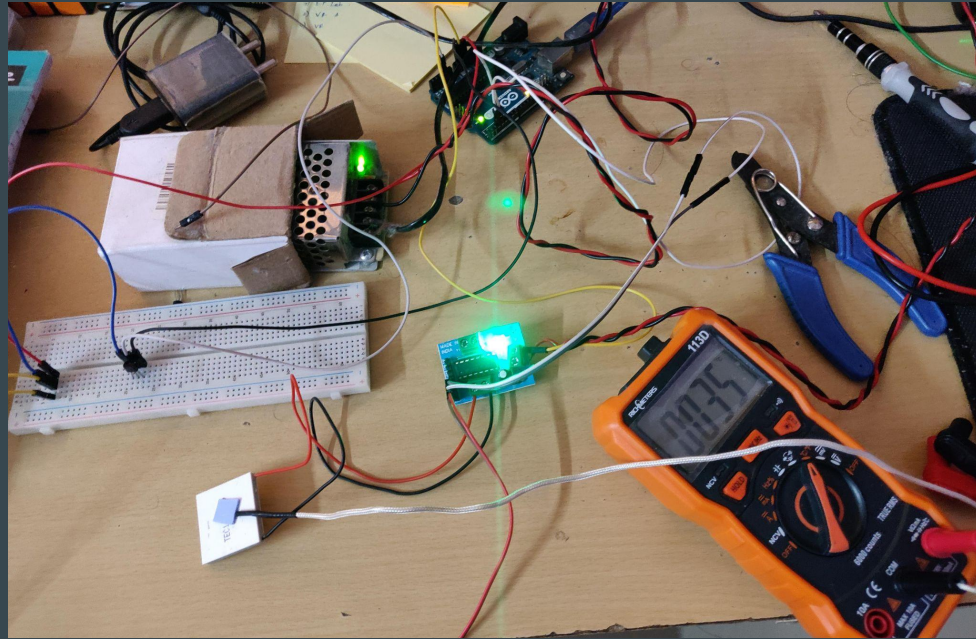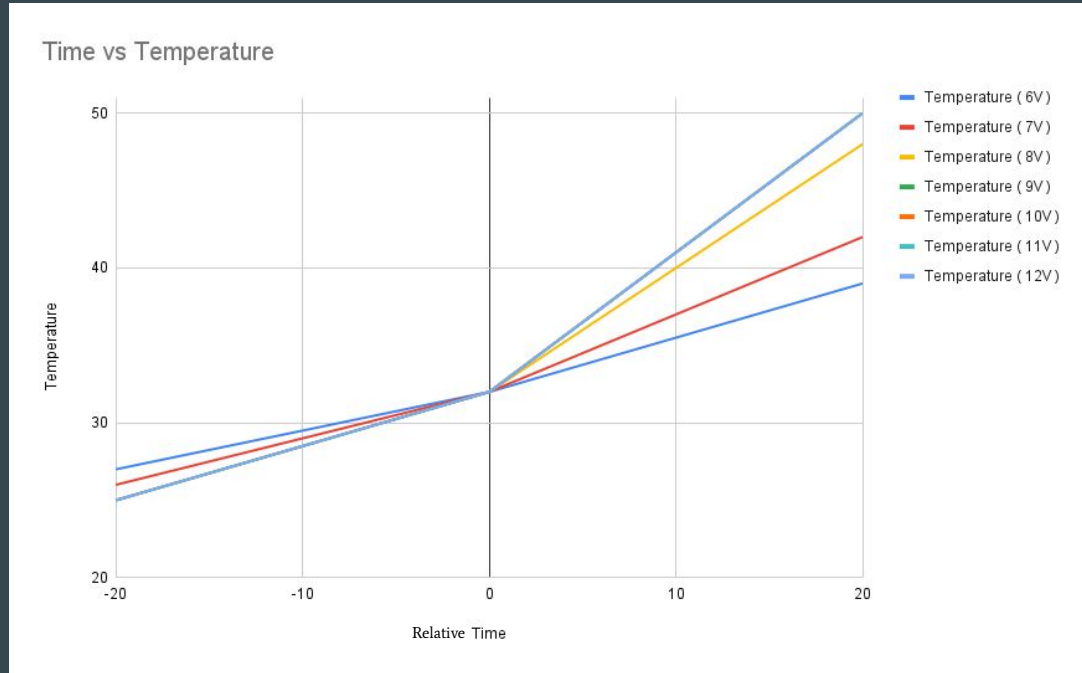- System gesture for opening the universal menu

Hardware setup

WiFi / Bluetooth

Battery pack

Motor driver

Microcontroller

Peltier module

Temperature Feedback
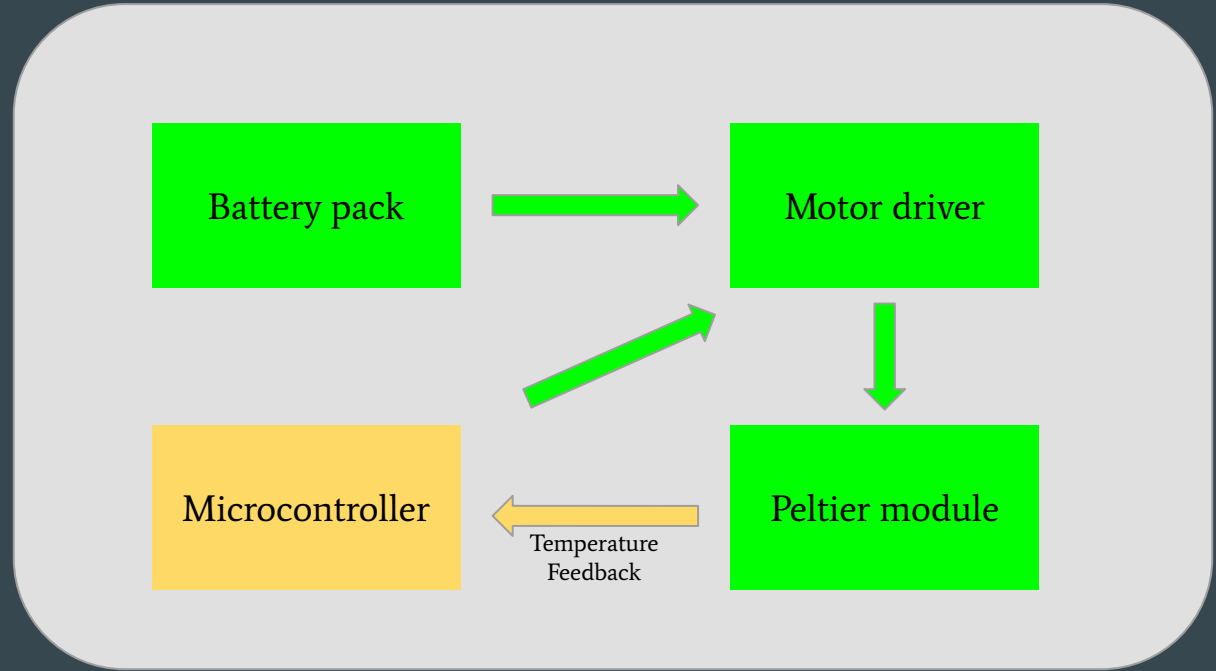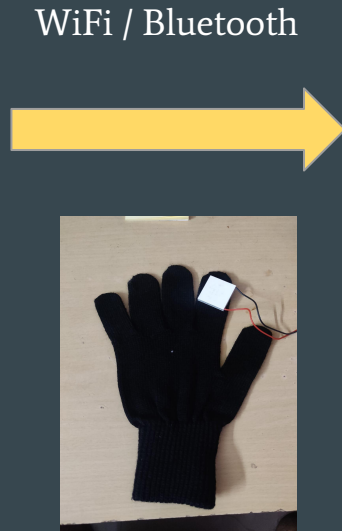
Need to finalise

Tested & works

Test / Prototype setup
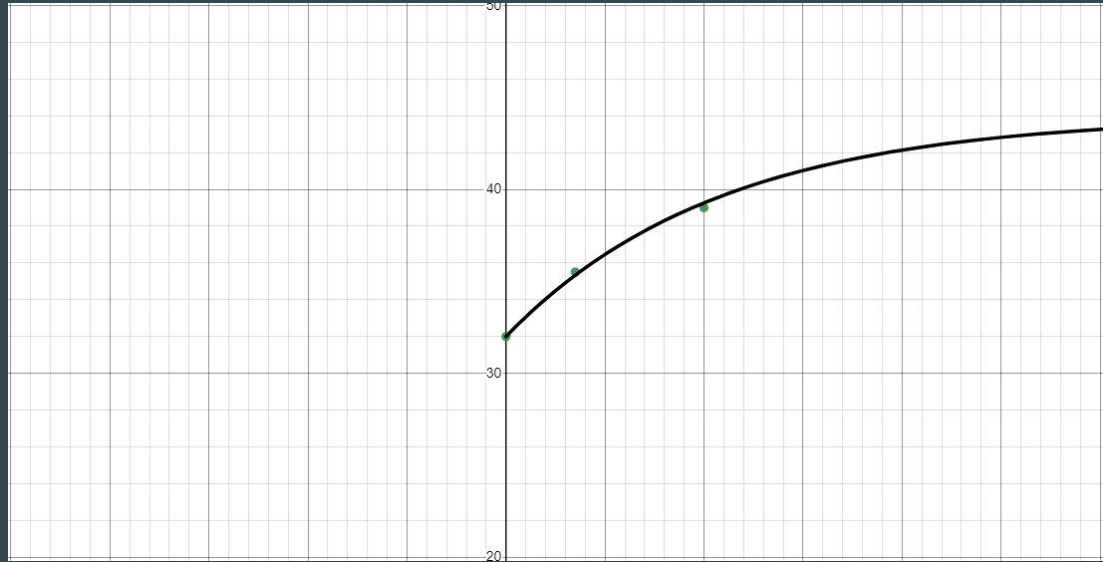
Calculating temperature gradient (dT/dt)

*Current limited to 600mA by the Motor driver

Plotting more points and curve fitting

*Current limited to 600mA by the Motor driver

Results & Observations :

- The temperature changes require time to fully take effect thereby eliminating applications which need instantaneous results. (Ex : Touching a hot pan)
- However the majority of change in temperature still happens within a few seconds (2-5 secs) , this can be utilized for applications where we bring our hands near a slightly warmer or colder object

  (Ex : Soda can / Vapour from boiling water)

- Hot applications can benefit better in this case and I plan to focus on them particularly.
  - Power law exponent of Temperature (Cold) = 1.0
  - Power law exponent of Temperature (Warmth) = 1.6

Plans for further reviews :

Review 2 :

- Complete glove hardware and program it.
- Finalise Game-engine and Microcontroller

Review 3 :

- Build a basic interface between Hardware and software and tweak the hardware to better suit the application.

Final submission :

- Have a complete environment that allows thermal feedback to the gloves.

Estimated cost :

Hardware :

- Peltier : 290 x 5 = 1450
- Microcontroller = ~500
- Motor driver = ~400
- Temperature sensor = ~400
- Misc = ~250

Software :
- Plugin for Interface = 20$ = ~1500

Total : 3000 + 1500 = ~4500

Thank you

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