Math 210—Project 2
Navigation in a peculiar world...

by Gavin LaRose (glarose@NebrWesleyan.edu), Nebraska Wesleyan University, January 1999

Satellite Allocation Division

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1 March 1999

Linear Mathematics, Inc.
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Dear LMI:

As you are undoubtedly aware, in the past year momentous events were seen in the field of extraterrestrial exploration, with (among other things) an unmanned rover being dispatched to Mars to obtain a wealth of data. It is our distinct pleasure to be in the process of developing a similar roving vehicle for use on planets or asteroids even farther from Earth, and it is in the development of the visualization portion of the navigation system for this vehicle (tentatively christened "Sam") that we seek your input.

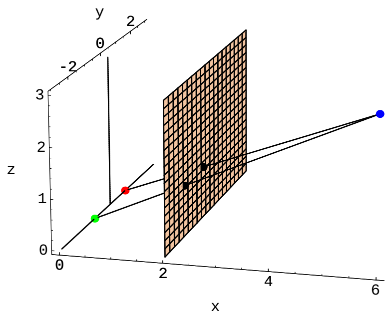

Figure: cameras and vision lines intersecting "screen."

The model for this vision system is shown in the figure to the right. This shows two cameras (the light-colored dots to the lower left of the figure) and an object being viewed (the darker dot to the upper right of the figure). Each of the cameras (Sam's "eyes") therefore "sees" the object as a projection on a virtual screen (the camera lenses, if you like), as shown in the figure by the dark dots where the line-of-sight of the cameras to the object intersect the virtual screen (the plane shown).

From the two two-dimensional projections (which are points (y, z) in the plane of the virtual screen shown) that Sam "sees," we need to be able to determine the actual location of the object (which will be a three-dimensional location, (x, y, z)). Our engineering division produced a tentative method for calculating this location, but we found on examination that the location it predicted was plagued with errors which may be due to measurement error in the screen-projections for either camera. We are therefore contacting you to obtain a more robust method of doing this. As it is possible to scale lengths on arbitrary scales, you may wish to consider the cameras as being located at $(0, \pm 1, 0)$ and the virtual screen at $x = 2$.

As is our custom, we have established contact in the local scientific community to act as a liasion between your company and our own division, this being the formidable Dr. maybe-the-P.-stands-for-prominent Gavin LaRose. Your written report on this matter should be submitted by the 19th of March. If you should find that you have questions regarding this project, Dr. LaRose has indicated that he would be quite happy to provide whatever assistance he is able to give. We regret, however, that owing to other responsibilities he will be unavailable to assist on this project any later than the 17th of March.

We look forward to receiving your report.

Yours sincerely,

Dr. Vern R. Von Brawn
Head Scientist, SAD

vrvb:glr