Omni-Directional Vision System for Mobile Robots

Biweekly Report

Presented to Professor Ricardo Gutierrez-Osuna
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by
The A Team

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Although we do not have a BOE-Bot in our possession, the A Team has not been idle in the time since we submitted our project proposal. We have searched for the best sources for an omni-directional mirror and low-cost batteries; submitted our purchase requests for the BOE-Bot, CMUcam and accessories; and began learning BASIC so that we can begin programming the stamp as soon as the BOE-Bot arrives.

Learning PBASIC

The majority of our time spent on the project during the previous two weeks has been reviewing and understanding the PBASIC programming language. The PBASIC software will be implemented to control our BOE-Bot. Once written and tested, it will be loaded into the BASIC stamp. The PBASIC program will tie in the CMU commands. These commands will be used to retrieve and send data to the camera through the specified ports. The data from the camera will be used to manipulate the BOE-Bot to track and pursue the object. Sample code is offered in the Seattle Robotics CMU Vision System for BOE-Bot user's manual. The sample software provides code for testing the BOE-Bot and touches on tracking objects. We conclude that the code will be useful for our purpose of tracking and pursuing any particular brightly colored object.

We also used the internet to review other PBASIC source code. The PBASIC stamp we ordered will contain the software for the PBASIC text editor, which will give us a good text editor and allow us to load the software into the stamp through a serial port. We located and downloaded a PBASIC text editor so we can begin experimenting with the language before the actual BASIC stamp hardware and software arrives.

One web site we have been using is:

http://www.parallax.com/Downloads/Software/BASIC Stamp 2 Tutorial from SIU.ppt

This website appears to be very helpful and includes step-by-step instructions on using the PBASIC text editor for implementing and debugging our software.

Omni-directional Mirror Options

The past two weeks have also been spent finding a new source for the parabolic mirror that was not settled upon during our original project proposal. Given the high cost of the precision mirror and time to deliver such a mirror, there was a group decision made along with the professor that we would have to settle for less than precision optics. Our original agreement was to locate and use a silver Christmas ball ornament, however this posed a problem as Christmas ornaments cannot be readily found in February. Thus all team members went searching for items that could be used in place to achieve the 360-degree field of view that is desired.

In the search, a conical lens that could be coated with a reflective material was found from Edmund Industrial Optics for a purchase price of $175.50. According to specifications from the manufacturer, this lens could accomplish the task, however, its field of view was limited to the total height of the mirror itself. In other words, the camera would only see as high as the mirror was placed because only rays parallel to the surface of the camera would be reflected into the lens. Thus a new option had to be found.

The optics found that will be utilized in the project were located at Lowe's Home Improvement. We will achieve a slightly higher altitude of the field of view in comparison to the conical mirror

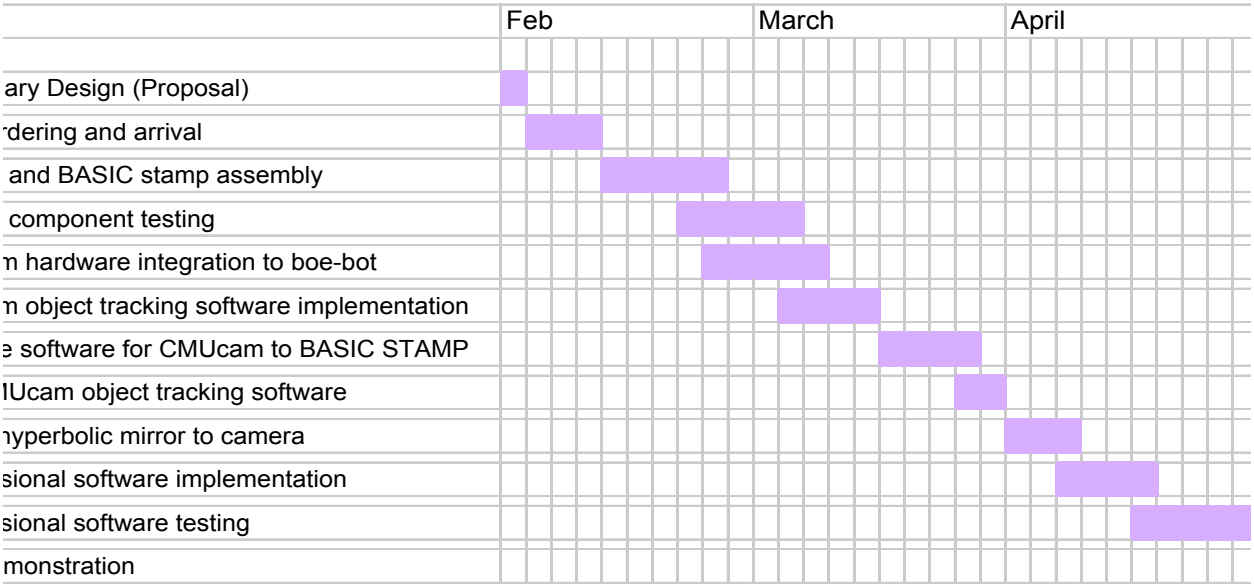
because we will be using a light bulb with a mirrored reflection on a hemi-spherical surface. The distortions in the images gained from the mirror will be noticeable but hopefully will not be beyond the scope of our camera system to detect and track color objects. However, by using this type of optics rather than the precision mirror, our horizon on the viewable surface will be much shorter and thus objects could potentially escape the tracking by moving too quickly for the robot to track. However, with efficient programming we should be able to minimize this risk and deliver an omni-directional vision system so that in the future, higher priced optics can be purchased.

Battery Sources

Initially we discussed using a 6 V rechargeable battery for our power source. However, just recently we discovered that there is 1.5 Volt rechargeable batteries available. We decided to use the 1.5 Volt rechargeable batteries as a power source for our Robot. The BOE-Bot will come with a pack designed for four AA batteries. It will be much easier to use these 1.5 Volt batteries rather than 1 6 Volt battery because the 6 Volt battery would require us to build a separate battery pack. The cost is basically the same and relatively inexpensive for both battery options.

Conclusion

According to our Gantt chart, we are on schedule. We scheduled the first half of the month of February for parts ordering and shipping. We are expecting the parts to arrive some time this week (February 17 - 21). Once the parts arrive, we will begin assembly and testing of the basic components. If the parts arrive later than Friday, February 21, it will push us behind schedule. It is critical that the parts arrive, so that we are not forced to rush assembly or fail to meet future deadlines.



The A Team has stayed on schedule and well within budget. Our mirror choice has significantly improved our financial status. Our review of the PBASIC software has supplied us with a good background of the programming language. We believe that we are well prepared and ready for the hardware to arrive.