

Draper Laboratory

Developing an Autonomous John Deere Gator

NavCom GPS:

The NavCom GPS provides the vehicle with global position and heading information.

SICK LIDAR:

The SICK LIDARs use rotating lasers to determine the range of objects at ranges up to thirty meters.

Drive By Wire :

The vehicle uses motors and linear actuators to allow the computer to control the steering wheel, gas, and brake.



Honda Genset:

The genset provides 2000W of power, enough to supply all of the vehicle's electronics.

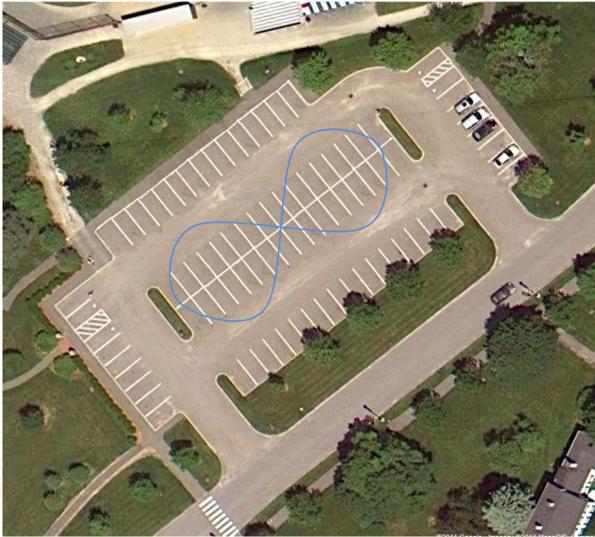
Electronics Box:

- 8 Core Server
- NI R-Series FPGA
- Motor Controllers

Wheel Encoder:

A quadrature encoder provides the vehicle with wheel odometry information.

The Missions:



Base Mission: Parking Lot Patrol

Required Vehicle Capabilities

- Navigate to GPS waypoints
- Repeat missions taught by a human driver
- Detect and avoid road barricades

Mission Outcome

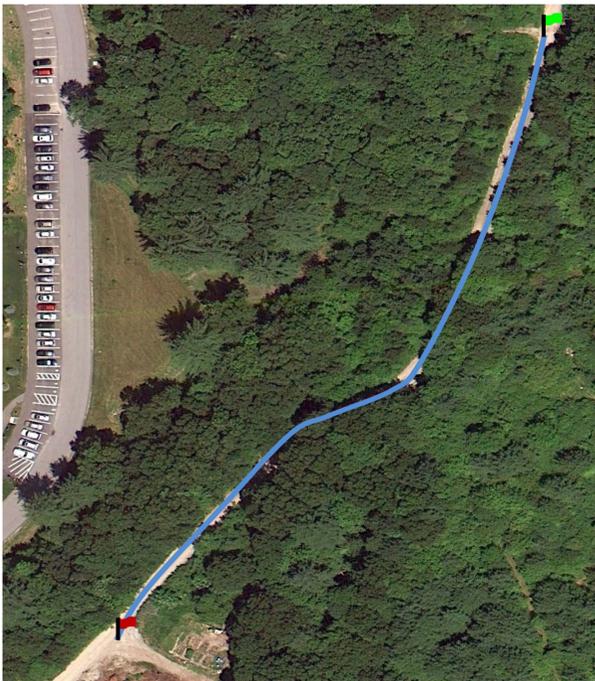
Vehicle repeated user-taught figure eights while avoiding various obstacle configurations.



This mission demonstrates the vehicle's ability to detect and avoid obstacles.



The vehicle commits navigate to one side of an obstacle.



First Option Mission: Wooded Road Resupply

Required Vehicle Capabilities

- Detect a drivable road in an environment with complex, organic obstacles.
- Detect obstacles despite data with noise resulting from complex obstacles & rough road terrain.

Mission Outcome

Vehicle navigated a quarter mile of wooded paths. During navigation, the vehicle successfully detected and avoided team members blocking the path.



This mission required the vehicle to navigate dirt roads with heavy vegetation.



The road had frequent pot holes that increased levels of sensor noise.



The robot had to find obstacles in a more complex, noisy environment.



Second Option Mission: Off Road Patrol

Required Vehicle Capabilities

- Evaluate complex drivability
- Detect sparse obstacles like shrubs & bushes

Mission Outcome

The vehicle was capable of patrolling the loop shown at left indefinitely without human intervention.



Off road navigation required the robot to deal with hills and rough terrain.



The robot had to detect sparse obstacles such as shrubs and bushes.