To Predict ▶ To Design ▶ To Perform

College of
Engineering
LSU
**Department of
Mechanical & Industrial Engineering**
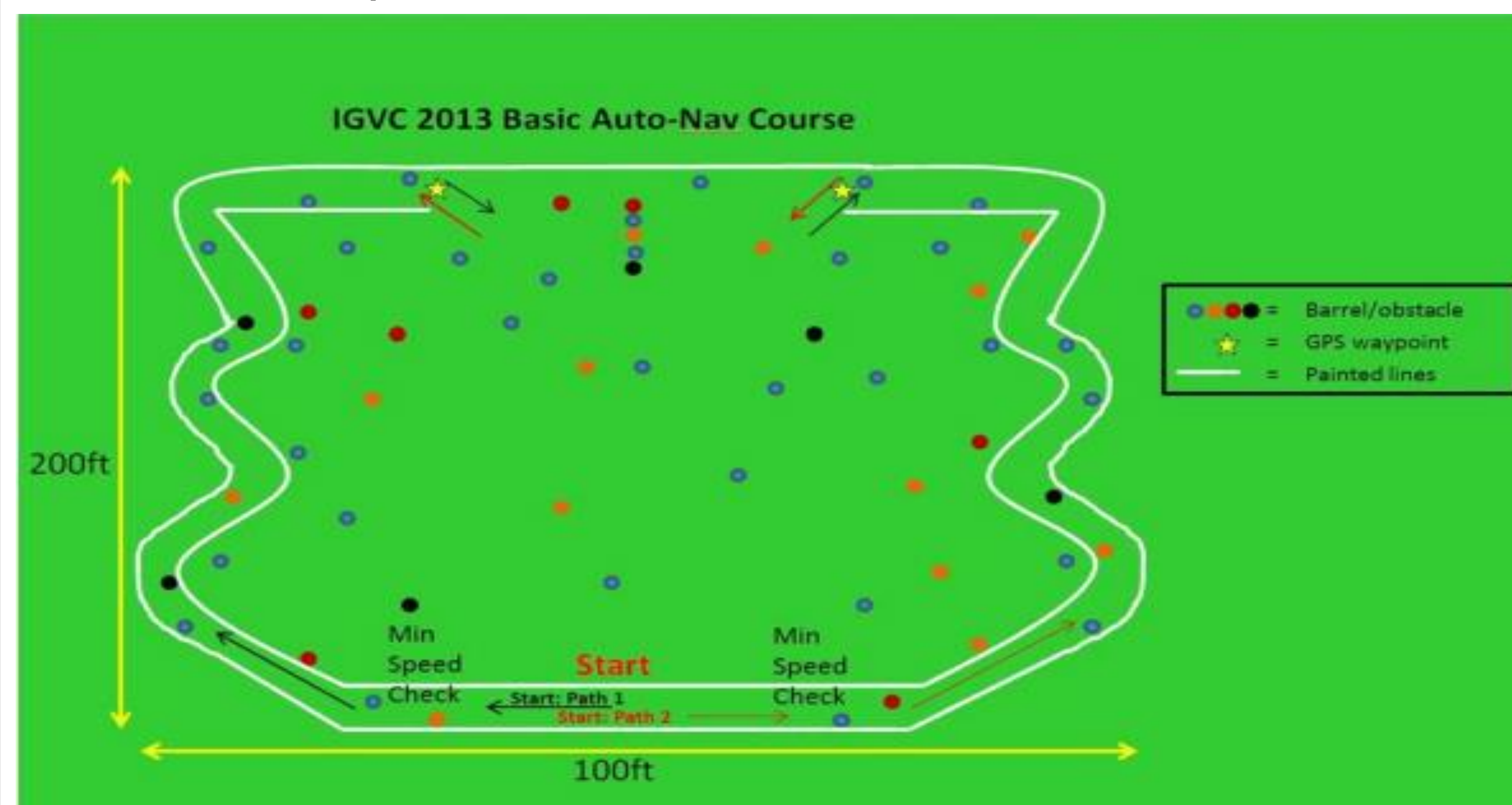
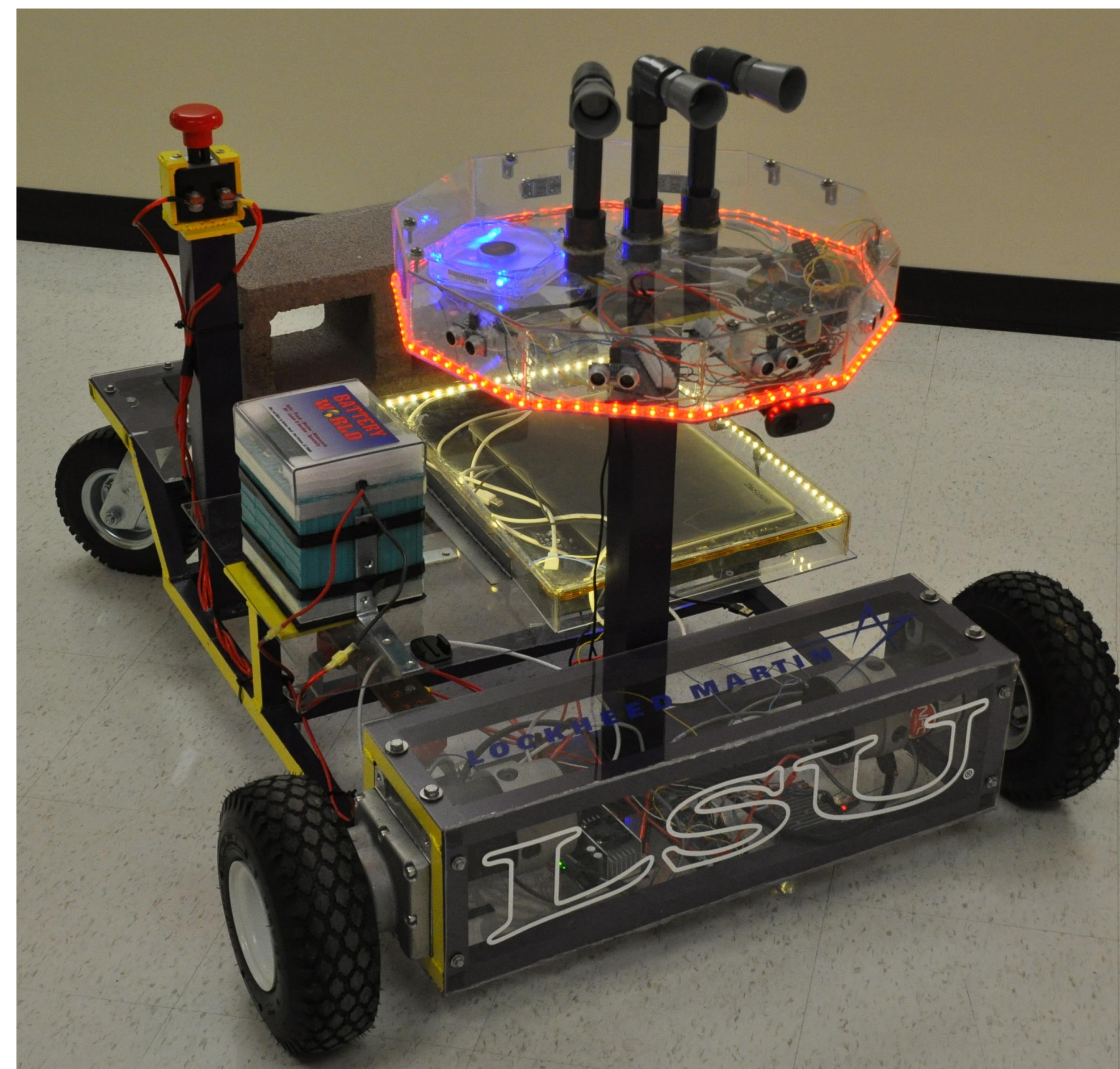**ME, ECE, BE Capstone Design Programs**

Team #5, Intelligent Ground Vehicle

**Angelo Adkins, Xavier Dillard, Zachary Harris, Jeremy Lopez,
Joshua Maciejewski, Joseph Pendleton, Vincenzo Tomassi**

LSU

LOCKHEED MARTIN

Background: The Intelligent Ground Vehicle Competition (IGVC) is held annually at Oakland University, where teams from universities around the world design an autonomous vehicle to compete in an outdoor obstacle course.
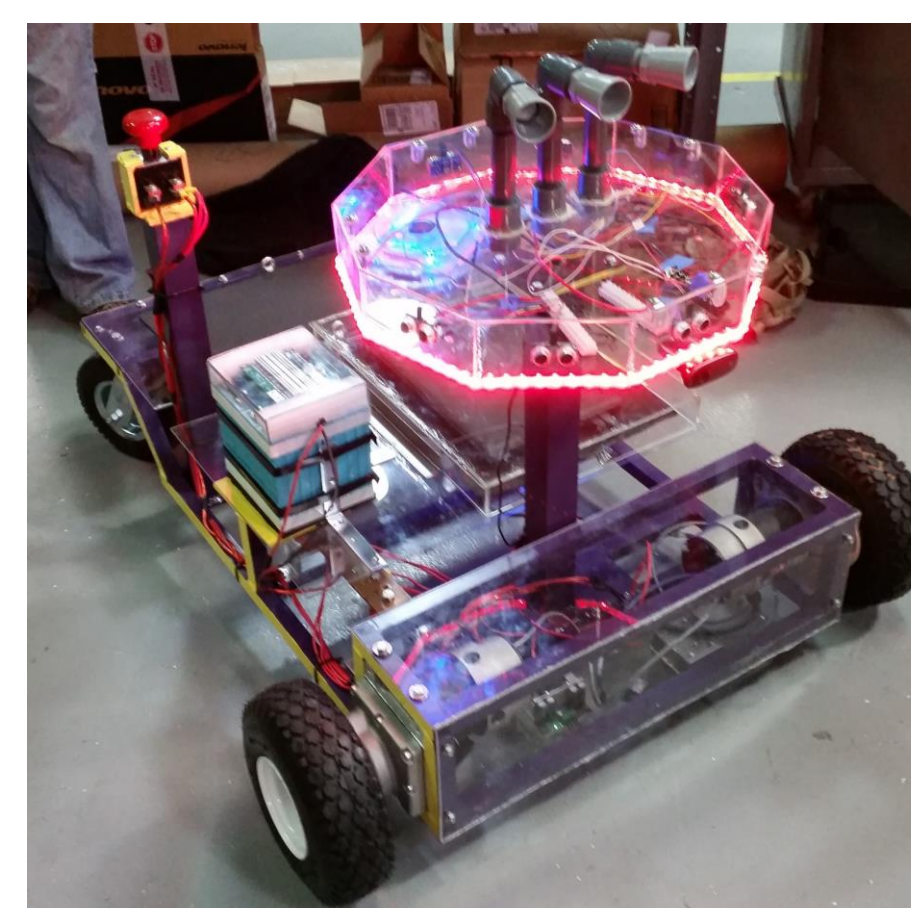

IGVC Basic Course

Team Objectives:
- Build a foundation for future IGVC Teams at LSU
- Complete the basic course
- Win rookie of the year award

Vehicle Objectives:
Autonomously perform the following:
- Detect and avoid obstacles
- Detect and stay within white lane lines
- Navigate to GPS waypoints
- Carry a 20 lbs payload

Safety

Emergency Stop:
- A mechanical and wireless e-stop are required

Signal Lights:
- Lights must be visible from all angles, solid while the vehicle is on, and blinking when in autonomous mode

Vehicle's Safety Lights

2015 LSU Intelligent Ground Vehicle: Cerberus

Sensors

Computer Vision:
- A USB Webcam is used to detect white lane lines
- Laptop is used to convert images to binary

Final Computer Vision Image in Binary

Ultrasound:
- Long and short range ultrasonic sensors detect physical objects

Ultrasonic sensor Platform

Odometry:
- An inertial measurement unit and motor encoders determine heading and speed of the vehicle

GPS:
- GPS is used to track the vehicle's location, relative to the target

Testing

Power Test:
- Objective: Ensure all electrical systems are working properly, and battery is able to power the vehicle
- Results: All electrical systems are functioning, and the motors are able to drive the vehicle, test successful

Safety Test:
- Test both mechanical and electrical e-stop, and safety lights
- Results: Both e-stops cut off electrical power, and safety lights function as designed

System Test:
- Objective: Combine all subsystems, and test the vehicle on a mock track
- Results: Vehicle was able to navigate to a waypoint, while avoiding obstacles, test Successful

Endurance Test:
- Objective: Run the vehicle under operating conditions for 25 minutes on a full battery charge
- Results: Battery lasted the full 25 minutes, test successful
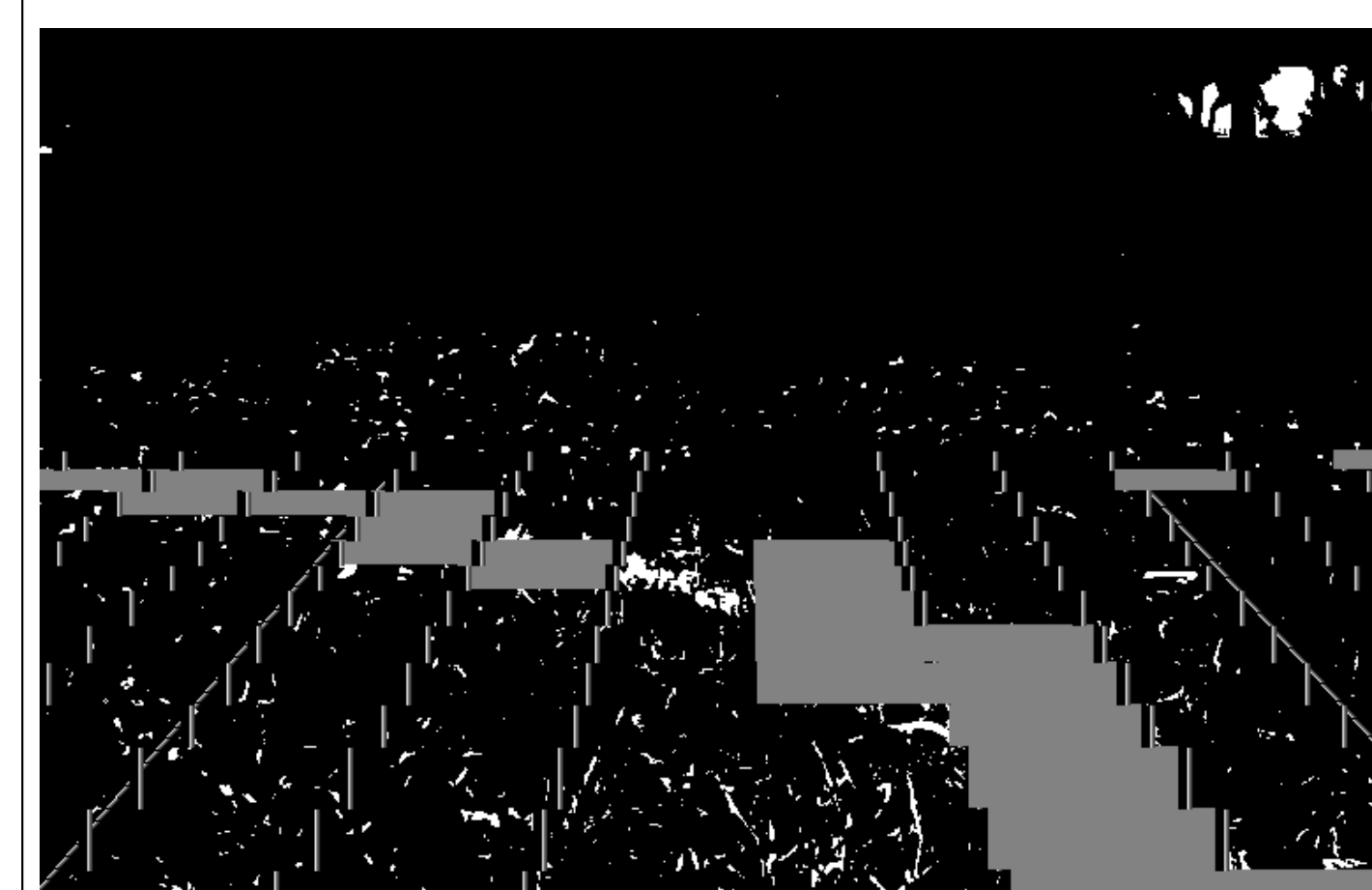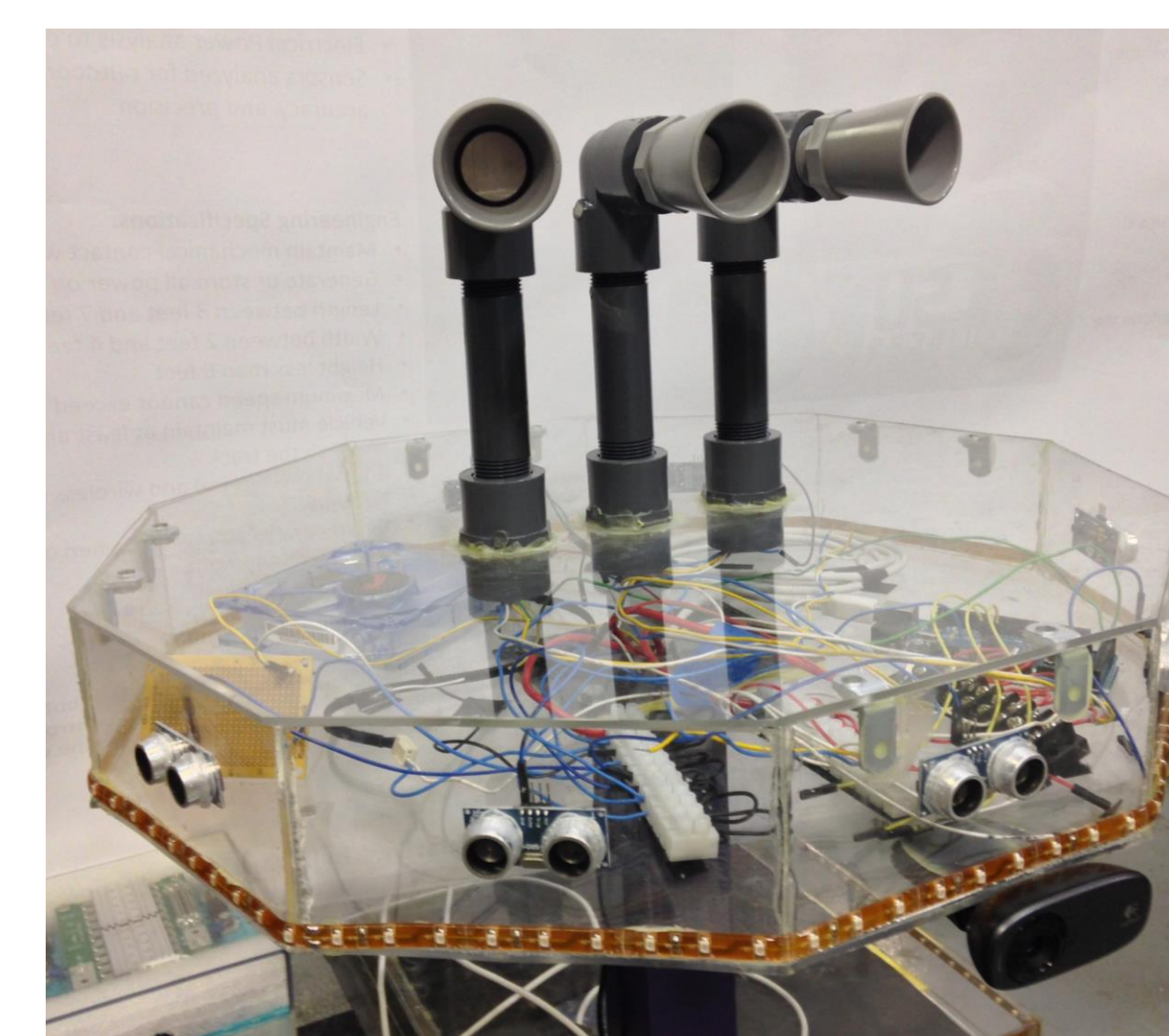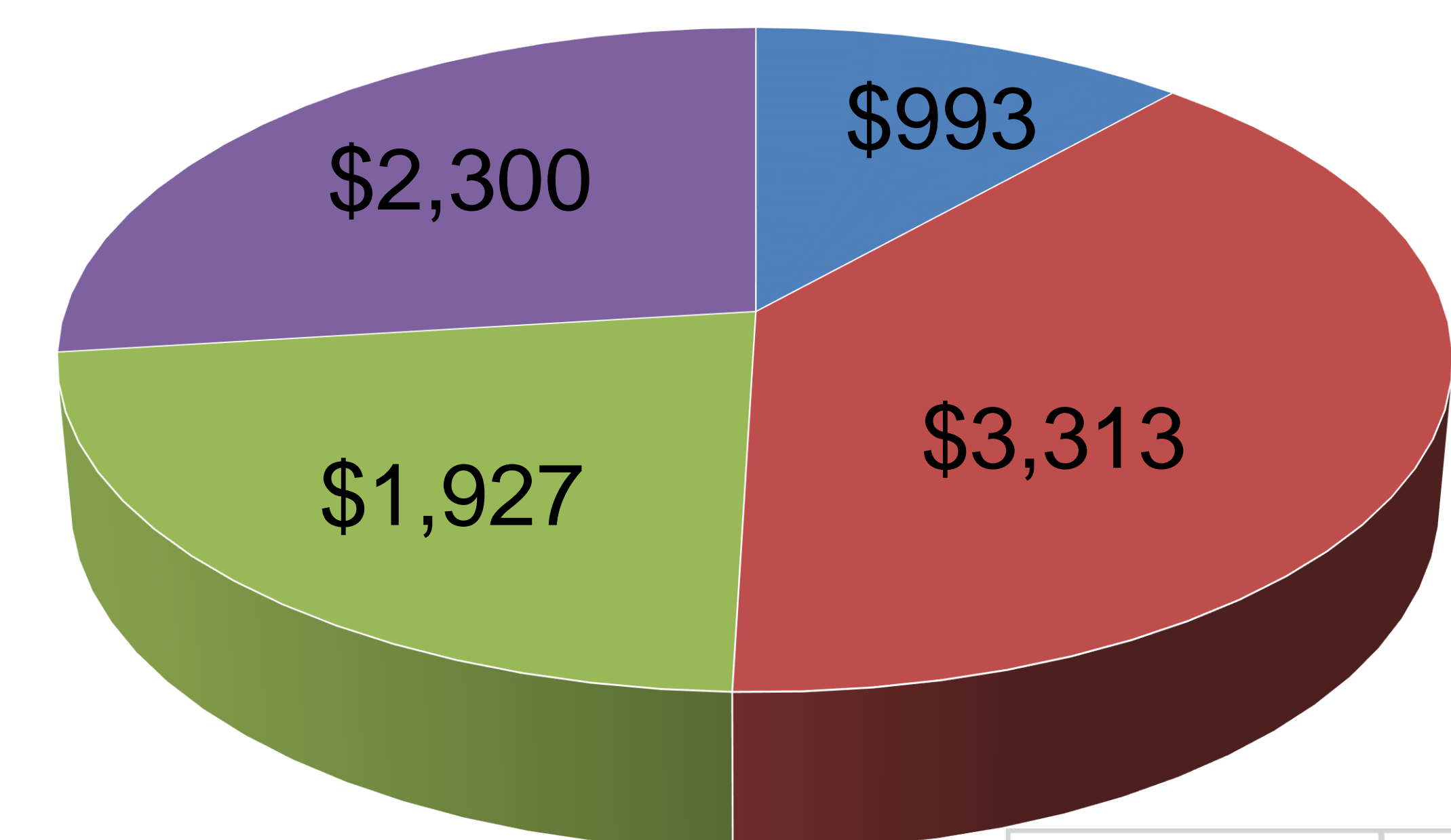

Testing Detection Software

Testing on a Mock Course

Budget

■ Mechanical	■ Electrical
■ Sensors	■ Travel (est)

Budget	$ 12,662.50
Expenses	$ 8,532.47
Remaining	$ 4,130.03

Sponsors: LSU, Lockheed Martin, Jack Rettig   **Advisors: Dr. Xin Li, Dr. Marcio de Queiroz, Clifford Gillio**