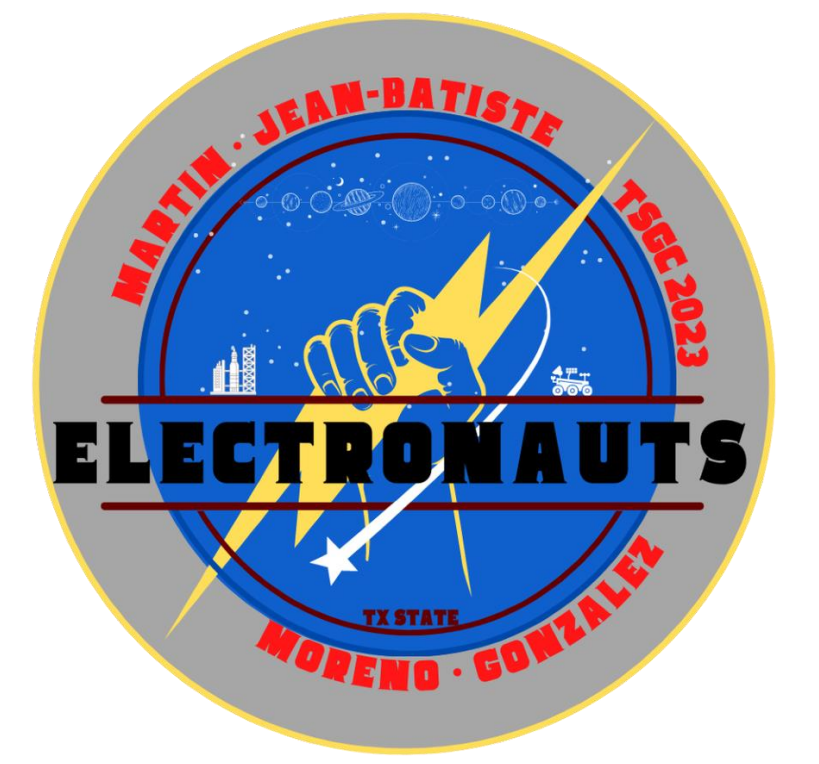
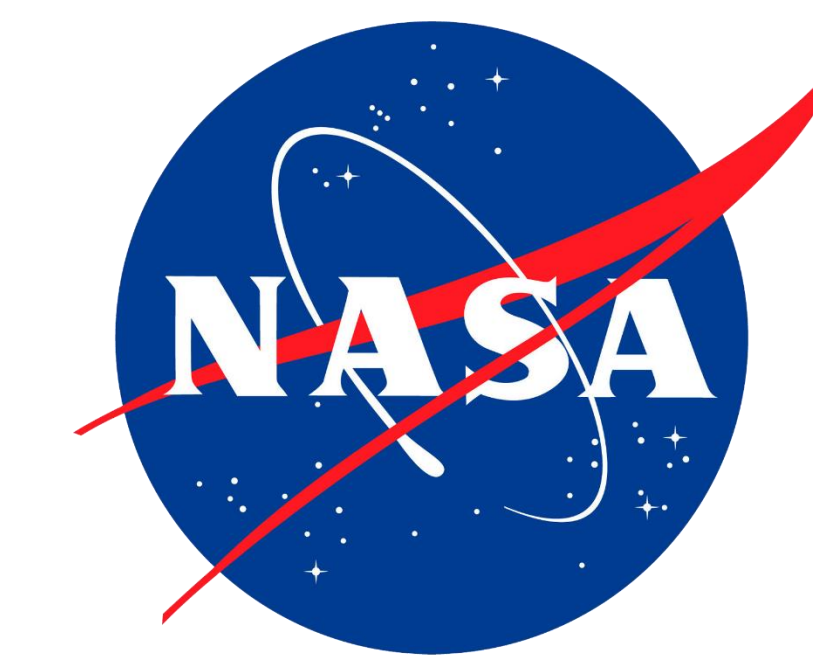


E1.01- Crew Tracking for Analog Space Research Electronauts



Background

NASA conducts 45-day simulations in the HERA habitat to observe the effects of isolation and confinement on astronauts' well-being. Effects such as "depression, poor sleep quality, accelerated cognitive decline, and unfavourable cardiovascular function" can have a negative impact on the productivity of the crew members. These crew members also wear other devices such as heart monitors to help keep track of their health.

Our goal is to build a system that will track 4 crew members and give their location and orientation within the simulated environment. We will accomplish this by placing multiple patch detection sensors around the habitat to read the patches worn by crew members.

Requirements

- Track crew members in a 6m diameter room
- Detect the direction and orientation of up to 4 people
- Record 45-days' worth of crew member data
- Crew members should not interact with the system

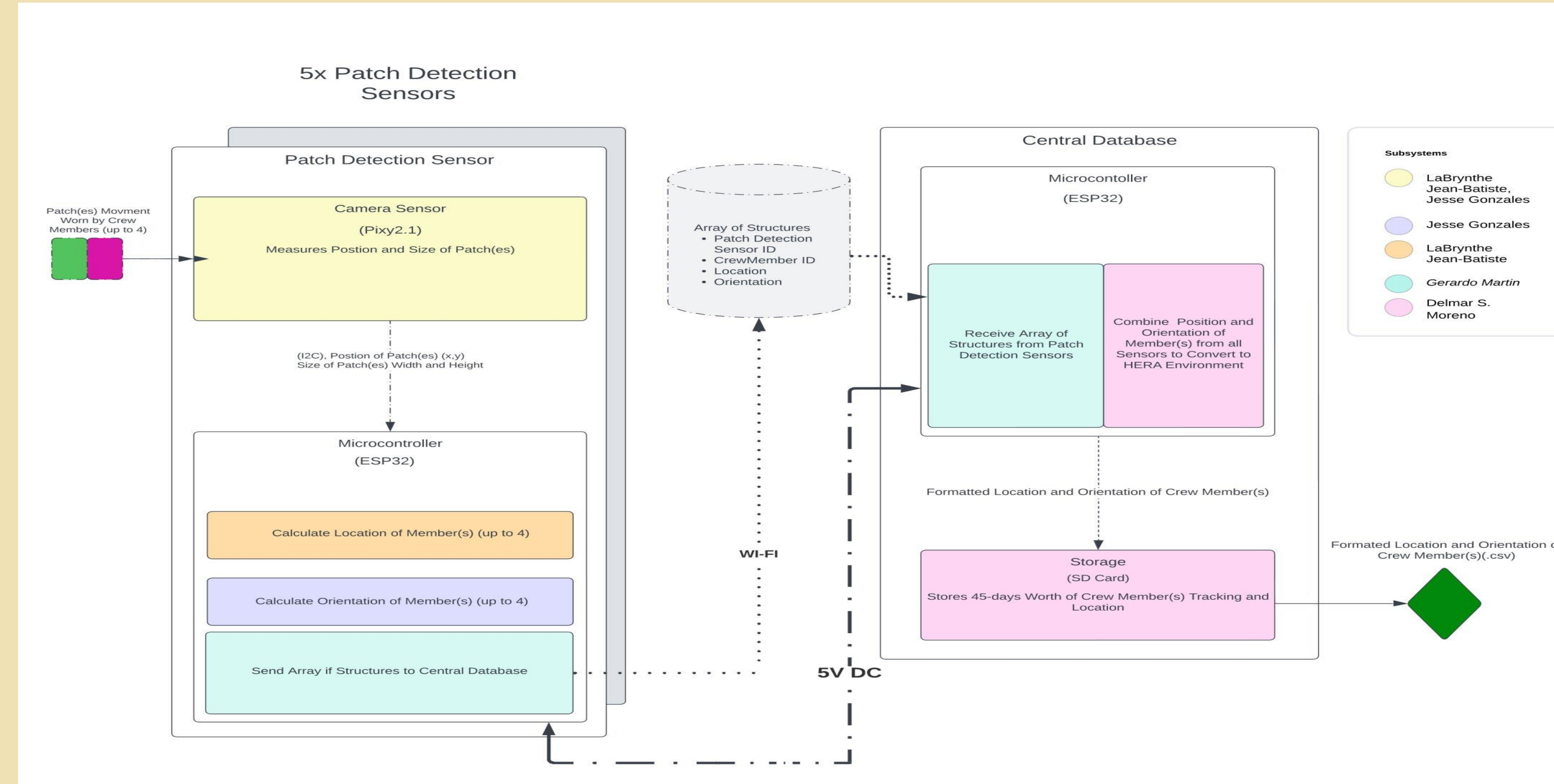
Features

- System can track a circular area with 6m in diameter
- Detects crew members using a color-detection system
- Uses Wi-Fi to send data wirelessly across the HERA habitat
- Stores crew member data on an SD card

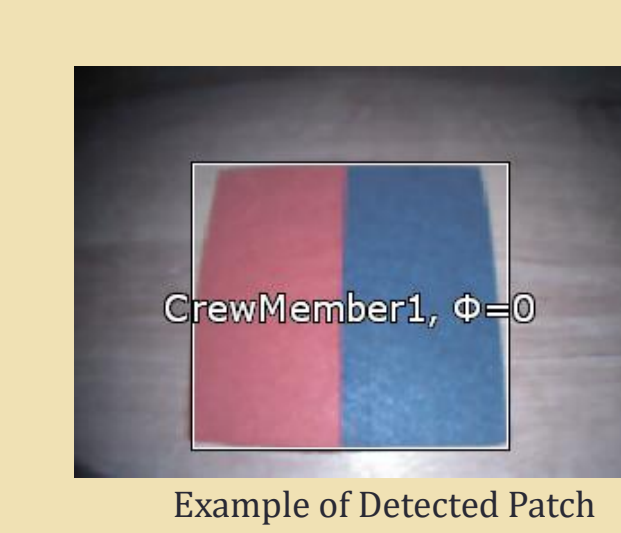
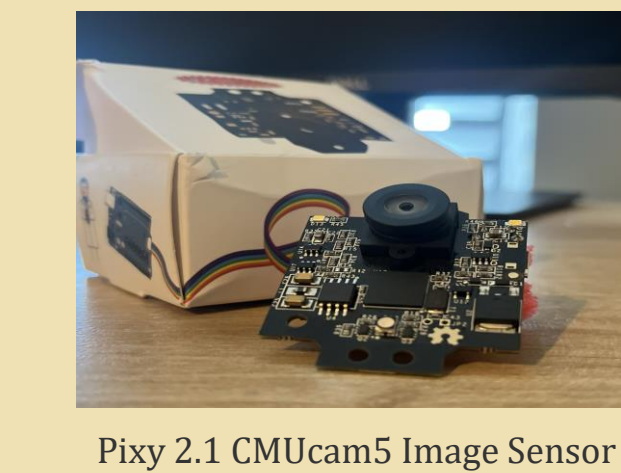
Acknowledgements

Sponsor: David Thomas (NASA)
Principal Investigator/Faculty Advisor: Dr. Cecil Compeau
TX State Faculty: Mr. Mark Welker, Dr. Lee Hinkle, Mr. Jeff Stevens

Top-level Block Diagram

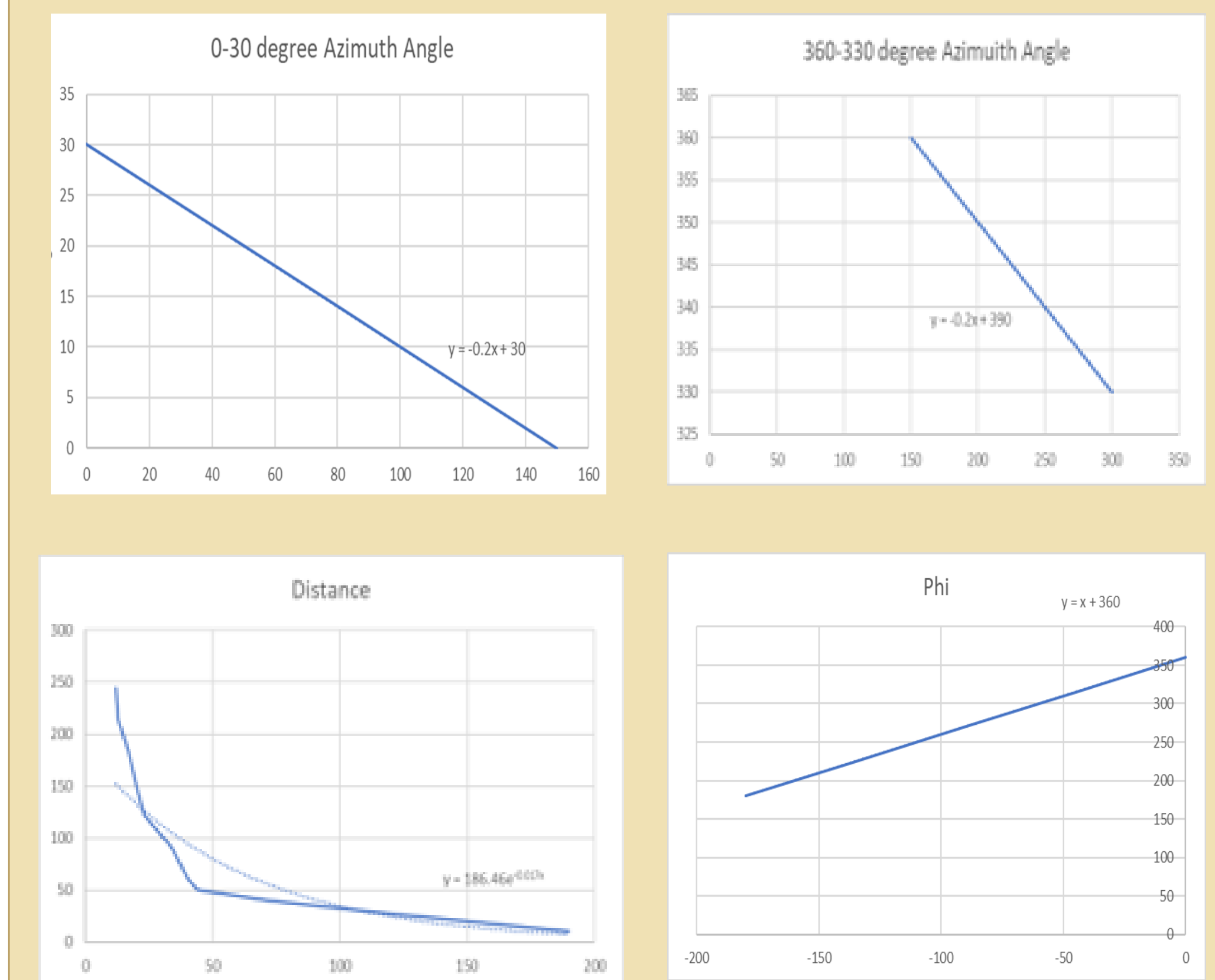


Pixy2 & Patch Design



- 2 - 6.35 x 12.7 cm
- Made of Cotton
- Two Distinctive Colors

Data Regression Models

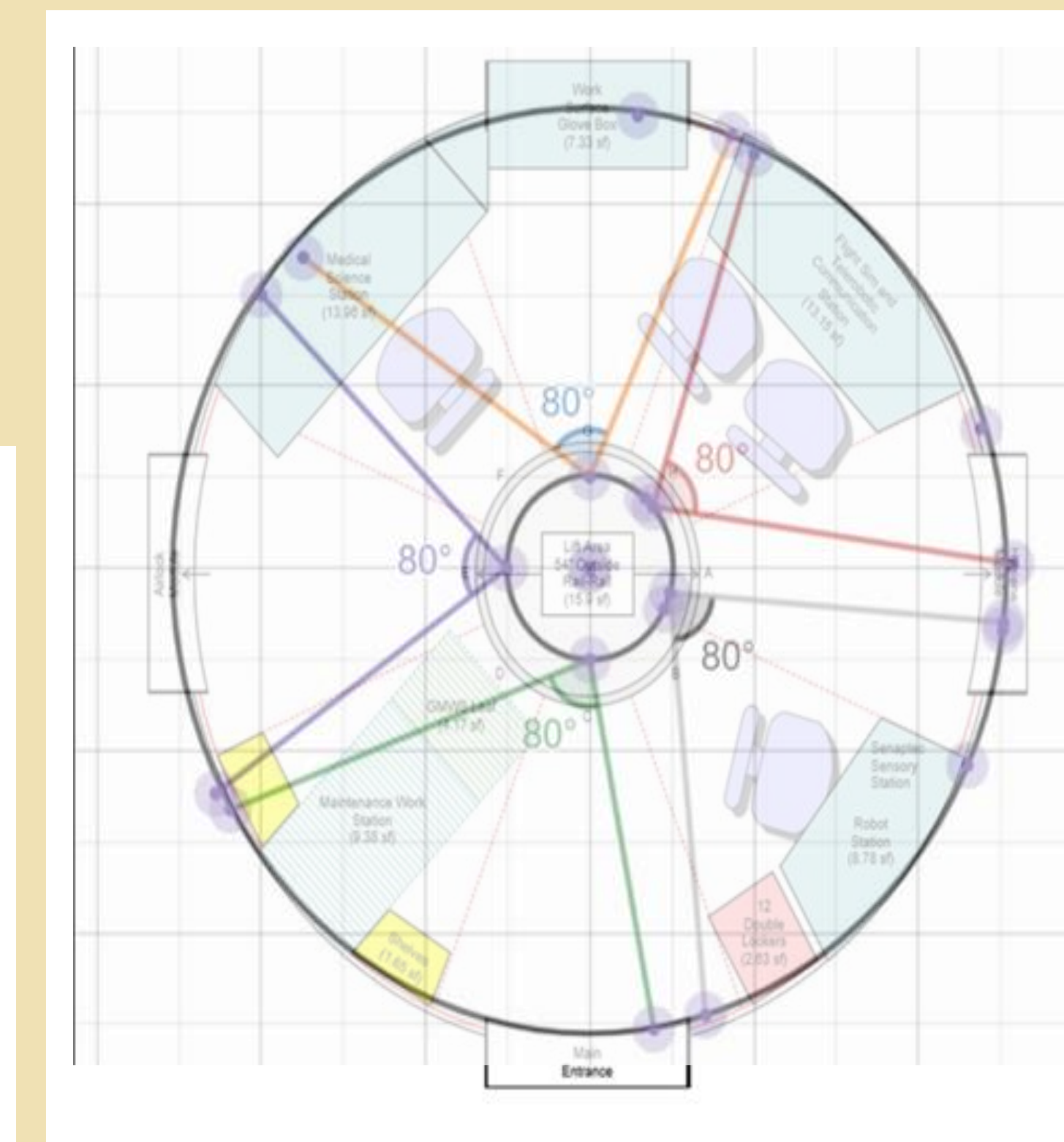
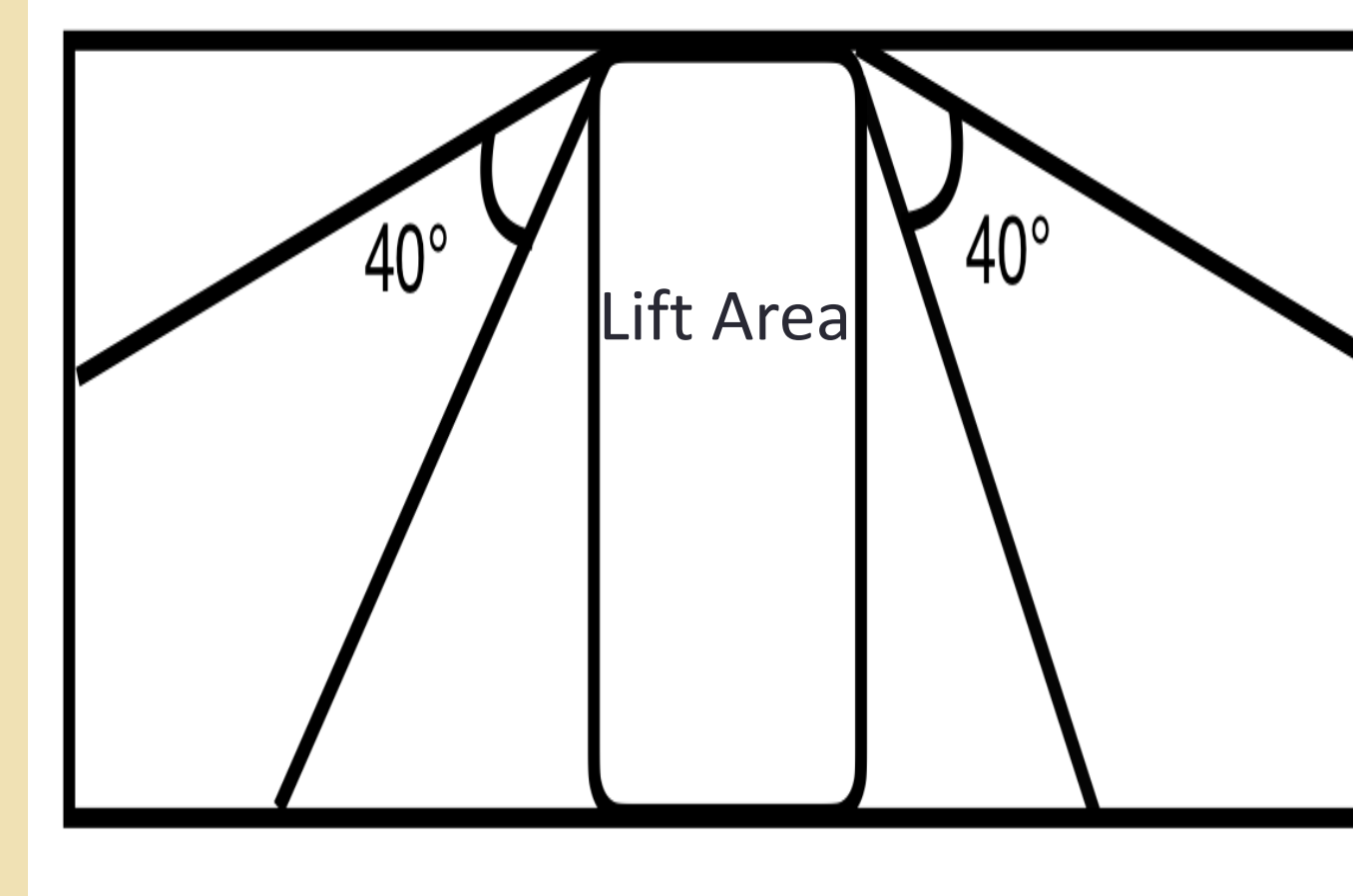
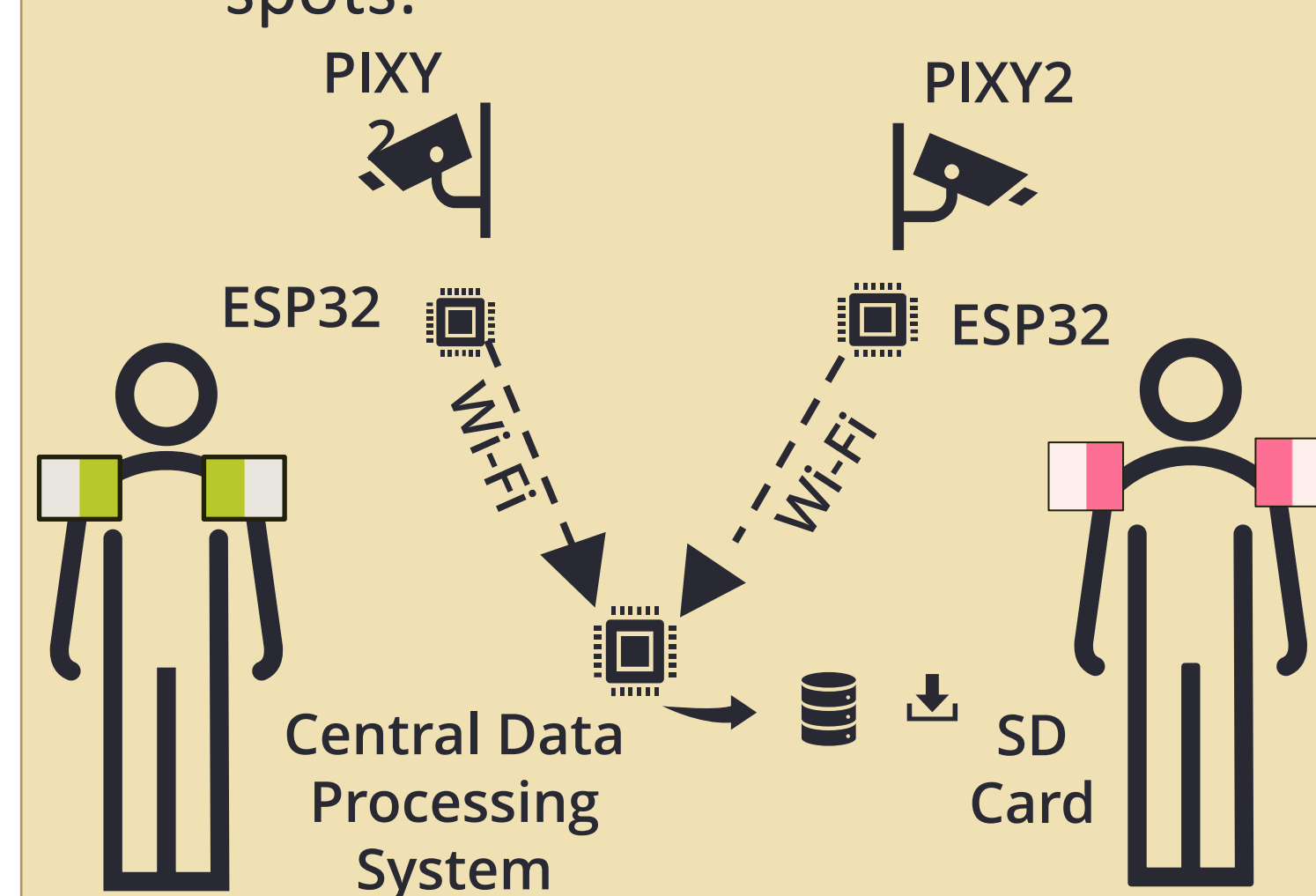


Example Output Data

R, θ, ϕ : 58.91, 352.60, 3.00
Radius, Azimuth angle, Observer_angle
 R, θ, ϕ : 69.70, 352.40, 357.00
Radius, Azimuth angle, Observer_angle

HERA Habitat and System Design (camera placement)

- The pixy2.1 is capable of visualizing an area spanning forty degrees in the vertical direction and eighty degrees in the horizontal direction.
- The HERA habitat is representative of a cylindrical shape, with a staircase in the middle, which is where the cameras can be placed to reduce blind spots.



Budget

Item	Quantity	Unit Price	Subtotal
Pixy2.1 Camera	5	\$69.99	\$349.95
ESP32 Module	6	\$5.96	\$35.76
SD Breakout Board	1	\$5.99	\$5.99
32GB SD card	1	\$9.99	\$9.99
Total			\$401.76

Future Improvements

- Refine formulas for determining distance and angle for each crew member
- Implement fault detection for incorrect data or camera drop outs
- Implement auto-brightness and auto-exposure to improve detection rates

Team Electronauts



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