FINAL DEMONSTRATION

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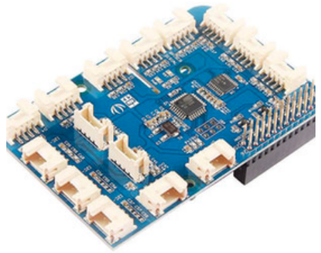
Group Kurukuru~

H A R D W A R E

Raspberry Pi 4 Model B 4GB



GrovePi+

RealSens Depth Camera D435

Grove - Rotary Angle Sensor

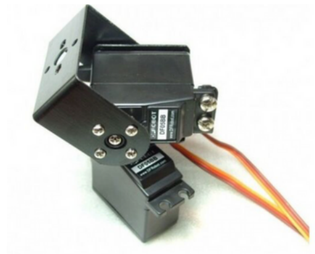
Grove - Switch(P)

Grove - Button(P)

Grove - PIR Motion Sensor

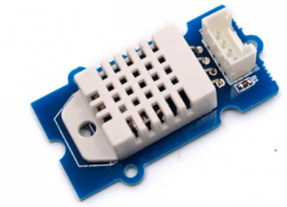
Grove - Buzzer

SSD1315 0.96" OLED Display x 2



DSS-P05; 5kg Servo Motor Set

Grove - LCD RGB Backlight



Grove - Temperature & Humidity Sensor

PureThermal 2

FLIR Lepton 2.5

Total = AUD $1081.42

STAGE 1 & 2

Timeline	Milestones	Comment
Week 4 ~ Week 5	Project Plan & Proposal Composition	✅
	Project Demo / Verifying Prototypes	✅
Week 5 ~ Week 7	Face Detection / Tracking algorithm Development	✅
	Thermal Camera Setup & Tuning	✅
	Motion Sensor for Human Activity Detection	✅
	Face Tracking with Servo	✅
	Menu & Instruction Development on Screen	
Week 7 ~ Week 8	Power Saving Mode Setup for Modules	✅
	Ambient Temperature Influence Data Collection & Tuning	
	Email alarm & report collection	

EXTRA GOALS

Progress:

- all aims completed
- added an additional 3d Printed shell for motor system stabilisation
- Re-arranged power source plan to improve system mobility
  - new power plan make a well utilization of our power saving function
- Furtherly improved accuracy but not a final stop. [Product 1st Generation]

EXISITING SOLUTION

DALI TE-W300

Error ≤ ± 0.6 ℃

< 4 hours
>3h recharge
0.98kg

$2,999.00

FOV: 25°×19°

ULIRVISION TI160-P1
Error ≤ ± 0.6 ℃

< 3 hours runtime
0.5 kg

N/A

FOV: 24°× 18°

Guide IR236

Error ≤ ± 0.3℃

Requires Wall Plug
≤45kg

AUD $2,144.09

FOV : 57.6 °to 2.5°

DM60

Error ≤ ±0.06℃

Requires Wall Plug
≤1.09Kg(W/O lens)

AUD $27,217.09

FOV : 16°×12°/0.5m

SOFTWARE

FACE TRACKING

TEMPERATURE
VS DISTANCE

FACE TRACKING

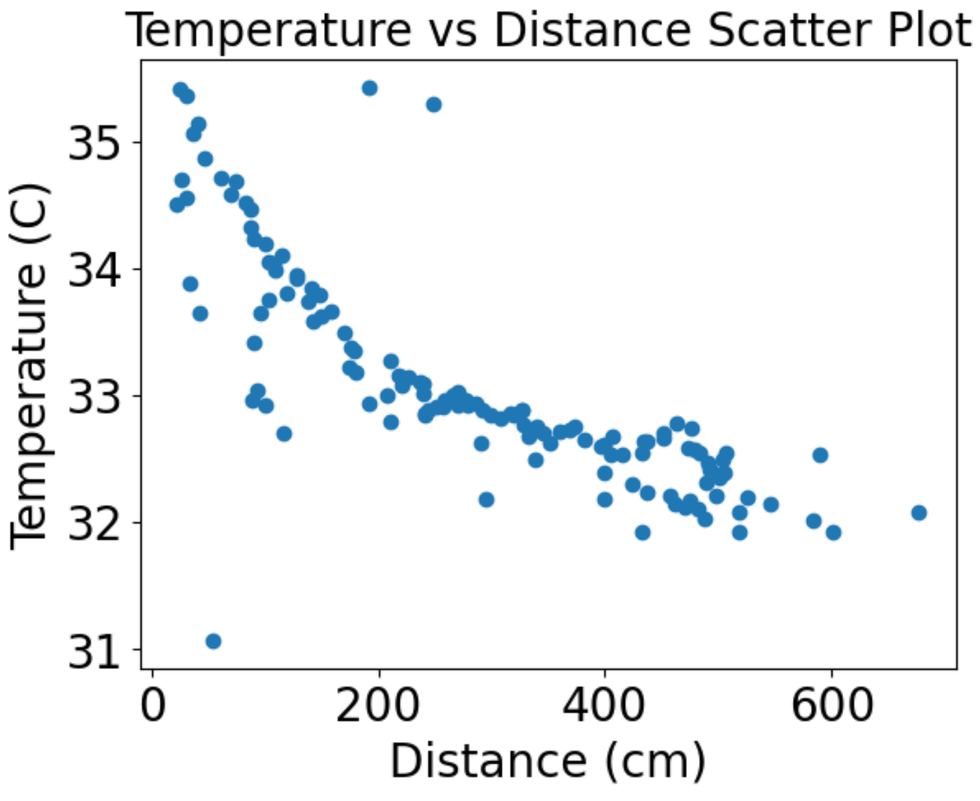
In Face tracking, we need to calculate the rotation angles of the servo motor in the x and y

$$\theta_x = \arctan\left(\frac{face_x - \frac{frame_w}{2}}{frame_w}\right)$$

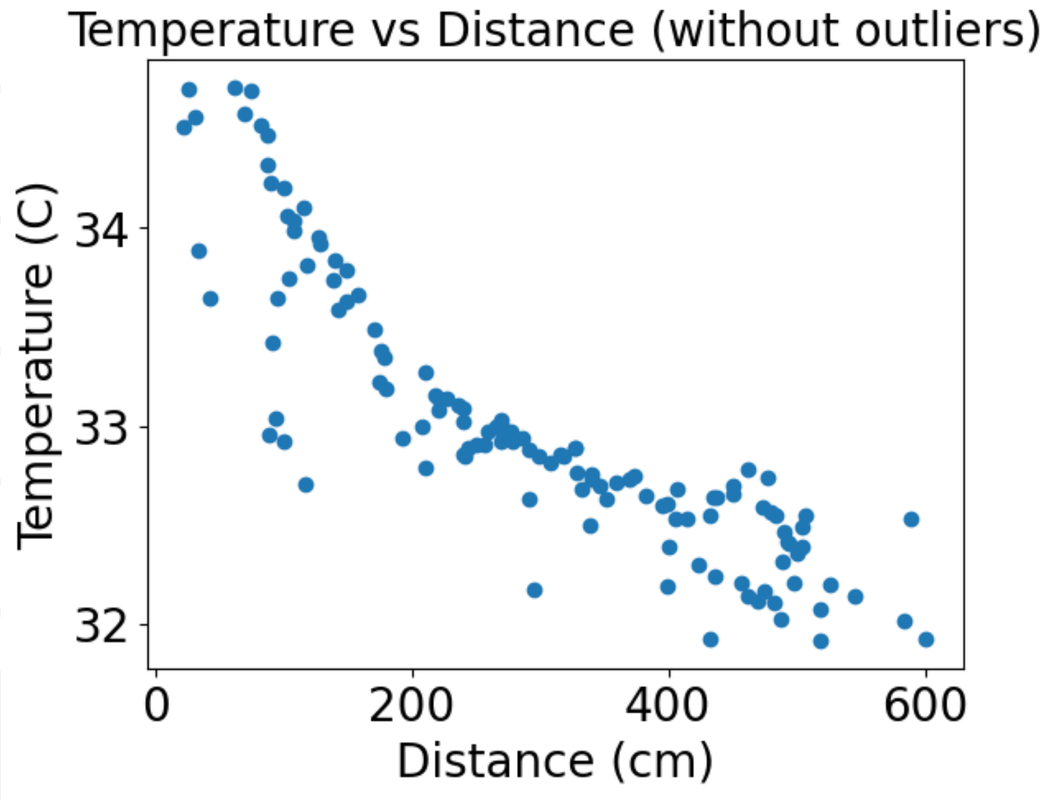
$$\theta_y = \arctan\left(\frac{face_y - \frac{frame_h}{2}}{frame_h}\right)$$

TEMPERATURE VS DISTANCE

The temperature of the face decreases as the distance increases.

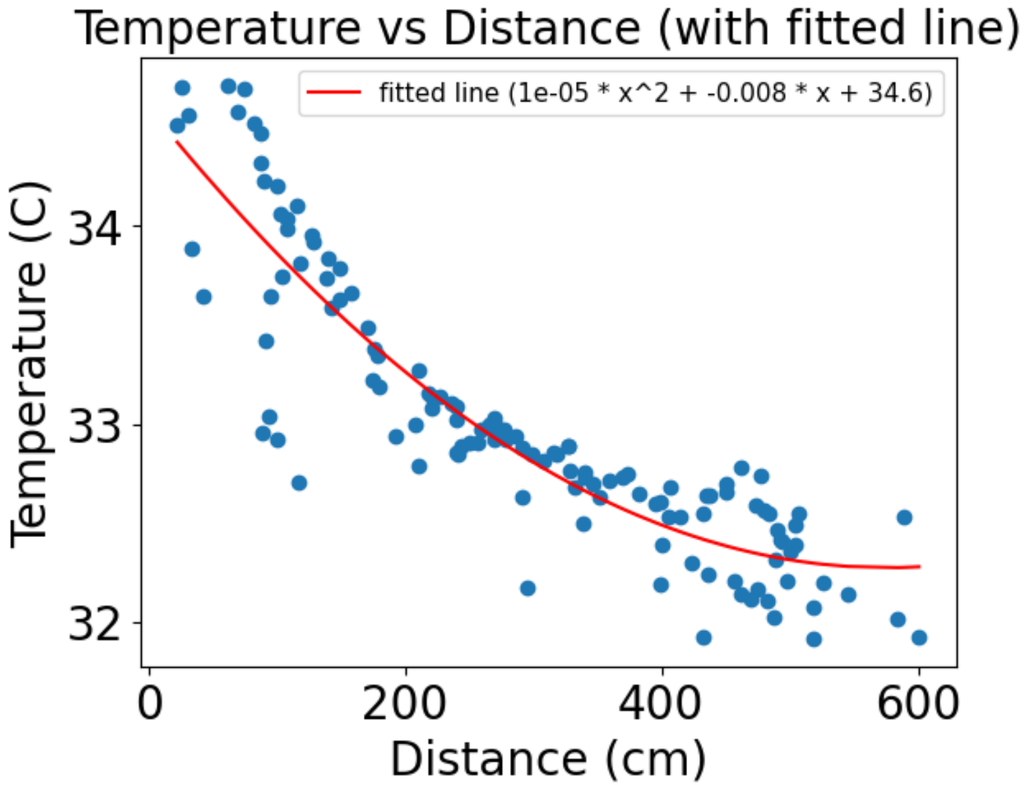


But the relationship doesn't seem to be purely linear.



TEMPERATURE VS DISTANCE

We fitted a quadratic polynomial fit line using the ‘np.polyfit‘ function to model the relationship between distance and temperature



TEMPERATURE VS DISTANCE

Given that the body temperature of our experimental subject at the time was 37 degrees Celsius. Therefore, the formula is as follows:

$$T_{fitted} = fit\_fn(distance)$$

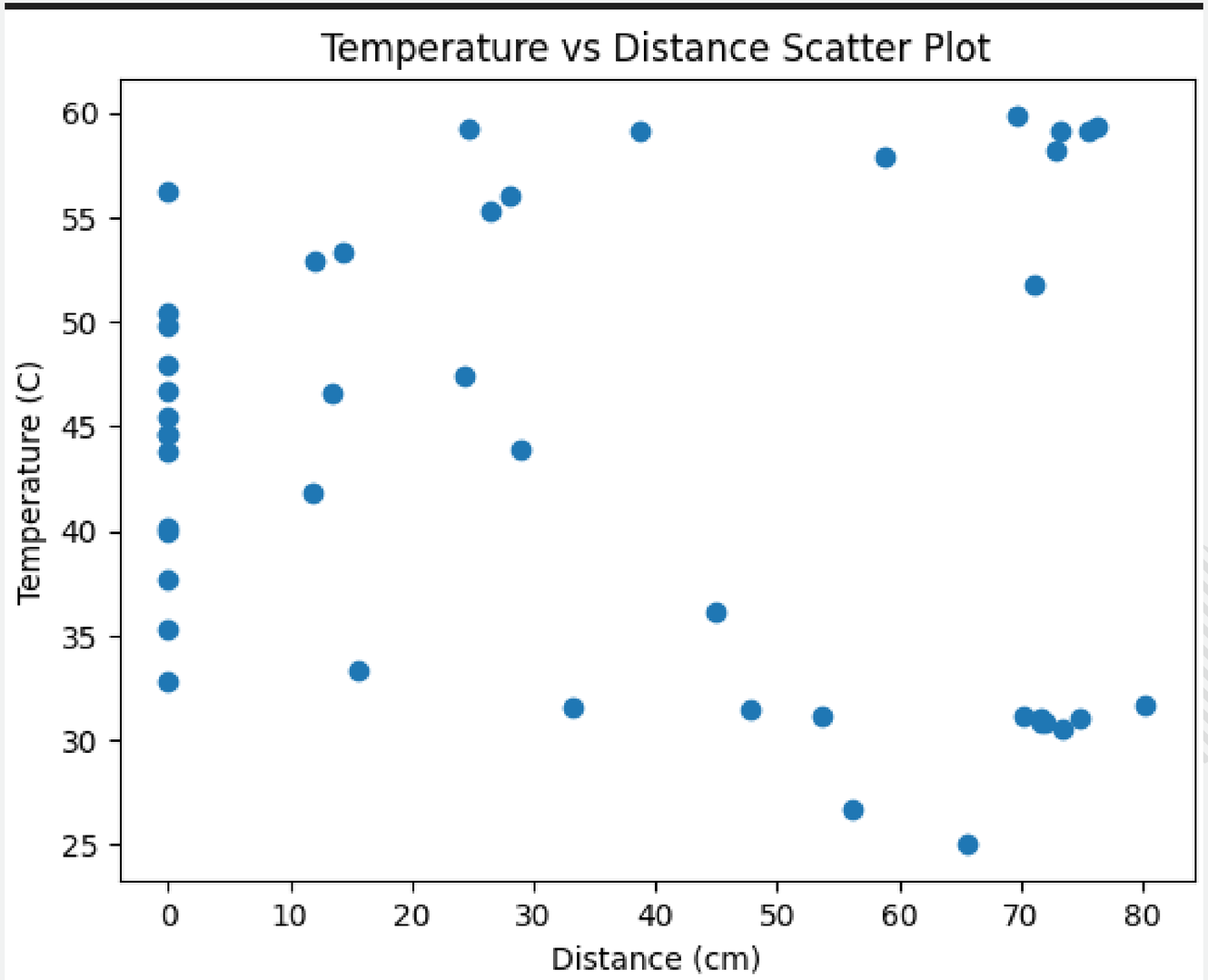
$$T_{corrected} = (37 - T_{fitted}) + T_{raw}$$

With this formula we get a more accurate value of body temperature that takes into account the influence of the distance factor on the measurement results.

TESTING

Fixed the camera to test the temperatures read from different distances in a single frame.

Rusult:A lot of outliers.
Inaccurate



NEW IDEA

RESOLVE OUTLIERS

Capture the temperature through many frames. The camera rotates to provide the needed tracking function for these multiple frames.

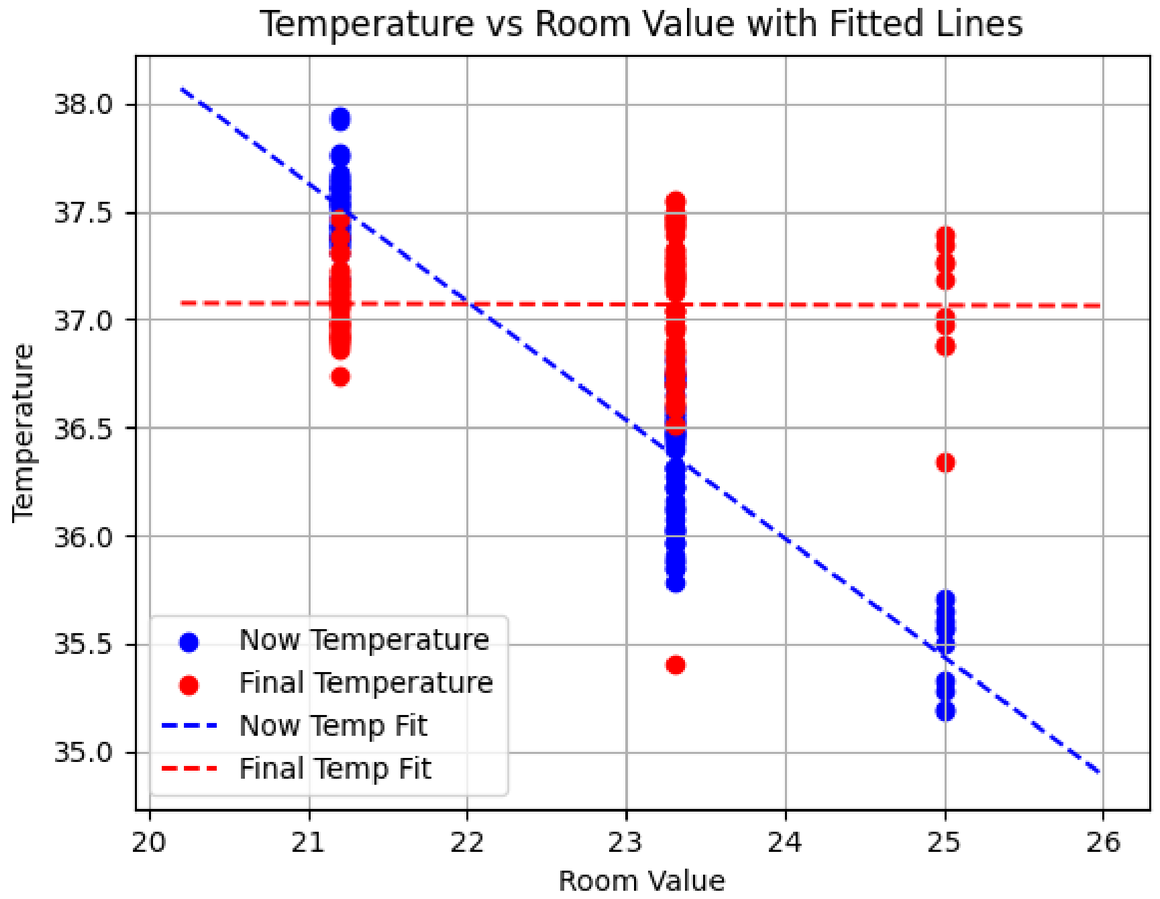
DATA DEVIATION

- Room temperature
- Distance

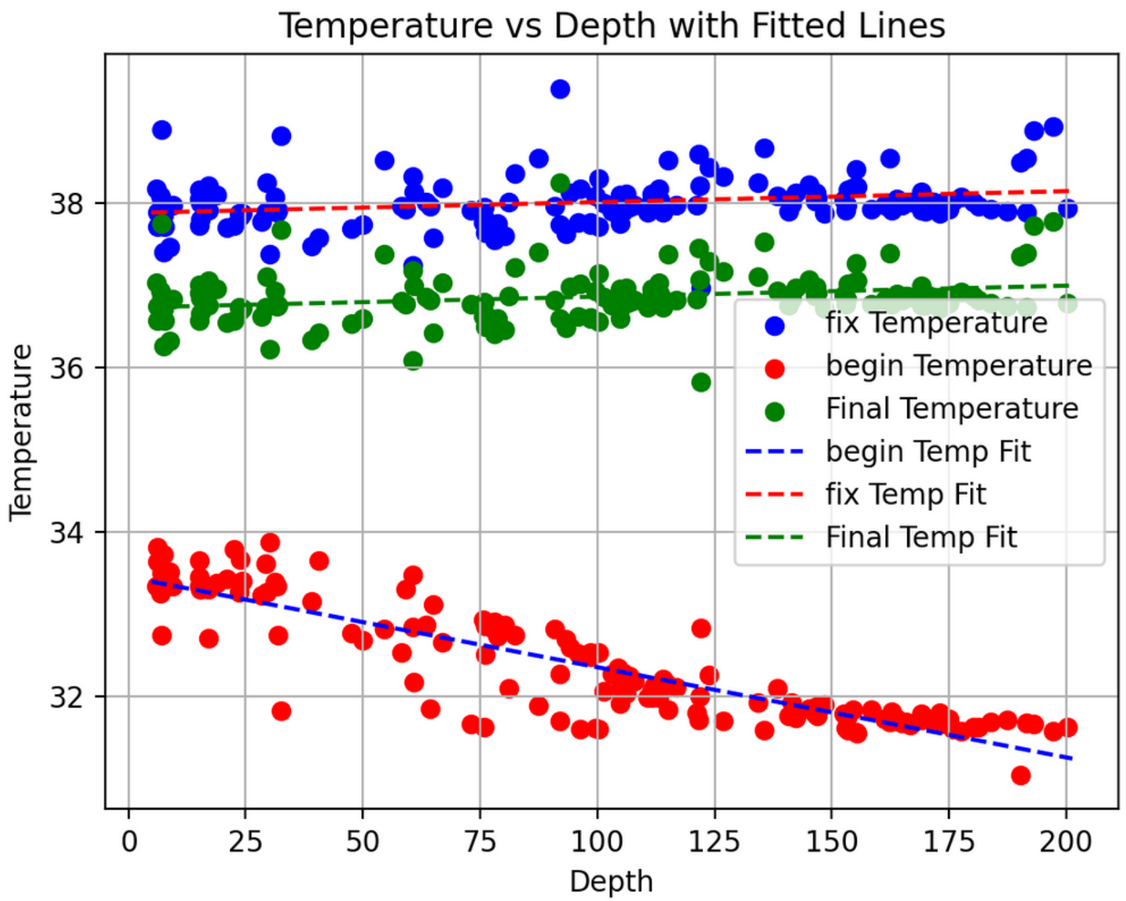
ROOM TEMPERATURE

Now, based on the adjusted formula, the ambient temperature affects our body temperature measurements.

The corrected line is in red, which aligns with the readings from the temperature gun and isn't influenced by room temperature changes.



ACCURACY



From our adjustments, it's evident now that the camera's temperature readings are no longer swayed by distance.

Moreover, the green line represents our final adjustment, and it pretty much aligns with the body temperature data we got using the infrared thermometer.

CONCLUSION

- Continuous tracking
- Continuous power supply
- Multi-frame acquisition, data stability

THANK YOU

Presentation by Group kurukuru~