

## Team 74: IEEE Region 5 Robotics Competition

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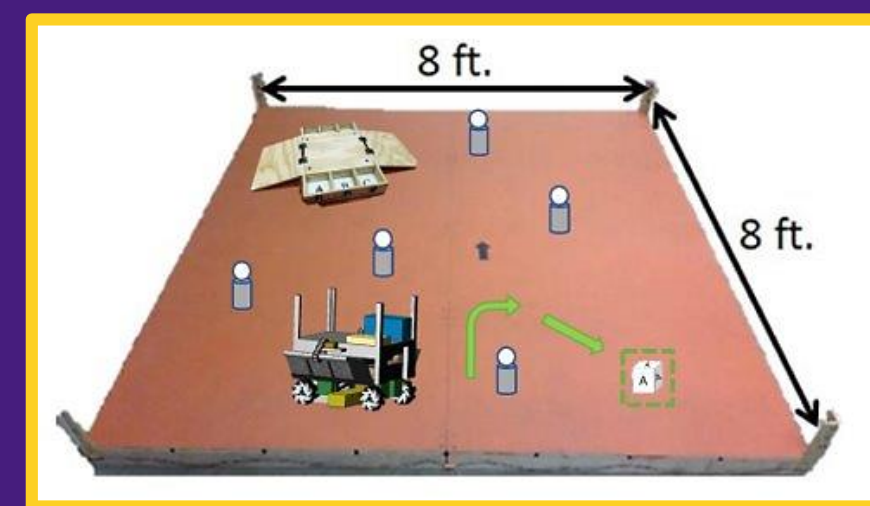
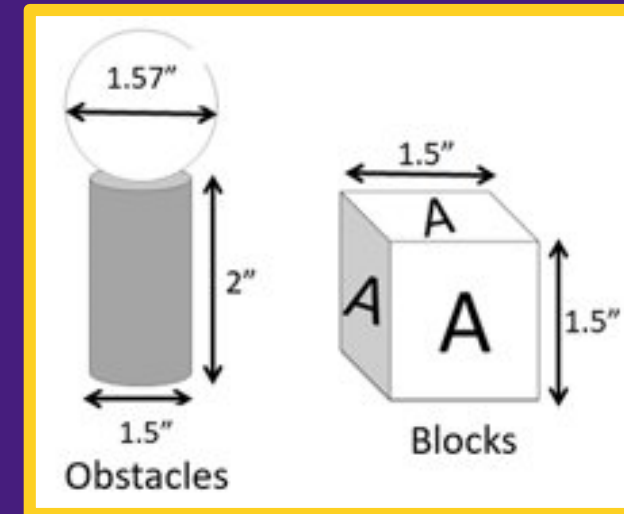
### Competition Overview

#### Objective Statement:

To create a mobile, autonomous robot capable of traversing the competition board through edge, obstacle, block, and mothership detection, while prioritizing block sorting, depositing, transporting and letter recognition.

#### Competition Specifications:

- Round Length - 6 minutes
- Competition Board – 8 x 8 Feet
- Block Location - Provided via JavaScript file
- Mothership Location - Unknown
- Obstacle Location - Unknown
- Minimum Object Clearance - 6 inches
- Block width – 1.5 inches cubed
- Obstacle height – 3.57 inches
- Mothership Height – 1.25 inches
- Mothership Ramp Width – 8 inches
- Cannot be idle > 10 seconds



#### Competition Constraints:

Specification	Outcome
Weigh < 40 pounds	Robot weighs: 12.5lbs
Fit within 1 cubic foot	Robot dimensions: 11.5in x 11in x 11.5in
Non chemical/explosive PWR SUPP	Lithium Polymer Battery
LSU Issued Project Budget	Total robot cost: \$1,572

#### Point Allocation System:

- +5 points per block picked up
- +15 points per block when placed in the mothership
- +30 points per block placed in the correct slot in the mothership
- +75 points for a perfect run
- +25 for returning to starting position after perfect run
- 5 points deducted per obstacle hit

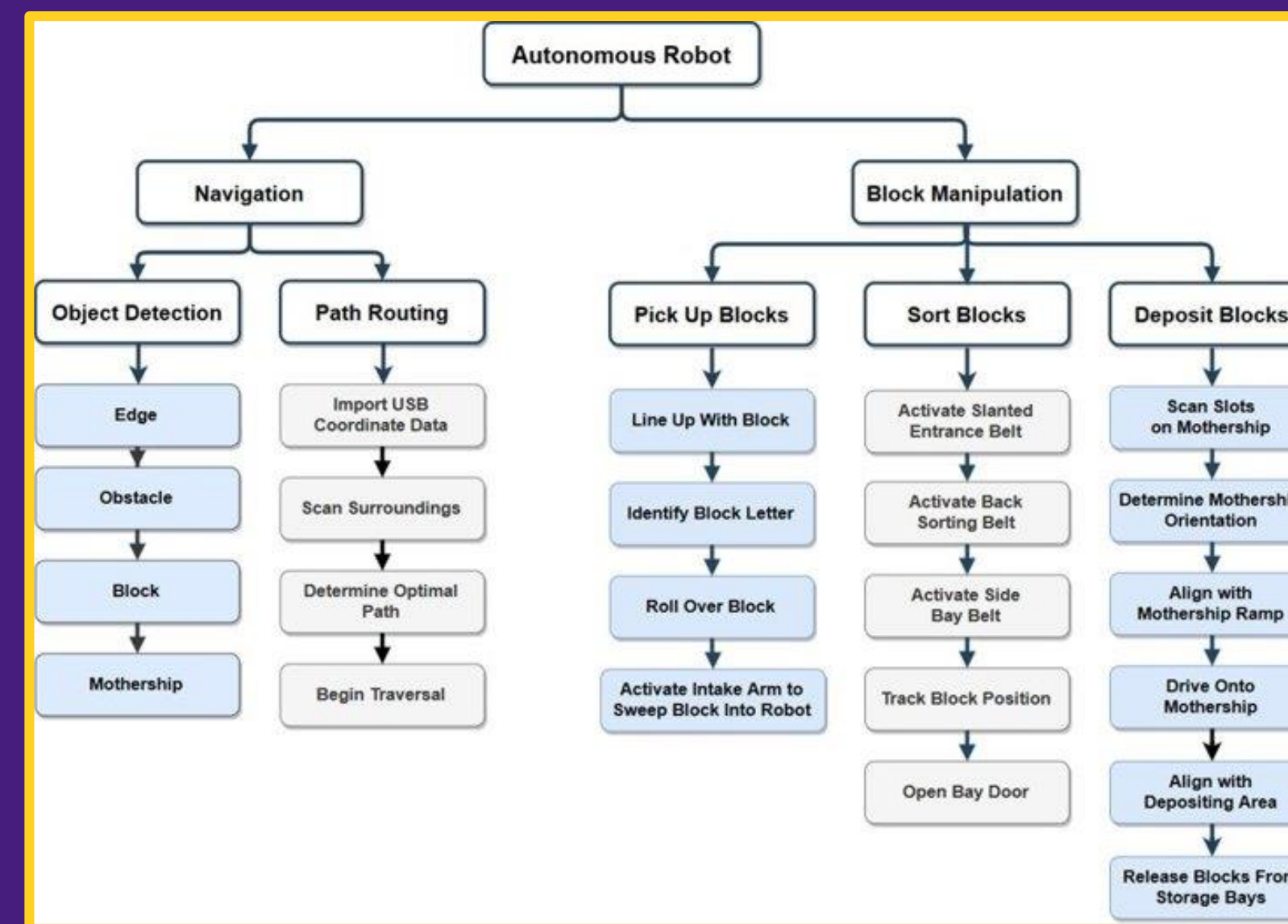
Round 1	Round 2	Round 3
2 blocks, 5 obstacles	4 blocks, 10 obstacles	6 blocks, 15 obstacles
175 points max	275 points max	375 points max

### Concept Design

#### Overall Functional Requirements:

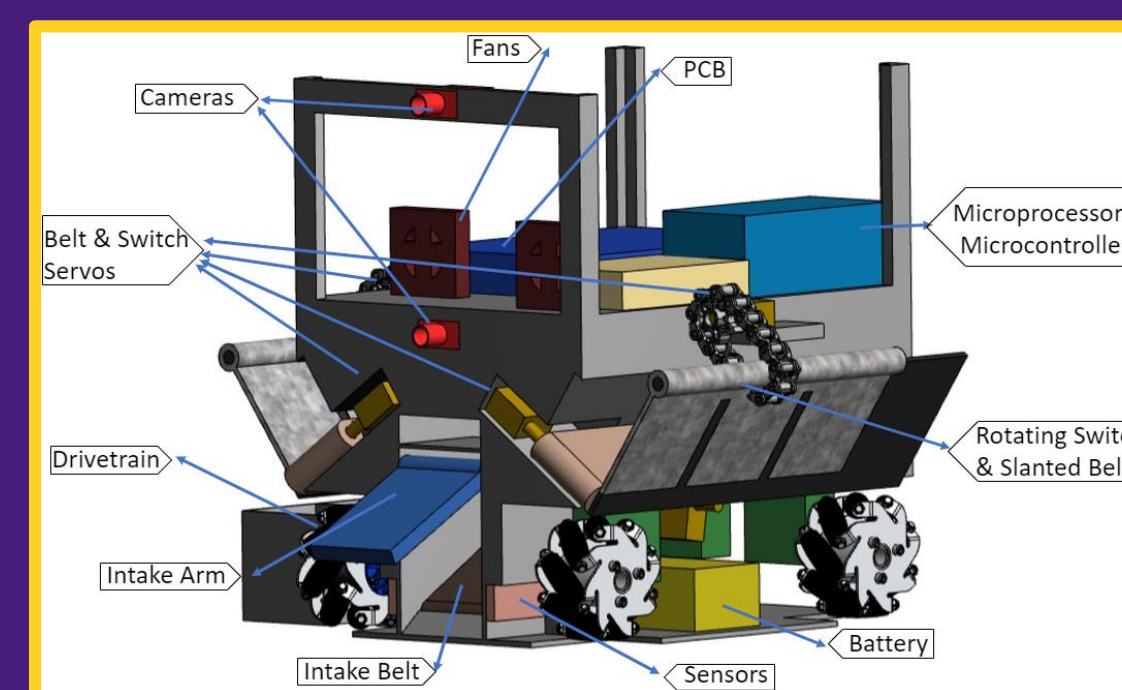
Specification	Outcome
Autonomy	Achieved via Ultrasonic, IR Sensors & Arduino
Multidirectional Movement	Achieved via drivetrain system
Avoid Obstacles	Achieved via drivetrain and IR Sensors
Intake Blocks	Achieved via drivetrain, sweeping arm & IR sensors
Store Blocks	Achieved via sorting belts & sorting flap
Deposit Blocks	Achieved via storage bays & string release
LED Finishing Light	Fabricated LSU LED PCB
Start & Stop Buttons	Installed via PCB board

#### Functional Decomposition:

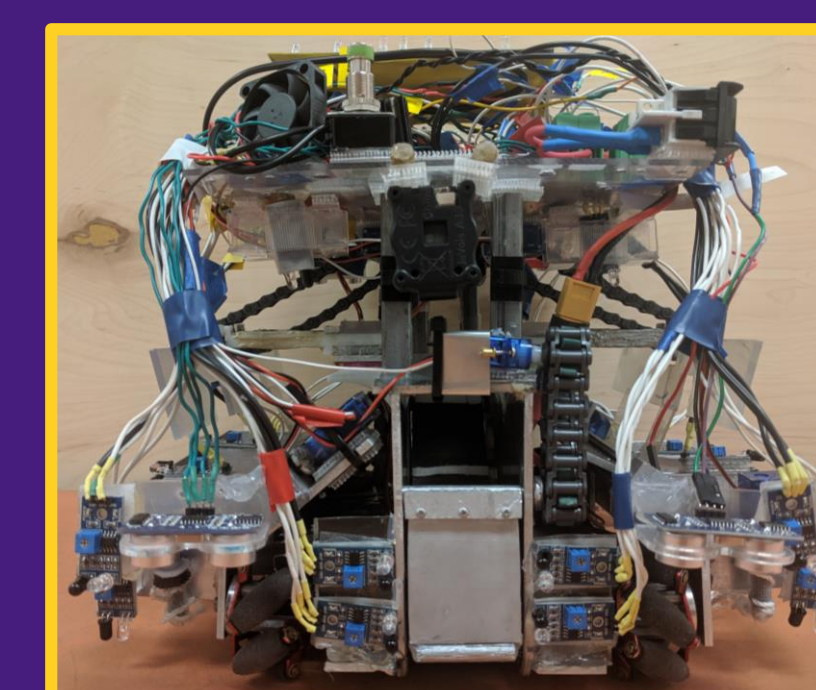


#### Robot Design Prototypes:

##### Original Solidworks Model



##### Final Prototype

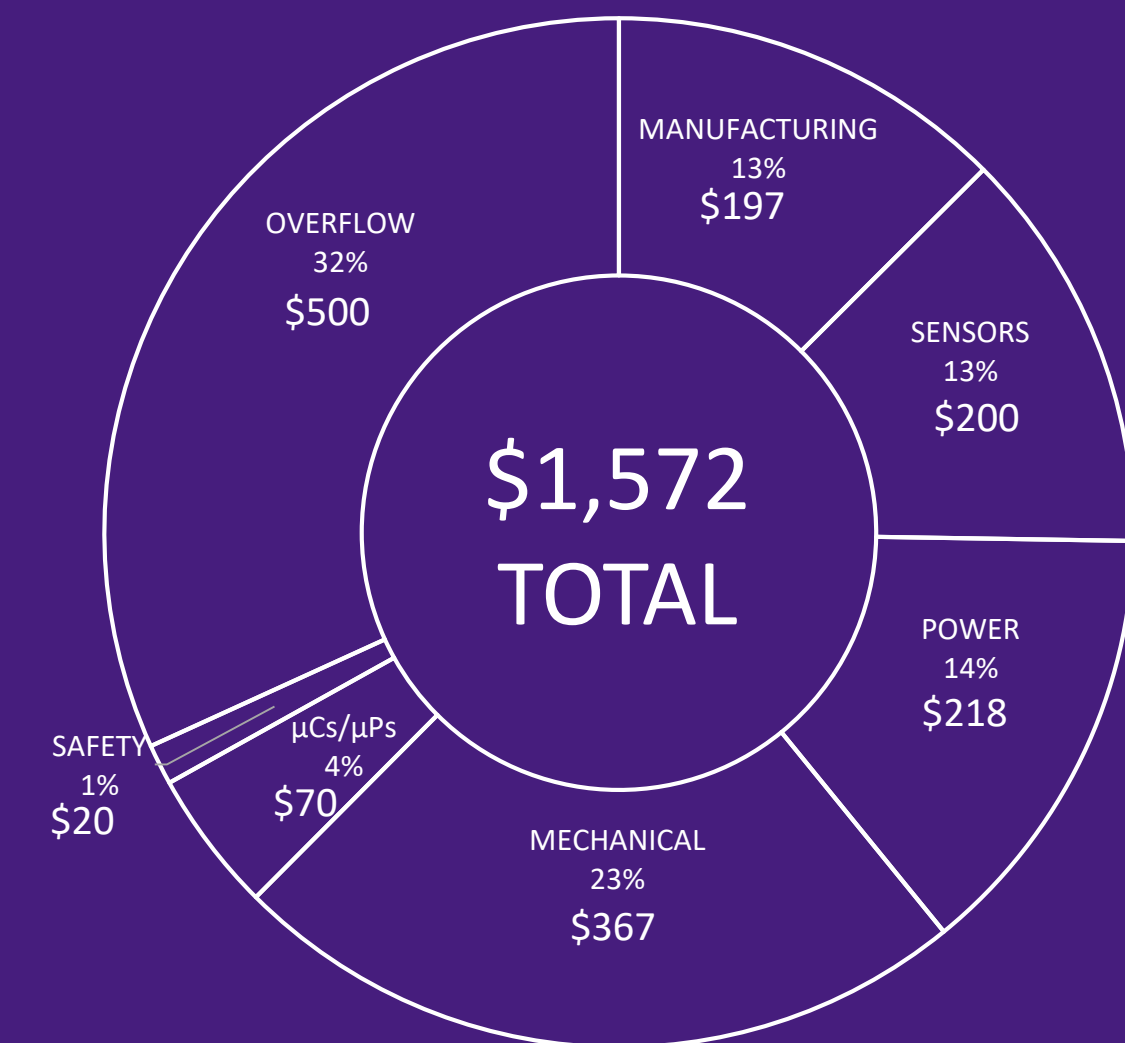


### Project Management

#### Safety Precautions:

- Heat Sinks
- Fans
- Thermal Paste/Thermal Glue
- Emergency Stop Button
- Fire Retardant Battery Charging Bag
- Heat Shrink Tubing
- Infrared Temperature Gun

#### Budget Breakdown:



Budget Category	Category Breakdown
Manufacturing	Aluminum sheets & rods, plexiglass & shop use
Sensors	Ultrasonic sensors, Infrared Sensors, and cameras
Power	Batteries, charger & PCB Fabrication
Mechanical	Continuous servo motors, wheels & gears
μCs/μPs	Raspberry Pi 3 B & Arduino MEGA 2560
Safety	Battery Bag and fans
Overflow	Fundraised for spare, replacement & additional parts

#### Conclusion:

Prior to the LSU IEEE Robotics Competition, the robot met all IEEE measurable specifications but not all functional requirements due to time constraints and obstacles encountered during multiple aspects of robot fabrication. After winning the LSU IEEE Competition, our team competed in the IEEE Region 5 Competition in Lafayette. The robot was able to move around the board, but was unable to place in the competition due to sensor malfunctions. Since competition, our final robot now meets all functional requirements, except for letter based block sorting.

- ✓ Block Intake
- ✓ Block Storage
- ✓ Weighs 12.5 lbs.
- ✓ Obstacle Avoidance
- ✓ Camera Letter Recognition
- ✓ 11.5 X 11 X 11.5"
- ✓ Edge Avoidance
- X Letter based sorting/depositing

