PROJECT PLAN

An Intelligent Ground Vehicle

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FLORIDA INSTITUTE OF TECHNOLOGY
Florida Tech IGVC Team

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Goals

The goal of Florida Tech IGVC is simple: win the annual Intelligent Ground Vehicle Competition (IGVC) in Michigan.

IGVC is an autonomous robot competition with random courses including random obstacles, random paths, and random goals. The course is a quarter of a mile long and the robot must be entirely autonomous for the duration of the course.

Florida Tech IGVC (FIT) is collaborating with Florida State University IGVC (FSU) to produce this robot. FSU will design and produce the chassis and motors of the robot. FIT will produce the software, sensors, and testing of the robot. Both teams will split integrating the final product.

The long term goals of the project are broader. The goal of the project is to consistently compete at the annual Intelligent Ground Vehicle Competition in Michigan for the next five years. Additionally, the project must continue developing a relationship with FSU to hopefully create opportunities for new collaboration projects in the future. With those two goals in mind, the robot and software developed need to be extendable. Another goal of the project is to use advanced sensors and software to produce a state of the art vehicle and software development process.

To accomplish these goals the team must develop a robot and software capable of autonomous course appraisal and navigation including these core capabilities:

- Intelligent navigation and planning
- Image processing and computer vision
- Motor control and position estimation
- Accurate and repeatable course simulation
- Continuous Integration and automated testing
- Multi-language interaction
- Hardware and software integration
- Developing an extendable software framework

Key Software Features

The major goals concerning developing the robot correspond almost exactly to the key features of the software which we will develop.

These key features are:

- Object recognition based on depth and color data
- Position estimation based on inertial and gps calculations
- Intelligent navigation and planning
- An extendable software framework
- An adaptable modular software system

The first three features correspond to developing a representation of any given course. The remaining features focus on the long term goals of the project.

Technical Challenges

The major technical challenges associated with the robot focus on the difficulty of producing

- Accurate simulations of a course environment
- A map-building algorithm that builds and updates a course representation in real time
- Continuous Integration and automated testing software to demonstrate and prove software performance
- Parallelized modular systems for image processing, motor control, and navigation
- Image processing and obstacle detection in real time
- Integrating high level software with low level sensors

Summer Milestones

0.1 Create a Continuous Integration and Automated Testing Framework

Develop a software framework for automated unit testing and building of software. Framework will be based on Jenkins and Gradle supported by TestNG and Google Test.

0.2 Develop Prototype Robot

Robot will possess prototype AI functionality with basic obstacle detection and motor control software. Robot will be tested on rudimentary courses.

0.3 Develop a Testing Suite

Write a unit and functional testing framework which provides metrics for measuring the performance of the robot and enhancing the development of the robot.

0.4 Write Software and Hardware Requirements

Write a complete set of requirements delivered to FSU at the end of the summer. These requirements will include detailed hardware specifications and our desired software capabilities.

0.5 Create a Software Design Plan

Create a software plan with the major architectural features detailed. The goal for the summer is to have a complete software framework developed which can then be fully populated.