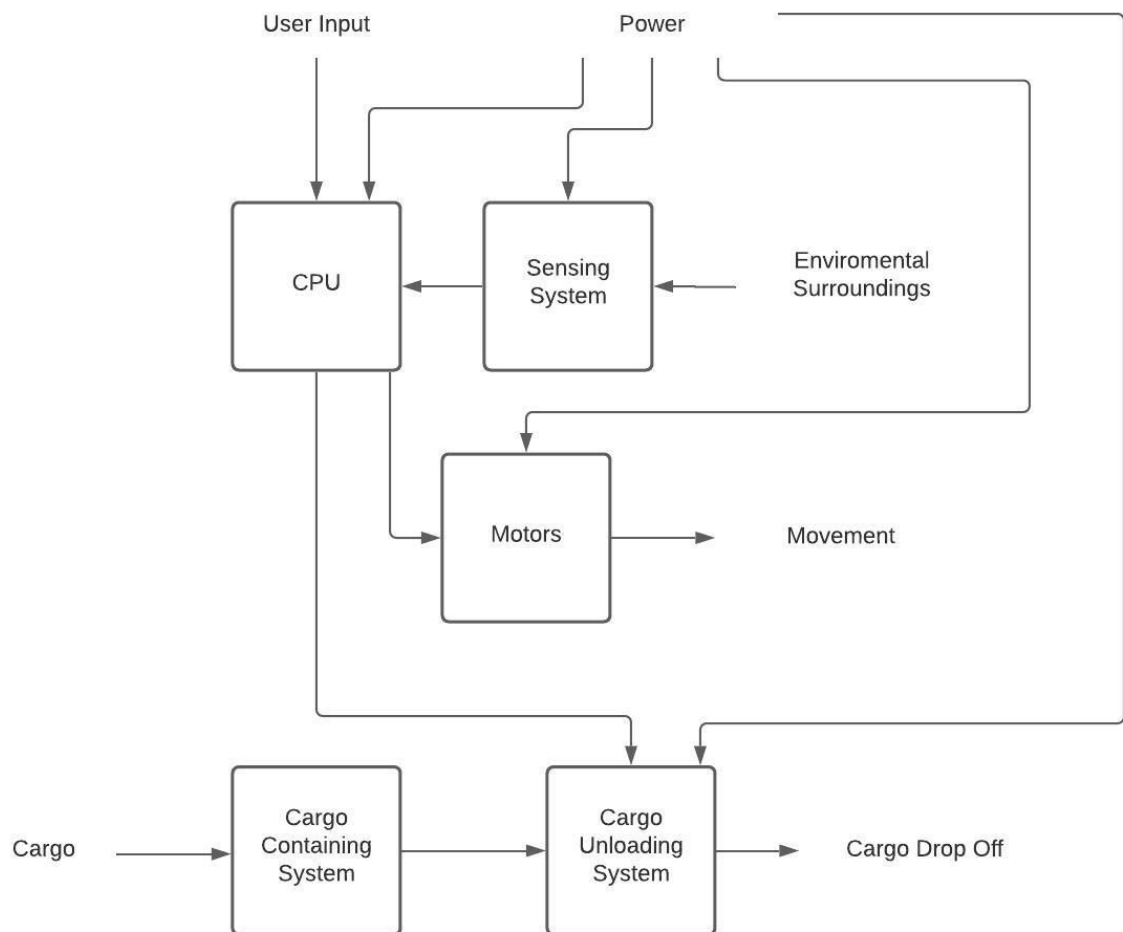# Design Specification Review

Electronic Signatures: Matthew Stuber, Alyssa Devincenzi, Agathiya Tharun, Natalie Harvey

MACRO Description

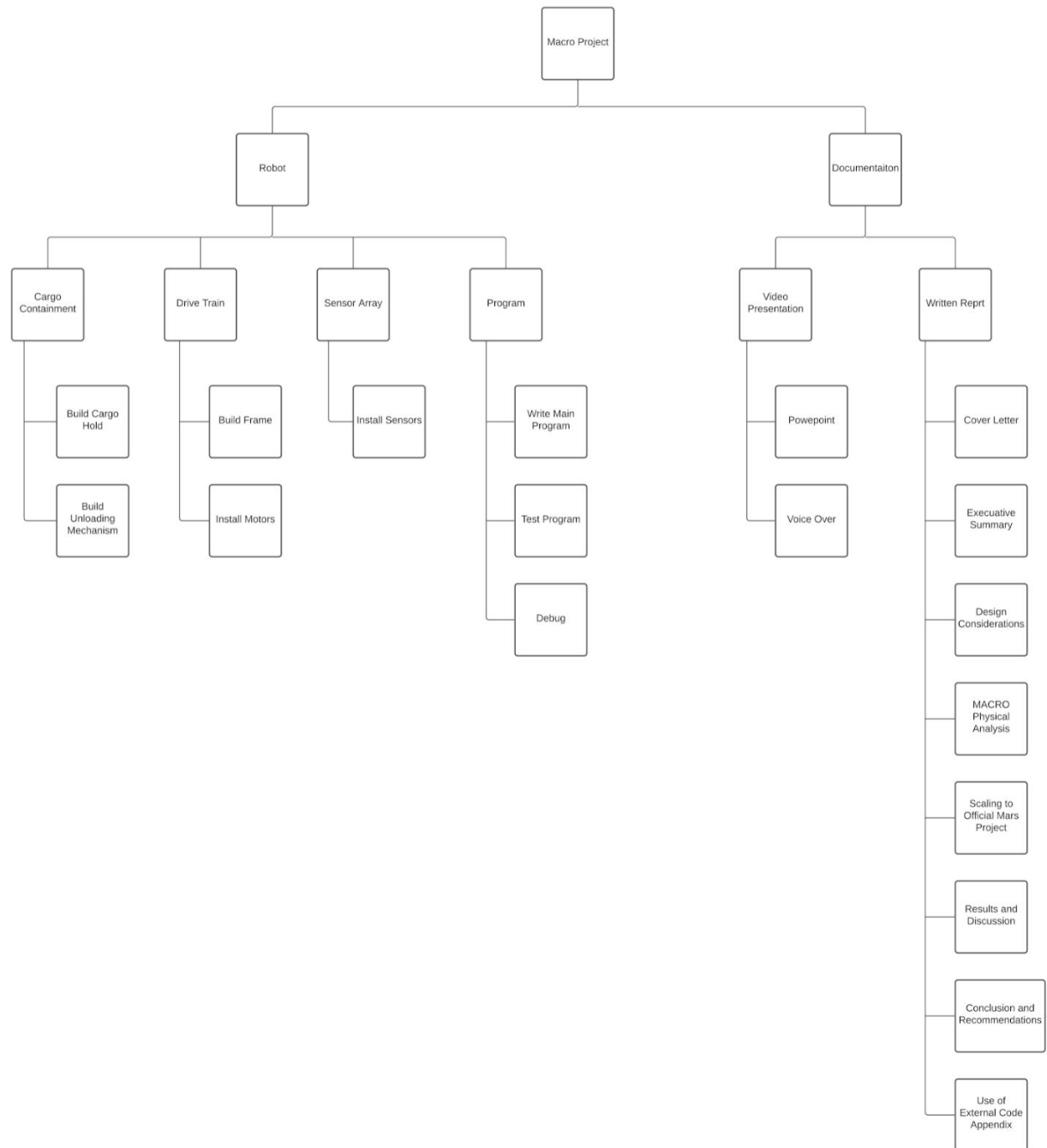Functional Block Diagram:

<u>Subcomponents:</u>

- CPU
  - Consists of the Raspberry Pi, Grove Pi, and Brick Pi
  - Stores and executes programs
  - Receives data from Sensing System
  - Sends commands to Motors and Cargo Unloading System
- Sensing System
  - Light sensors
    - Detects intensity of light
    - Analog output
    - The brighter the light, the larger the value
  - Touch sensors
    - Button that senses when pressed
    - Digital output
    - Returns 1 when pressed, and returns 0 when not pressed
  - Line finder
    - Detects black or white
    - Digital output
    - Returns 1 for black, and returns 0 for white
  - Ultrasonic sensors
    - Analog output
    - Returns distance from object
  - Internal measurement unit
    - Contains accelerometer, measuring linear acceleration
    - Contains rate gyroscope, measuring angular velocity
    - Contains magnetometer, measuring magnetic field
    - Three analog outputs, x, y, z
  - Hall sensor
    - Measures the magnetic field
- Motors
  - Drive Motors
    - Tank steering
    - Controls MACRO movement
  - Internal Motors
    - Used for cargo unloading system
- Cargo Containing System
  - Holds cargo securely inside MACRO
- Cargo Unloading System
  - Unloads cargo upright on top of target

Engineering Specification:

Customer Need	Technical Need	Technical Requirement	Target Value
Navigate to sites	Success rate of runs per total number of runs	Success rate of at least 90%	At least 95%
Recognize and handle hazards	Rate of successfully recognizing and handling obstacles per total obstacles encountered	Success rate greater than 95%	Same as Technical Requirement
Timely delivery of mission hardware	Difference between desired and actual speed	A difference no greater than 2 cm/s	Same as Technical Requirement
Transporting cargo from location without dropping or tipping the cargo	Success rate of transportation per total attempted runs	Success rate greater than 90%	Greater than 95%
Drop off on target	Distance of cargo from the target after drop off	Distance less than 5 cm	Same as Technical Requirement

Project Management

Work-Breakdown Structure:

Gantt Chart:

MACRO Project Gantt Chart
Team 30

Task name	Duration	Start date	Finish date
Cargo Containment	8 Days	Oct-19	Oct-26
Build Cargo Hold			
Build Unloading Mechanism			
Drivetrain	5 Days	Oct-26	Oct-30
Build Frame			
Install Motors			
Sensor Array	4 Days	Oct-30	Nov-2
Installation			
Programming	11 Days	Nov-3	Nov-13
Write Program			
Testing/Debugging			
MACRO Complete	28 Days	Oct-19	Nov-16
Video Presentation	9 Days	Nov-10	Nov-18
Create Powerpoint			
Voice Overs			
Written Documentation	9 Days	Nov-10	Nov-18
Write Cover Letter, Executive Summary, Design Considerations			
Write Analysis, Results & Discussion, Scaling to Official Mars Project			
Write Conclusion & Recommendations, External Code Appendix			
Documentation Complete	9 Days	Nov-10	Nov-18
END OF TERM	37 Days	Oct-19	Nov-24

Week columns: Week of Oct-19 (M T W R F), Week of Oct-26, Week of Nov-2, Week of Nov-9, Week of Nov-16, Week of Nov-23