

# GPS Robot Navigation Bi-Weekly Report

4/11/04 - 4/25/04

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## Goals for Two Week Period

As the end of the project approaches, technical difficulties have cost the team in terms of time and productivity. The chief cause of this has been the unreliable nature of the Mark III control-board the team had adopted. After much work and stress, the team has opted to replace the control-board in favor of another using the same micro controller. To prevent problems previously faced with the Mark III, the team sought to research alternatives and order a new control board before the end of the project period.

Due to the problems mentioned with the Mark III, progress with the software and hardware development has been slowed. The team seeks to make up lost time by finishing the robot car control code in order to provide a demo for the professor as soon as possible. Following the completion of the control code, the team will convert the navigation code, written in MATLAB and simulation tested, for use on the robot car. The code has thus far shown very reliable in simulation and the team looks forward to testing it in the real world.

Finally, in order to complete the overall goal of an autonomous robot navigating itself along a path, the GPS module must be successfully interfaced with the control

board. The team must write code that reads the sentences broadcast by the GPS module and parse at the desired position data; latitude and longitude.

## Accomplishments

The team completed a short research study of alternative control boards available using the OOPIC. We found a board that uses a parallel interface for programming as opposed to a serial interface. This means that there is less circuitry on the control board. After purchasing the new board we were able to successfully program the OOPIC consistently.

Now that we had a properly functioning microcontroller, we were able to work on the problem of parsing the latitude and longitude data from the GPS. Using an array of bytes we were able to store the incoming data from the GPS. Since we were able to store the data, we then displayed the latitude and longitude onto the LCD.

This week we also attached the compass to the OOPIC. Using the LCD module we were able to see the output of the compass. Using a handheld compass we compared the readings from the electronic compass with that of the handheld compass. The readings were similar to each other.

Perhaps the biggest accomplishments during these last two weeks is the completion of the “Go North” demo. This is a demo in which the car will be placed on the ground facing an arbitrary direction. The car will then turn to face north and continue to travel north.

## Problems Faced

The main problem that we faced during this period has been the inability to program the OOPic on the MarkIII board. This set us back significantly since we were unable to test our throttle and compass code or test the GPS input to the OOPic. We resolved this problem by ordering a new board, the OOPic-S board, which we received halfway through this period. Since then, programming has been successful and we have been able to make progress.

A second problem we have faced is accurately reading in the GPS coordinates to the OOPic. We believe we have corrected this since we are now getting the expected results in the lab. However, because the GPS is only reading in zeros due to interference, our next step is to take the OOPic and GPS outside and verify the coordinate readings without interference.

The third, minor problem that we faced while translating the MATLAB code to C is the inability of the OOPic to support the arctan function. This function is critical to our navigation code for finding the angle of our destination from our current heading. After doing some research however, we found an approximation function for arctan that will be sufficient.

## Future Goals

The team plans to have all parts of the robot integrated and functional by the end of the next week so that we can spend our final week testing the robot outdoors and correcting problems that we find with actual performance. In order to finish integrating

our robot, we will have to program the C code onto the OOPic and verify that all of the components work together as expected. Individually, each component has been successfully tested. Combining them all together with the navigation algorithm is our next and final challenge.