ECE 682 Preliminary Design

Alpha Squad Seven

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Overview of Topics

- Problem Introduction
- Control Theory
- Sensor Theory

Problem Statement

- Mini Version of the DARPA 2007 Urban challenge
- Smaller robots
- GPS emulated by camera
- No path planning, ie all points are mapped out beforehand
- Generic intersection drawn out on lab floor
- Robots have single Lidar, a pair of cameras and a set of ultrasonic sensors

Goal

- To have the robot follow a set path around a course
- To avoid obstacles that have been set on the course including “cars”, traffic signs (stop signs) and other conceivable object
- To win the “race” between us and the other teams robot

Schedule and Agenda

- Thus far team is familiarized with simulator and code. Meeting times: Mon, Weds 11:30, Tues 1:00
- Week 4: Complete design and plan for integration.
- Week 6: Testing with real robot.
- Week 9: Complete testing.
- Week 10: Demonstration and presentation.

Control Aspects

- The robot is controlled by a basic C++ program
- The C++ program contains all necessary data to steer to robot along set waypoints and around obstacles
- Programs are first simulated in Gazebo before actual testing on the Robot
- Program is run in Player to control actual robot

Sample Program

- How the program works

Sensors

- Lab Camera- emulates GPS coordinates using a basic x-y coordinate plane over the intersection drawn out on the lab floor
- Lidar(Light Detection and Ranging)- an optical remote sensing technology which measures properties of scattered light to find range and/or other information of a distant target
- Ultrasonics- a sonar system that sends out waves in a 360 degree radius and when an object is detected the sent out waves are bounced back and seen by the sensors
- Cameras- views the objects through a lens and displays it

Our Choice

- Lidar and virtual GPS via the lab camera
- Why Lidar?
  - Advantages over other sensors
- Why virtual GPS?
  - Only way of tracking robot around the course
- Integration into program
  - Use of proxies to call the sensor information

Summary

- Basic Problem
- Methods of Controlling
- Sensor Usage

References

- www.wikipedia.org
- http://playerstage.sourceforge.net/doc/Player-1.6.5/player-html/classes.php
- http://playerstage.sourceforge.net/doc/Gazebo-manual-0.7.0-html/worldfile_syntax.html

Questions???