Omni-Directional Vision System for Mobile Robots

Biweekly Report

Presented to Professor Ricardo Gutierrez-Osuna
on
March 26, 2003

by
The A Team

Denise Fancher – Kyle Hoelscher – Michael Layton – Eric Miller

Much has been accomplished since the CDR. We have made significant progress in both hardware and software over the last week. We have completed the mounting structure of our mirror and sonar attachments. We have begun software implementation and testing for obstacle avoidance and Object tracking. The most notable set backs have been in creating an image dump.

Creating a Mounting Structure

We initially had several designs in mind for mounting our optics. Long ago we opted on using a mirrored light bulb as our optics rather than a high cost parabolic mirror. This light bulb was at the center of our designs.

The first design was a failure. It consisted of a single L-bracket attached from the back to support the light bulb. Unfortunately we could not find a sturdy enough material to support it. The metal strapping, even doubled up, created too much movement in the light bulb. We fear that this would cause problems in the image tracking, as well as giving our robot an unprofessional appearance.

The design we finally implemented consists of a long piece of acrylic sheeting, formed into an U-shape, and attached at both the front and the back. This provides an extremely rigid, and exceptionally sturdy structure to attach the mirrored light bulb to. The open end of the "U" is the part that is actually attached to the BOE-bot. This provides a nice flat area at the top, which we drilled a hole through to mount the light bulb. At this point in time there is a long slit at the top. This allows us to move the mirror, and determine optimal placement. In our final design, the

mounting socket for the light bulb will be securely fastened in place. The acrylic sheet is near perfectly clear, thus should not be a concern with interfering with the image consistency. Only after testing the object tracking will we know for sure that it will work. The entire team is very confident in this design.

We also attached the sonar unit to this acrylic sheet framework. The sonar is mounted on the front of the robot, facing forward. There were two holes in opposite corners of the circuit board the sonar is attached to. We used these holes and two that we drilled into the acrylic sheet, to attach it directly to the U-shaped frame on the robot. Initially, the sonar unit wasn't working. After we soldered the wires in place, however, it worked perfectly since we avoid any power lapses. We performed some basic testing to find out how the distances calculated by the software compared to actual distances. The method we used to determine this was simple. We recorded the values outputted by the software from placing a statistics textbook directly in front of the sonar at distances of 1 – 12 inches at1 inch intervals. There was a slight discrepancy in the distances that we will take into account in our final design.

We also have attached and tested the infrared emitter/detector system. We decided to use this method, rather than the whiskers to detect objects on either side of the BOE-bot. The whiskers were awkward, clumsily, and difficult to attach in a manner to yield definite side collisions. Several other groups also warned us they experienced trouble with the whiskers.

Software Progress

Software development is progressing along nicely. We have created several skeleton programs for testing the individual components in our design. We also have created simple programs to allow our robot to move around and avoid obstacles. The largest problem we have encountered is creating an image dump of what the camera is actually seeing. Creating an image was not part of our original problem statement. It would, however, be very helpful in aligning our camera.

Conclusion

According to our Gantt chart (see below), we are on schedule in some regards, and behind schedule in others. We have completed everything that we scheduled except for testing the basic tracking software provided with the camera. We have however already completed the task of attaching our optics and began developing code for object tracking and obstacle avoidance. Over all, we are on track and confident in achieving our delivery date.