GPS Robot Navigation Bi-Weekly Report
3/14/04 - 3/27/04

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GPS Robot Navigation Bi-Weekly Report

3/7/04 - 3/27/04

Goals for Two Week Period

The team sought to make as much progress the week before and after spring break as possible. After settling on a final design after the Critical Design Review the team was further galvanized with the projects new sense of direction.

Over this period of the project, the team sought to solve the speed control problem and implement it into software to allow the robot car to intelligently modify its throttle in order to maintain a slow consistent speed. Another goal for the team was to troubleshoot the GPS module and survey test sights for the robot car. Then integrate speed control algorithms with existing code to arrive at an up to date code for this stage of the project. Finally, begin working with system layouts to add the various necessary components in a logical and clean fashion while providing power and IO.

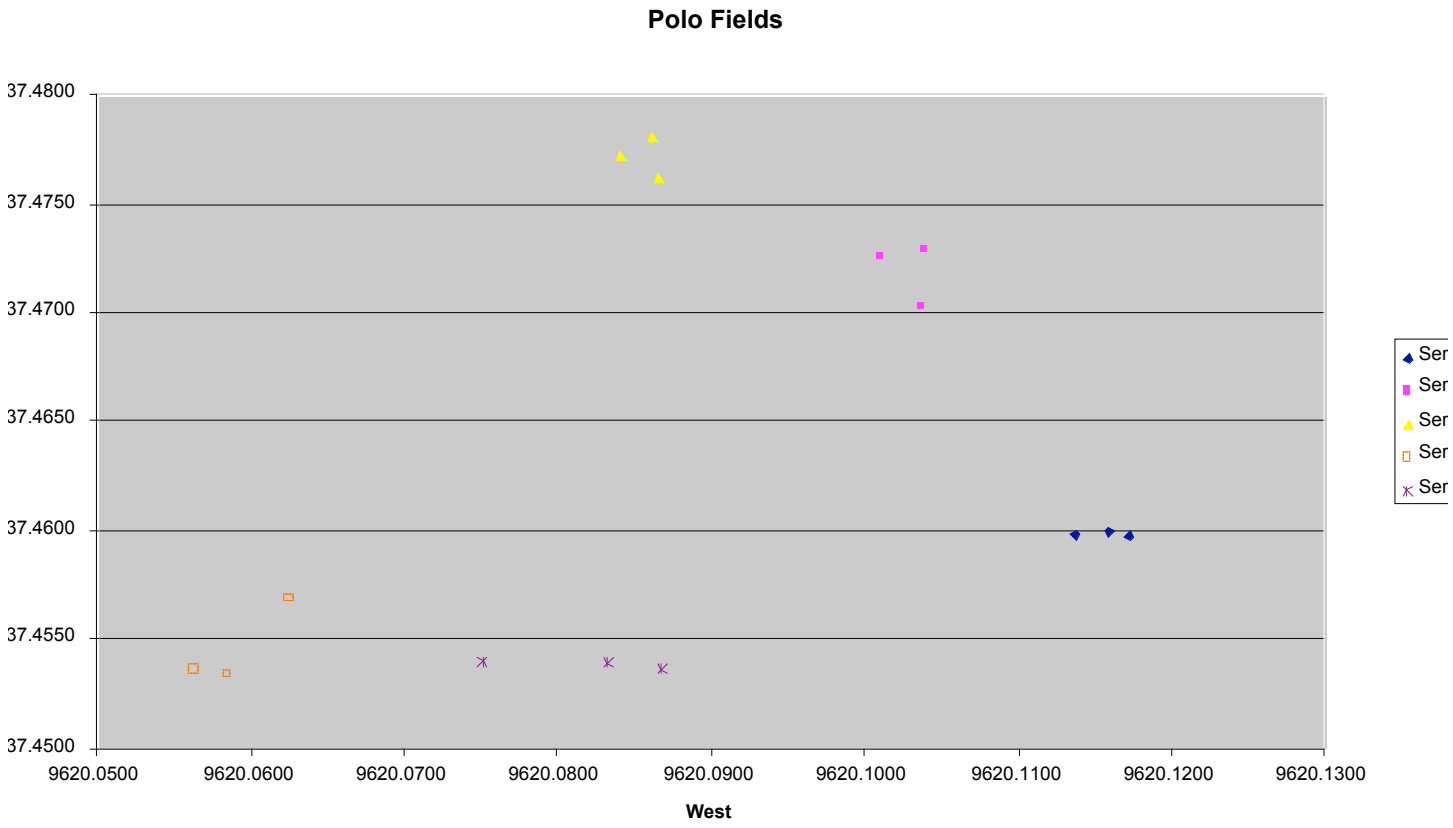
Accomplishments

After much effort and work, the team has decided to abandon the throttle controlling servo as the means of controlling the speed of the car. The servo simply did not provide the degree of control necessary to accomplish our needs even if it did

simplify hardware concerns. The team is now making progress with a pulse width modulation scheme with an H-bridge. The part has been ordered and arrived at the end of this project period. Experiments with another DC motor and H-bridge have revealed this to be workable and will soon be implemented.

The GPS module has arrived and has been successfully interfaced with a laptop computer over its serial port. The team has completed some test readings that have revealed the GPS module to be fairly consistent. By the end of the project period the team has completed partial surveys of potential test sights including the polo fields and the parking lot next to the architecture building. Below is the data from the polo fields.

ion	North	West		Avg North	Avg West		Deviation North	Max North	Deviation West	Ma
	3037.4599	9620.1137					0.0000		0.0019	
	3037.4600	9620.1158		3037.4599	9620.1156		0.0001	0.0001	0.0002	
	3037.4598	9620.1172					0.0001		0.0016	
	3037.4726	9620.1011					0.0007		0.0018	
	3037.4729	9620.1040		3037.4719	9620.1029		0.0010	0.0016	0.0011	
	3037.4703	9620.1037					0.0016		0.0008	
	3037.4782	9620.0861					0.0010		0.0006	
	3037.4773	9620.0840		3037.4772	9620.0855		0.0001	0.0010	0.0015	
	3037.4762	9620.0865					0.0010		0.0010	
	3037.4534	9620.0585					0.0012		0.0006	
	3037.4536	9620.0563		3037.4546	9620.0591		0.0010	0.0023	0.0028	
	3037.4569	9620.0625					0.0023		0.0034	
	3037.4536	9620.0868					0.0002		0.0051	
	3037.4539	9620.0833		3037.4538	9620.0817		0.0001	0.0002	0.0016	
	3037.4540	9620.0751					0.0002		0.0066	



Until the speed control hardware is complete it is difficult to write software to interface with it. However the team has developed a control scheme that when the hardware available we can test it and having functioning very quickly. In order to monitor speed the position of the drive shaft will be check over fixed time intervals by the optical encoder using a clock signal at a frequency set to this time interval linked to a interrupt. When the interrupt is activated the position of the drive shaft is checked and compared to the previously checked position. If the difference exceeds the value associated with the desired speed, throttle will be reduced. If it is less, throttles will be

increased. The team currently has the interval set to 1/10 of a second but this is not necessarily final.

The team has had limited success in working on the system layout of the components. This was given a much lower priority than the other goals because other goals contributed more to the functionality of the project. However, the team has acquired some raw materials to construct frames to hold and secure components including a tray to hold two large batteries to supply the voltage needed by the H-bridge we will be installing. The team has begun the final design of a power distribution scheme using a maximum of 3 batteries to power the car and the electronics. The DC motor and H-bridge will require both of our 7 volt batteries because the H-bridge has a minimum voltage of 12 V and to prevent power spikes from the DC motor harming our electronics it has been proposed to run them on a separate 9 V battery.

The team has also seen success interfacing with the compass module that will provide additional sensory data to help navigate the robot car. Using code from the internet the team has verified that we can discern north using the compass and that we can also get a bearing relative to north. This will be a helpful contribution to the development of our navigation and collision avoidance algorithms. The team has established what settings of the steering servo will orient the front wheels to be centered and turn to the left and right. The team as also determined the limits of the steering servo ability to turn the wheels right or left.

Problems Faced

The team suffered a minor set back in the final decision to abandon the throttle servo control but because the interface of the H-bridge has well documented sources team will be able to recover ground quickly. The team has experienced some small setbacks when interfacing the GPS module and a lap top including difficulty getting readings while testing it inside the lab and difficulty acquiring a laptop that had a serial port. However much of this has been overcome and progress is being made. Having the work period broken up over spring break had its own issues. Each of the team members were gone during the holidays so little was accomplished this week. There was a short adjustment getting back up to speed with where the team was in the project and getting back on track.

Future Goals

With the initial design and experimentation work complete the speed control will soon be finally considered solved. Soon after the speed control hardware is complete to control will follow very quickly and the team will have completed the integration of the sonar sensors code with that of the speed control. When the interfaces of the sensors with the controls of the car have been completed final construction of the system layout, power distribution, and IO can be completed.

Now that the reliability and interface of the GPS has been proven using the laptop computer work can now begin with integrating the GPS in to the systems of the car by interfacing it with OOPic and writing software to extract from the GPS module about the

robot cars current coordinates for the navigation system. Work will also continue in the development of our navigation and collision avoidance algorithms. They are currently being verified and fine tuned using simulations in Mat lab. Once the navigation system is fully constructed and installed, these algorithms can be tested in the field.