Team 16 FPR
Trash·*E*

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Meet The Team

Stephen Townsend
Computer Engineer

Jasmine Hickey
Electrical Engineer

Smit Patel
Computer Engineer

John Diep
Computer Engineer

Team 16 Advisor
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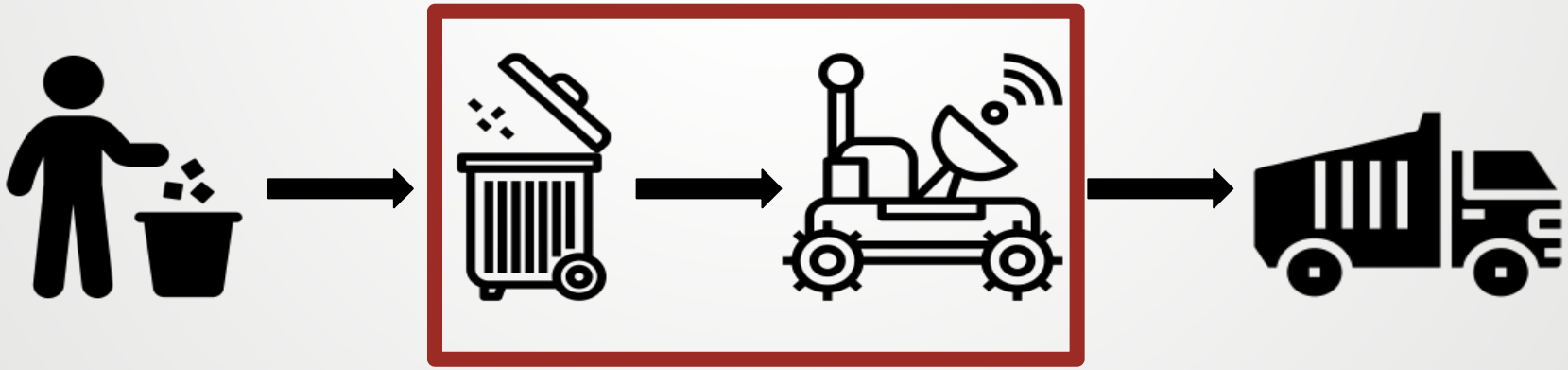
PROBLEM STATEMENT

Bringing garbage to the curb can be a difficult task for some, whether they are physically disabled or elderly. Aid lent by caring companions can be unreliable as everyone has their own schedule and may not be available at the necessary time. Those in need of refuse removal can be assisted using *Trash·E*. *Trash·E* will take the strenuous part of taking the barrel to the curb out of the process; it is a Wi-Fi enabled robotic system to move garbage from its near-home collection site to the curb on a path and at a specified time.



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DESIGN GOALS, SPECIFICATIONS, AND TESTING PLAN

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Design Goals

- The System shall
  - specify what days and times *Trash·E* will run
  - wait for a preset amount of time at the pickup location before returning to its starting location
  - detect when trash is picked up
- Navigation
  - follow designated line forward and backwards
  - return to line if deviation occurs
- Obstacle Detection
  - detect and stop before obstacles in front of the system
  - alert the user of an obstacle
- Environmental Restrictions
  - fully functional on paved surfaces

System Specs (Updated)

Requirement	Specification	Value
Arrive before specified pickup time	User-inputted day/time	Arrive at least 10 minutes before time specified, alert user
Payload of average trash bag	Pounds	Greater than or equal to 25 lbs.*
Battery Life	Trips / Time	Two round trips on one full charge
Wait at Pickup Location	Time / Load Verification	Wait until load is taken away or EOD
Object Detection	Distance	Detect objects <= 0.5 meter from rover (90% accuracy)
Navigation [Primary]	Line Tracking	Follow line from start to pickup and back (90% accuracy)
~~Navigation [Secondary]~~	~~Find Relative Home~~	~~Alert user after disturbance or error within five minutes (80% accuracy)~~
Movement	Surface, Slope	Work on paved surfaces up to 10° slope
WiFi Connectivity	Distance	20 meters, LOS
Arrive at Starting & Pickup Location	Error Tolerance	Arrive within 2 meters of final destination (90% accuracy)
User Alert [Obstacle]	Time	Alert the user of an obstacle within one minute (90% accuracy)

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BLOCK DIAGRAMS & PCB DESIGN

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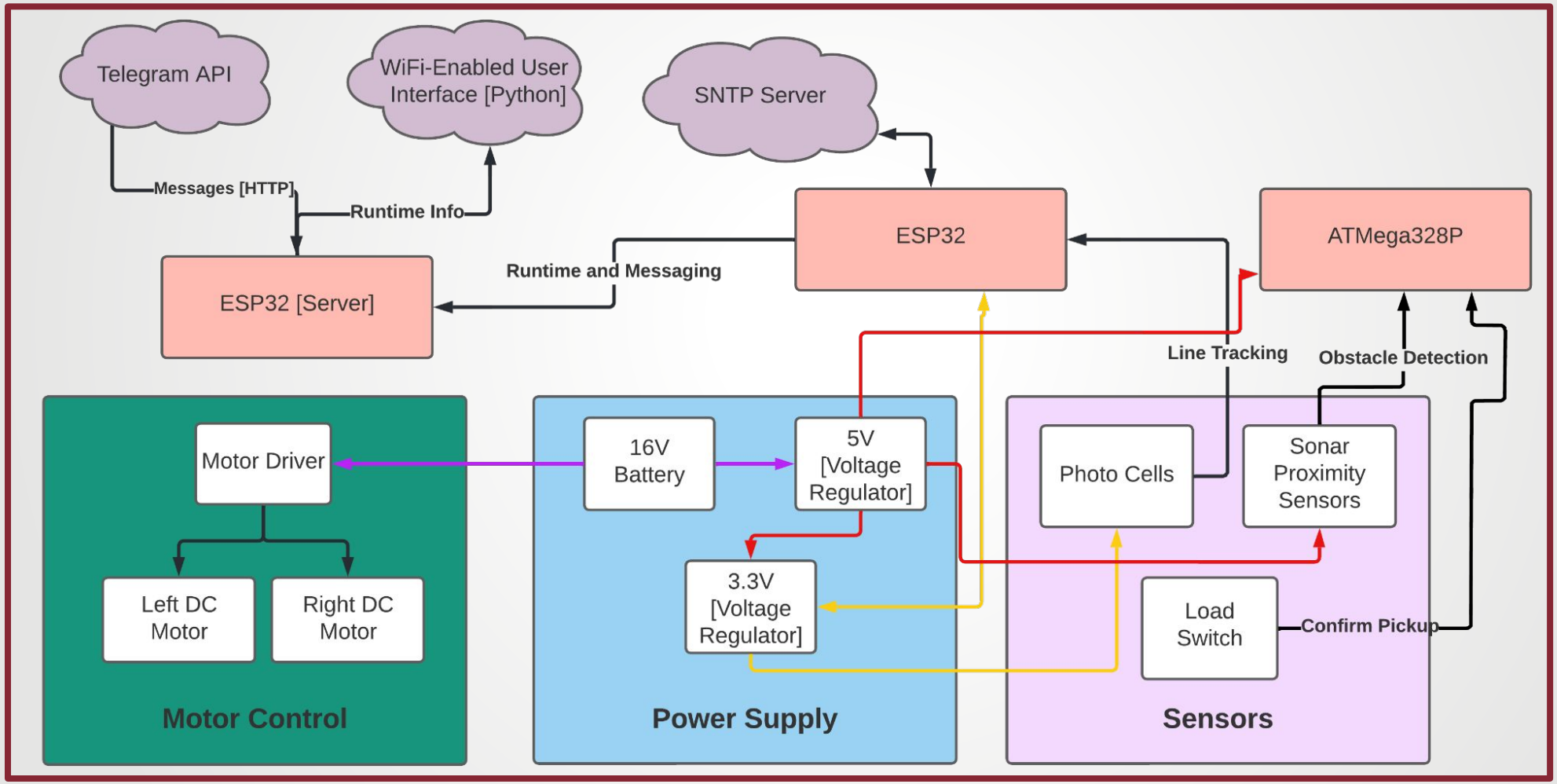
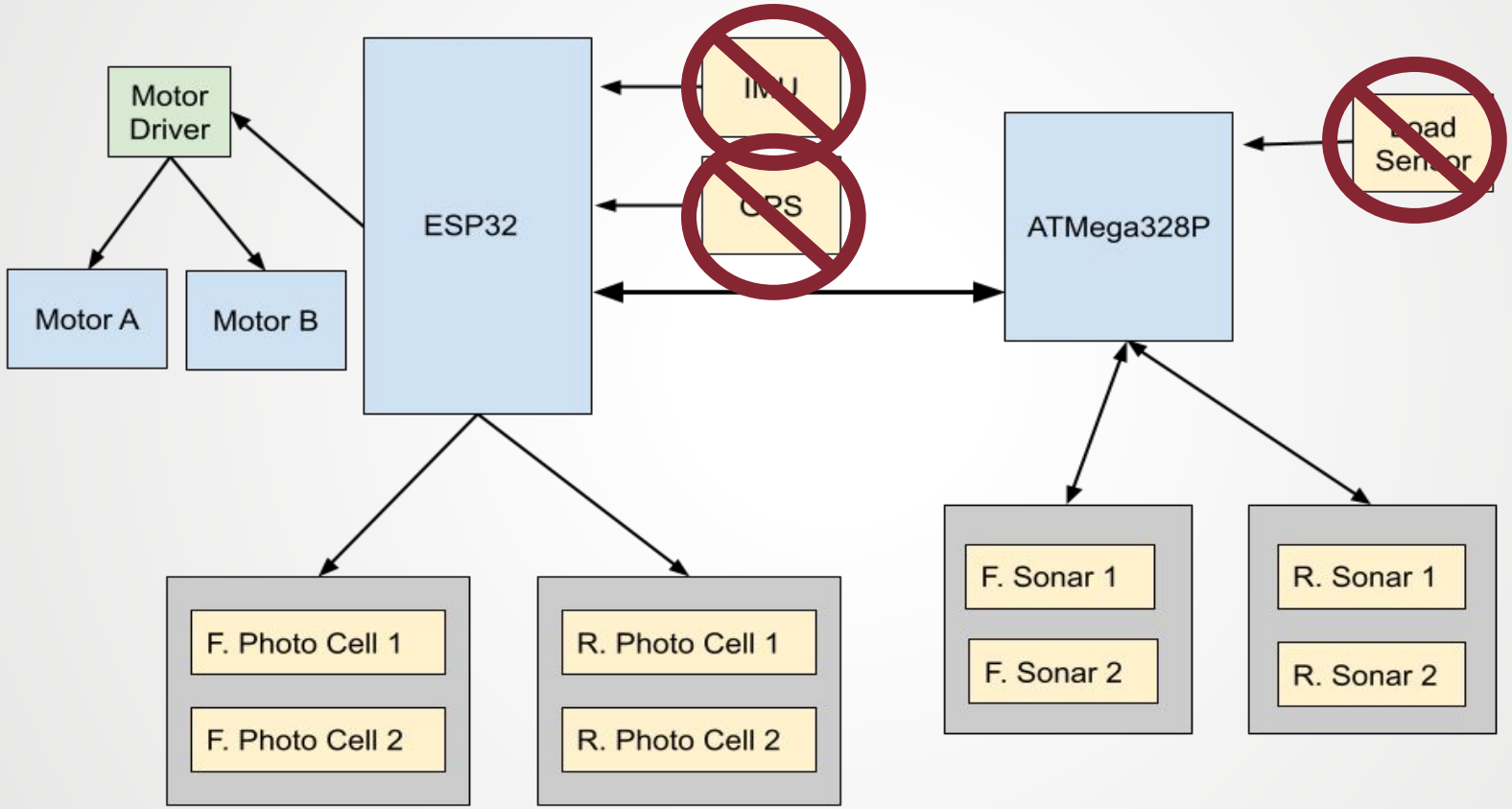
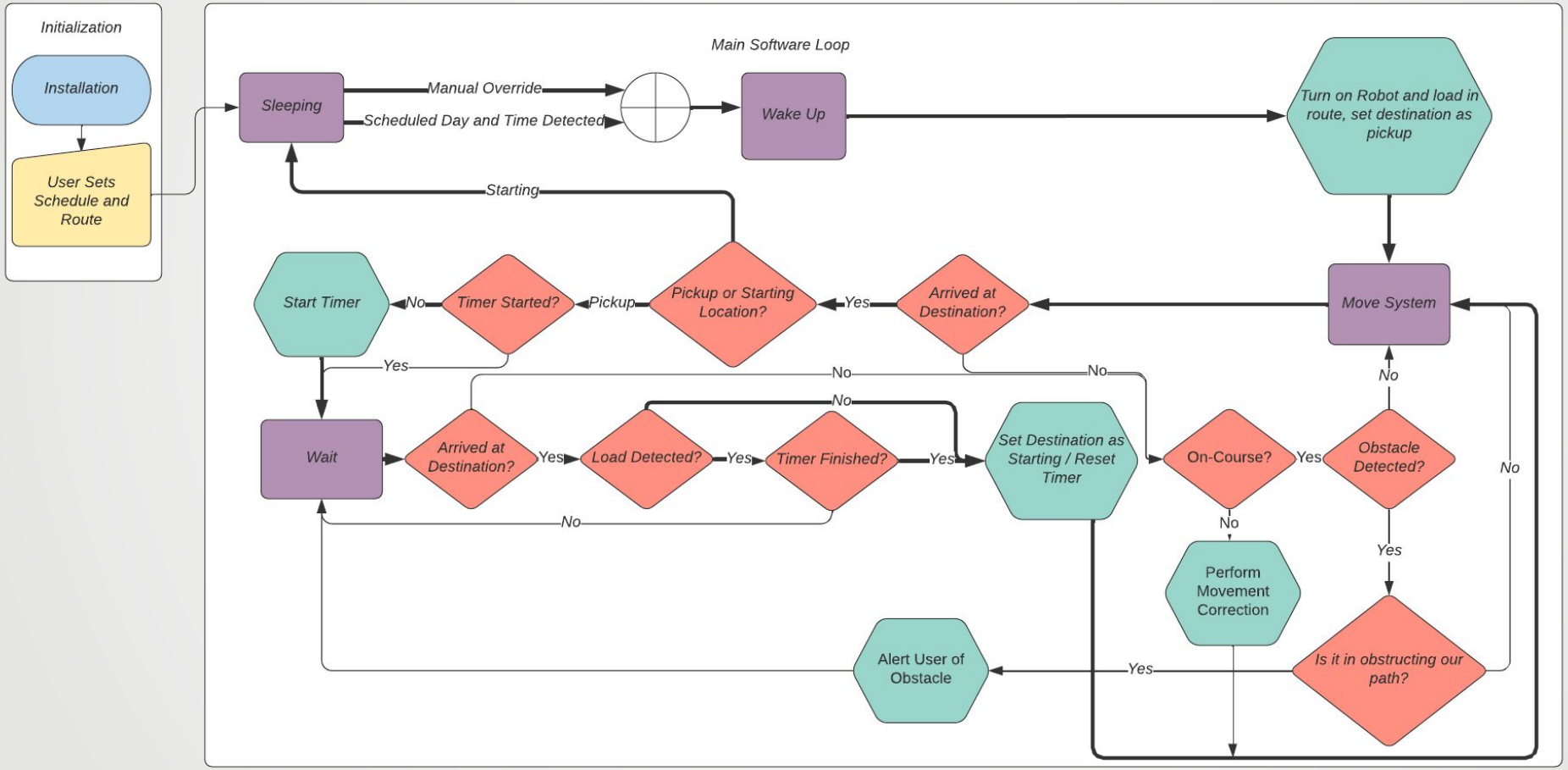
(UPDATED) SYSTEM BLOCK DIAGRAM



Hardware Block Diagram



Software Block Diagram

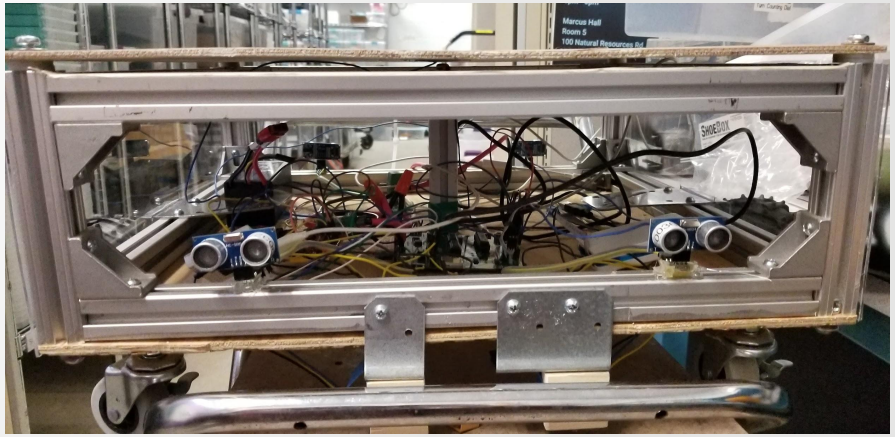


The Scale Up

- 19” x 19” x 6” 80/20 aluminum frame
  - lightweight and sturdy
  - conjoined with corner brackets on all joints
- 4” driver wheels
  - connected to motor shafts
  - motors are held in place with L brackets and pipe strap
- 1.5” castor (lazy) wheels
  - in all four corners for stability
- Everything is mounted to a wooden baseboard
- Polycarbonate siding for weather proofing
  - blue tack and tape used to close seams
- Total weight is about 25 pounds

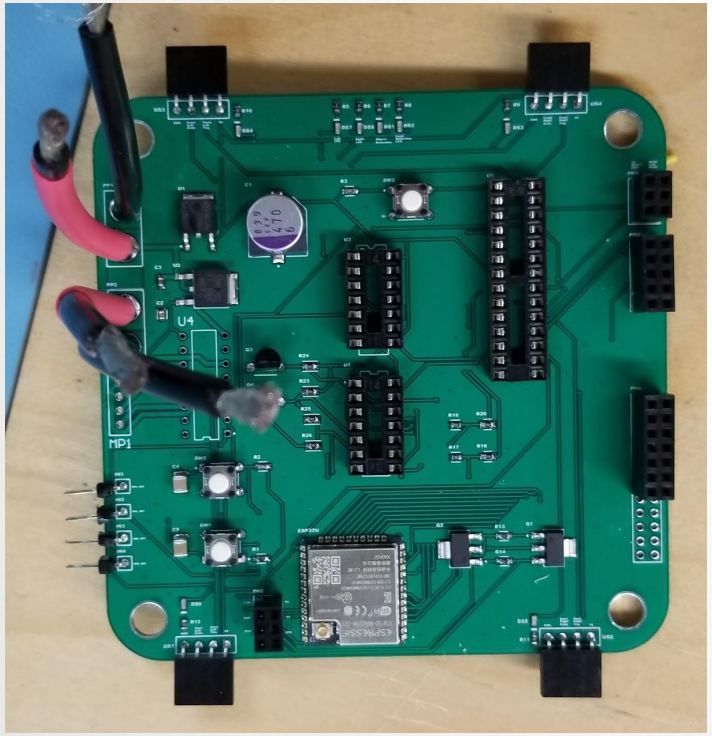
What has changed since CDR?

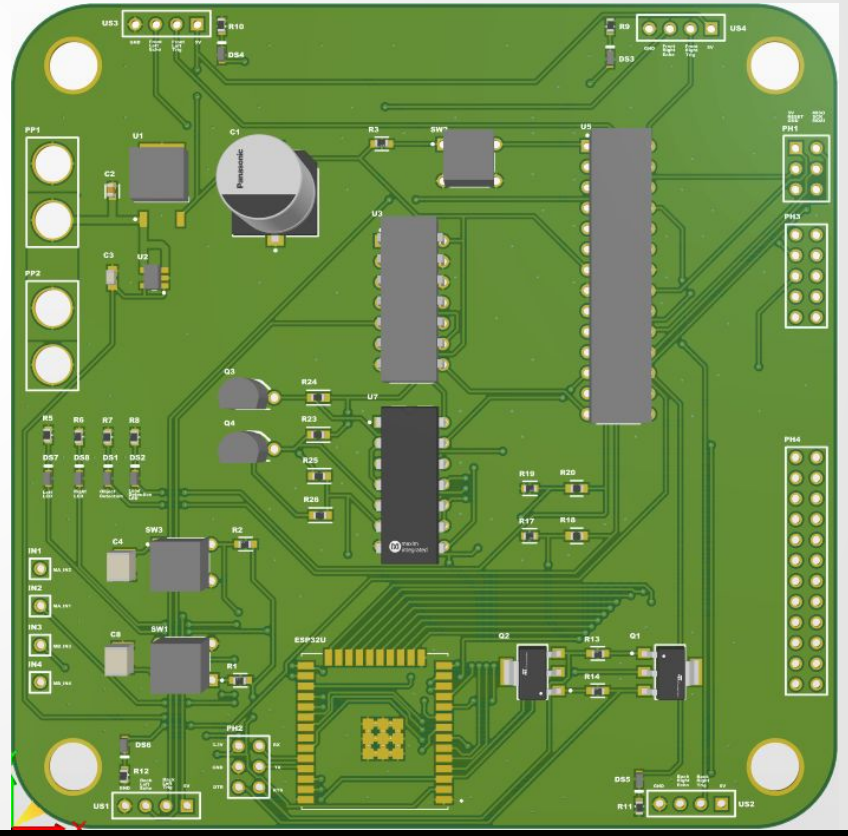
- Motors switched out for DC Geared Motors (218.4:1 Gear Ratio)
- Swapped out wooden bottom plate for a much more light-weight wooden plate
- New Load Detection system (Essentially a momentary button)
- Integrated PCB into system
- Whole system runs on one battery
- Swapped out caster wheels for smaller sized wheels



PCB Design

- To Facilitate Signal communication between Microprocessors and sensors
- Allow for singular power source to run whole system





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COST ESTIMATE

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Cost Estimate

Total Cost Estimate: $999.23
Total Cost Without M5 Items: $451.28

*Items sourced from M5 so actual cost is zero

Costs (Up to CDR)

Component	Predicted Cost
GPS	$39.06
Motor Driver	$5.45
Battery	$34.95
Huzzah32 Feather*	$19.95
Proximity Sensor x4	$25.71
Testing Platform	$29.99
Load Sensor x4	$31.72
Load Cell Amplifier	$6.05
Photoresistor PCB Parts	$26.20
ESP32 + Adapter	$21.94
Main PCB Parts	$100.36
Antenna	$11.98
IC Regulator	$0.76
Motors*	$520.00
Aluminum Frame*	$38.00
Castor Wheels*	$20.00
Spray Chalk	$15.96
6 ESP32	$51.14
Total	**$999.23**


QUESTIONS?
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