

# GPS Robot Navigation Bi-Weekly Report

2/07/04 - 2/21/04

Chris Foley  
Kris Horn  
Richard Neil Pittman  
Michael Willis

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### Goals for Two Week Period

For the first week, the team set out to complete their research and make the necessary purchase orders. The two major purchases to be made for this work period are the Garmin 15L GPS receiver, and the Traxxas Stampede RC electric truck. The team desired to have these components available as soon as possible to allow for greater progress in the overall project.

The second week, in the case that the ordered GPS and RC truck arrive by this time, were to have the RC truck moving at a controlled two feet per second and to survey possible navigation test sights for noise using the GPS receiver. In order to make collision avoidance and navigation simpler, the team has decided on a speed of approximately 2 feet per second. This is to allow the robot to detect obstacles in time to avoid them rather moving too fast to register the obstacle before colliding. One of the major obstacles in creating a functioning navigation system is finding a way to get reliable readings about the robot's current position. Interference from buildings and vegetation can create noise that will reduce the reliability of the GPS readings. At this point in the project the team seeks a test location that has a minimal amount of interference in order to prove the team's concept for the robot before attempting to correct for the noise in other environments.

## Accomplishments

Over the course of this work period the team has been able to accomplish most of its goals in addition to some additional progress. The team double checked its research of potential components to reassure themselves that the settled upon components were appropriate for the project. The team then completed the purchase orders for these components and turned them in by the end of the week.

The RC truck arrived the following Tuesday, February 17, 2004, and the team set out the day after to assess its capabilities and to plan how to go about reverse engineering the controls of the servos to control throttle and steering. After some experimentation with controlling servos via the OOPic, the team managed to determine what positions on the servo correspond to the lowest speed available on the truck, stop and neutral. Using this knowledge the team was able to write programs commanding the truck to go, coast, and stop.

During this period, the team also learned how to interface sonar devices with the OOPic in order to determine the distance to an obstacle. This is an important part of our collision avoidance capability. Since the throttle control and sonar were working, the team desired to take the next logical step and put them together. The OOPic, RC truck, and sonar were wired together and a new program was written. The program told the truck to move forward unless it detected an obstacle. If an obstacle was detected, the truck would stop and wait and then check again. If the obstacle is no longer there it will attempt to move forward again otherwise it will sit idle waiting for the obstacle to move.

## Problems Faced

At the time of this report, the team had received notification that the GPS had arrived but not in time for the team to pick it up and begin testing locations on campus for noise to decide on a future test site. The team plans to acquire the GPS as soon as possible the following week and begin these surveys of possible test sites.

A problem that has arisen is that lowest speed supported by the truck is very fast when running on the tile floors of the H.R. Bright building, but is quite slow when running on the grass outdoors. Since the final test of the robot truck will be outdoors on a grass surface the team feels this not something to be concerned with yet. Possible solutions to this problem may be to reduce the voltage given to the motor by the servo transmission system with additional resistance. However this might remove power necessary to move on grassy surfaces where friction is greater. The idea of an accelerator to help in speed regulation has been discussed.

## Future Goals

Since the GPS has arrived, the surveying of possible test sites for noise interference becomes a priority for the team. The team has already pre-selected several sites as potentially suitable for team's proof of concept. These possible sites include the polo fields, the golf course, and Research Park. These sites will be tested by the team using the GPS received that will later become part of the robot truck.

Now that the team has control of the RC truck's throttle and has some collision avoidance built in, the team desires to reverse engineer the cars steering, making it possible to then control the truck completely from the board. This milestone will mark the end of the reverse engineering aspect of this project.

Once complete control of the has been established, the team can devote time to adding sensors such as additional sonar and the compass and writing software to control the car. More attention can also be given to interfacing the GPS module that has arrived with the OOPic and writing the navigation software.