Projection Geometry of the VVVV Software

GIS Internship Final Report

Amy Schardijn

California State University, San Bernardino

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Advised by Dr. Belisario Ventura
Mathematics Department California State University, San Bernardino
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Table of Contents

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Executive Summary

The project aimed to study the projection geometry of the vvvv software currently used for projecting text onto three-dimensional representations of surfaces. The text gets deformed when projected onto uneven surfaces, making it difficult to read. By examining the geometry of the surface and the projection software, we aimed to introduce a mathematical correction which, when encoded in the software, will take away the projected text deformation introduced by the uneven surface.

We are currently using a projection technique that is in the process of getting implemented into the software. Once that implementation is concluded, we will evaluate the results and see which further adjustments are needed.

The choice of tangent planes depended on the software description of the map. We settled on using the GIS description, which approximates the surface using triangular faces and provides normal vectors for each triangular face.

Project Objectives

The project aimed to study the projection geometry of the vvvv software currently used for projecting text onto three-dimensional representations of surfaces in order to determine a solution for the deformation of the text that occurs when it is projected onto uneven surfaces (see Figure 1).

The project used orthogonal projections to correct the deformities induced in the projected text by the unevenness of the three-dimensional map, onto which it was being projected. Orthogonal projection is a topic I started studying in multivariable calculus and linear algebra and that I continue to study in the advanced linear algebra and independent study courses that I have been taking concurrently with the project. I have always been interested in analysis, where the understanding of the orthogonal projection plays a central role. The current project has provided me with a fairly thorough application of these ideas. I have been able to examine the concepts of orthogonal projections from different points of view and in turn, my understanding of the subject has increased considerably.

Project Approach

For this project, we needed to determine a solution for the issue of the deformities in the projected text. We changed the linear dimensions of the letters in the text that was to be projected in order to adjust the unwanted changes on the text brought by the unevenness of the map. We stayed within the techniques of projecting onto the tangent planes with the variant of introducing more tangent planes if the situation demanded it.

Project Outcomes

At this point of the project, the approach taken to solve the problem works for surfaces that have a limited number of irregularities. We are currently testing on surfaces with an increased amount of irregularities to determine the necessary adjustments that are needed.

At the time of this report, the project is still in progress. So far, the tests done with the suggested changes to the software have worked well, but we are still waiting on the results of further tests for the more complicated projections. Should these tests prove to be unsuccessful, we will have to work on further corrections that will depend on the results of the tests.

Conclusions

Our approach proved successful for those pieces of the surface with limited deformations per square unit. We are currently expecting the results of tests on those parts of the surface with a higher density of deformations. The results of those tests will determine if further improvements to the current method are necessary or if we need to use a different technique for the sections of the map with a higher density of deformations.

Appendix

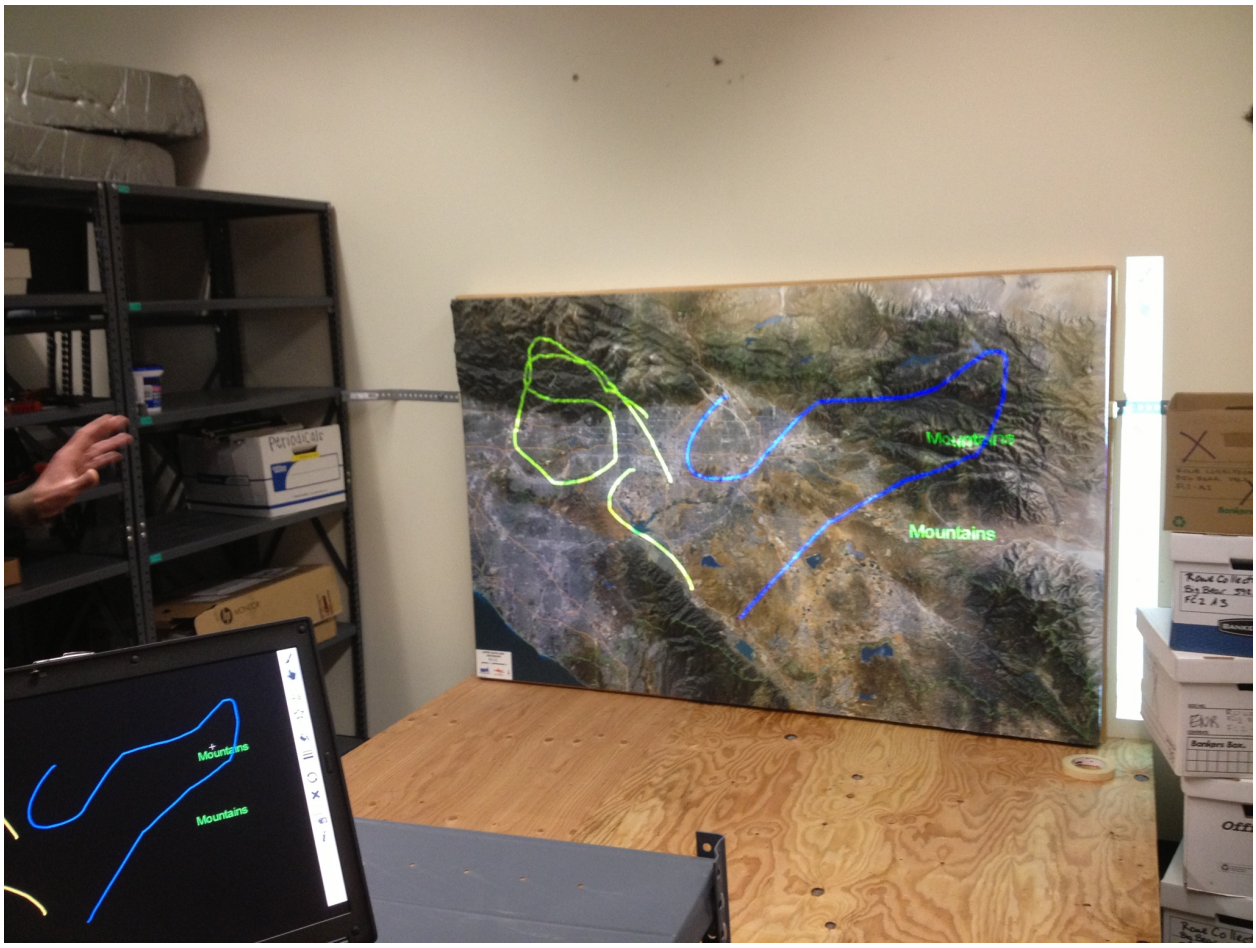

Figure 1. Three-dimensional map with projected text and images.