

ME, ECE, BE Capstone Design Programs

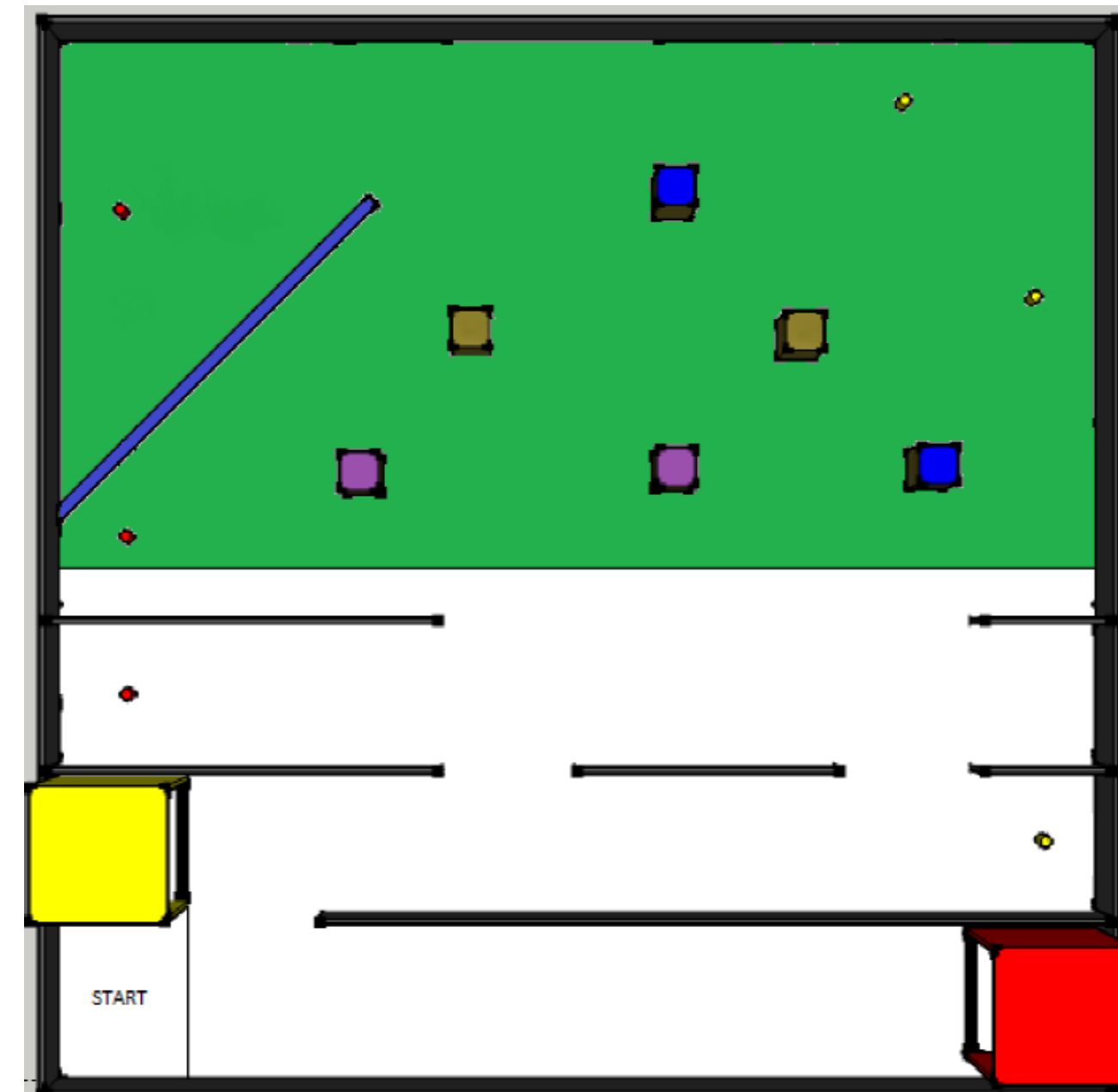
Team #19: IEEE Region 5 Robotics Competition

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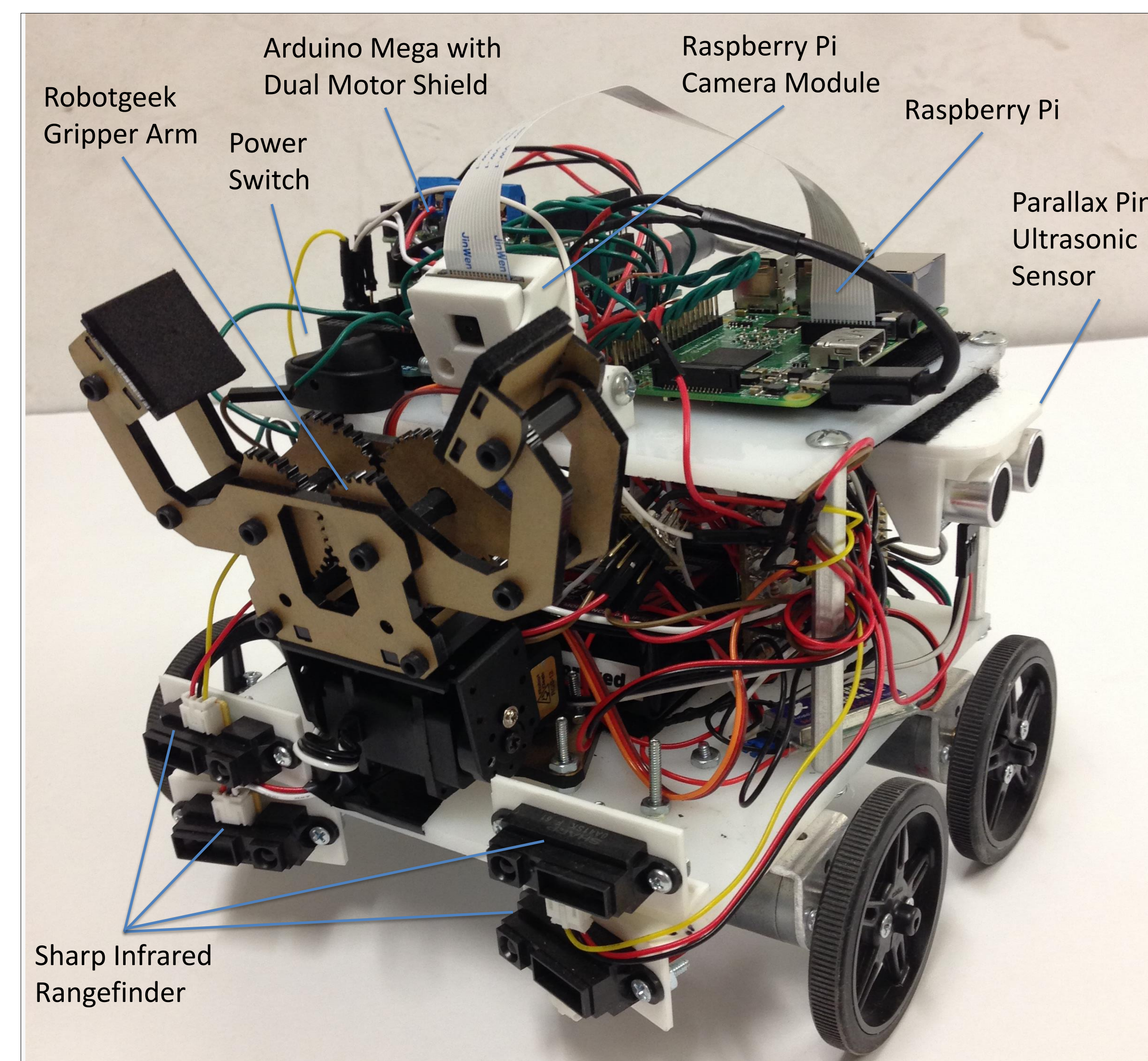
Background

- Search and rescue scenario
- 4 victims placed throughout course
- Robot must find and return to drop-off zones
- Extra points for returning to drop-off zone of correct color
- Fully autonomous



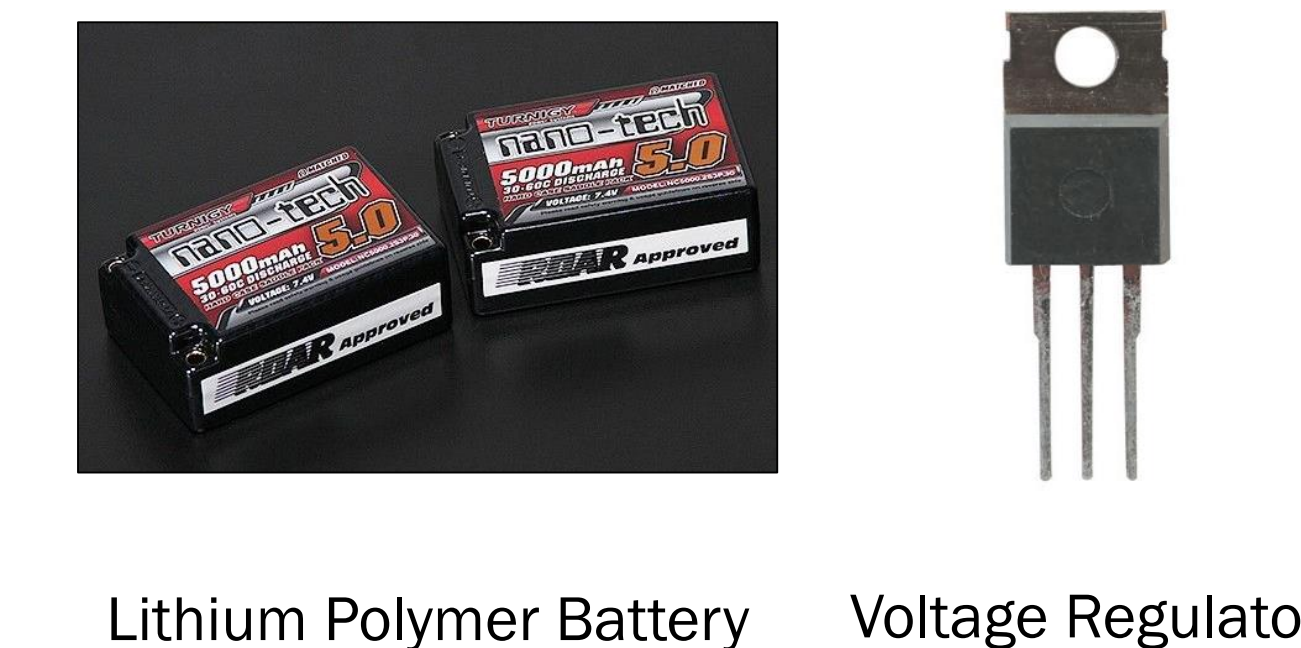
Prototype Design

- 4 drive wheel design
- Back-oriented grabber
- HDPE Frame
- 2 levels to hold sensors and electronic components



Power System

- 7.4 V 5 Ah Lithium Polymer Battery
- 5 V and 6 V Voltage Regulators



Testing

Subsystems

- Power
 - Sensors
 - Control
 - Motors
 - Gripper arm
- #### System
- Autonomous obstacle avoidance
 - Pathfinding algorithm
 - Full competition course

Engineering Specifications

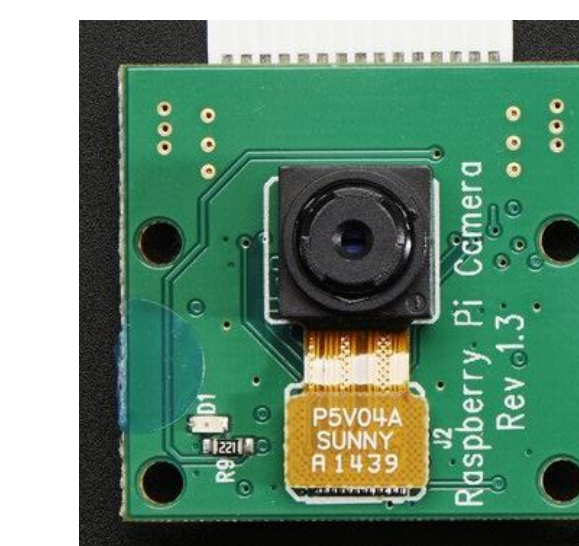
- Battery lifetime at least 18 minutes
- Maneuvers through 11" gaps
- Must fit in 1 ft³ starting area
- Be able to detect objects >= 2.5" away
- Accurately detect color of victims

Results

- Battery provides power for more than 29 mins
- Robot is < 8" wide and performs zero turns
- Robot is < 0.25 ft³
- Sensors detect objects up to 8'
- Accuracy >= 80%

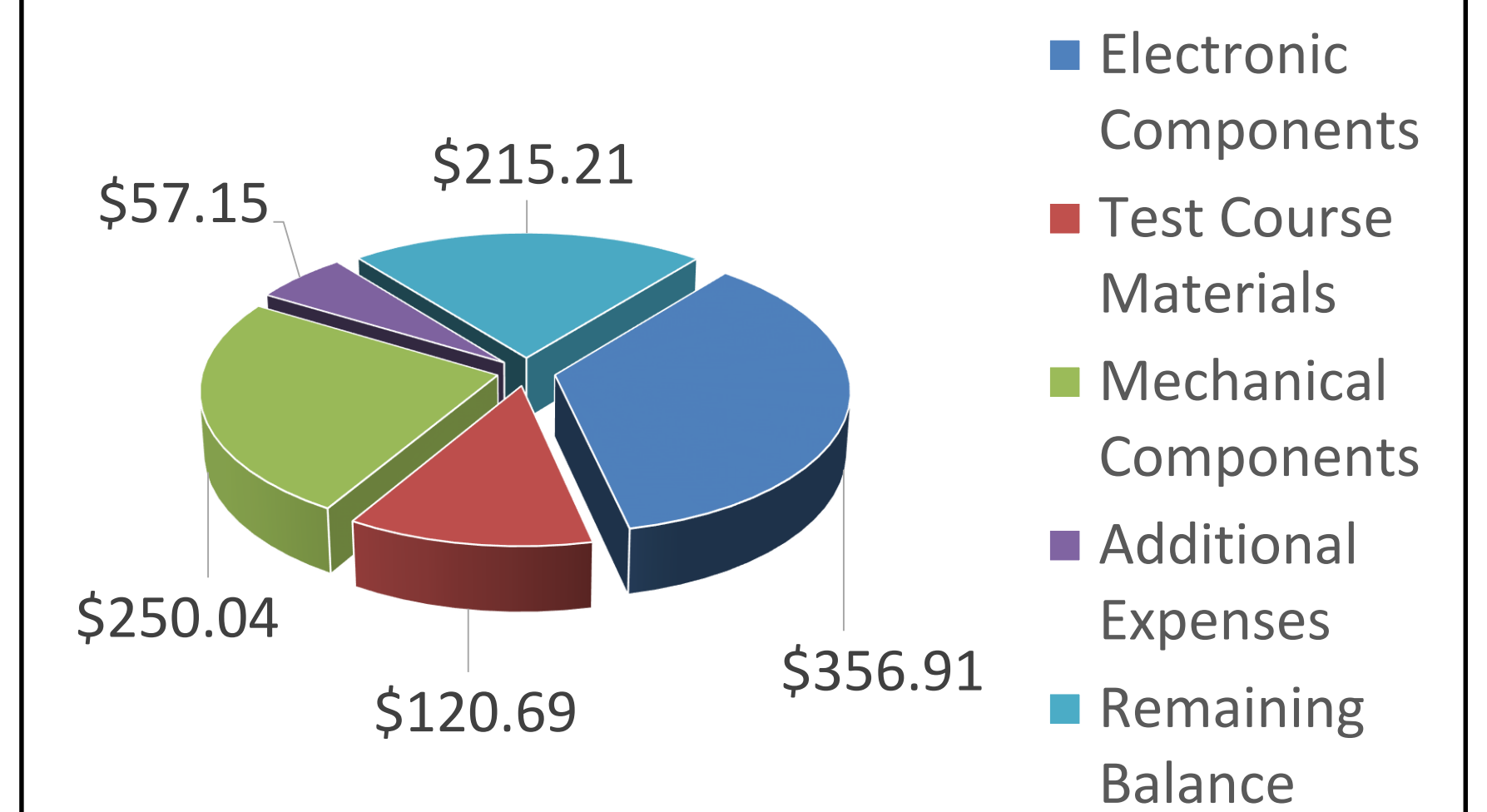
Color Recognition

- Digital Camera



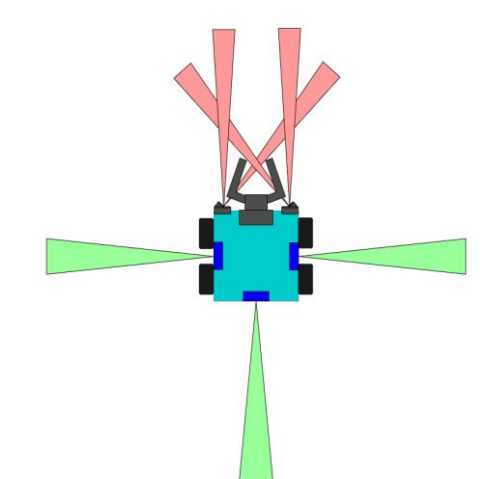
Raspberry Pi Camera Module

Budget



Object Detection

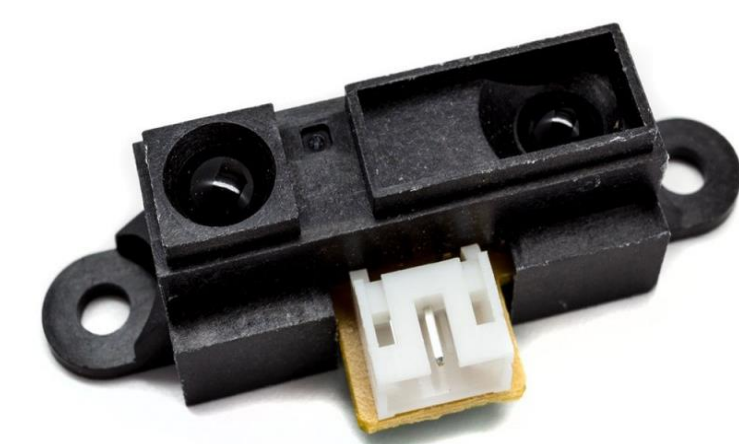
- Array of 3 ultrasonic sensors to detect walls and obstacles
- Array of 2 infrared sensors in cross pattern to detect and align with victims
- Array of 2 infrared sensors for wall and obstacle detection



Sensor Arrangement



Parallax Ping) Ultrasonic Sensor



Sharp Infrared Range Sensor

Control Hardware

- Raspberry Pi 2 B - behavioral flow control
- Arduino Mega - sensor reading and motor control



Raspberry Pi 2 B



Arduino Mega

Safety

- Emergency shutoff switch



SPST 12V DC Switch

Project Timeline

