Company Background

Walker Water is a technology services company founded in 2021 by John Walker, and built upon his strong passion for conservation, and a budding knowledge of how the complex irrigation system in the Surface Creek Valley of Western Colorado works. The development of our technologies is based upon what we learned as irrigators and water users ourselves within this valley.

We are a software development and irrigation system consultation services company whose charge is to build administrative tools that help the water administrator to ensure the accurate and timely delivery of their water to the rightful user and allow ditch companies or even individual users to know what water is flowing in their ditch.

Introduction

This project is a continuation of the Walker Water project from last Fall's Field Session. In that session the students were able to accomplish part of the goal of modeling how water comes down a watershed. The students demonstrated that they could map the pathway a particle of water (let's say a marble) would travel as it came down the mountain.

We provided the students a grid of elevation data, and they used that grid to compute a direction vector and an inertia value for each cell in the grid. They then traversed the grid by following each direction vector and considered the affect inertia would have on the direction the marble would follow. The larger the magnitude of the direction vector the higher the inertia would influence the marble to follow that particular path.

The image below shows what the Fall Session accomplished. The blue line shows the pathway that the marble took from NE to SW. What was promising was that the blue line follows the path of one of the main streams in this drainage, so we are quite confident that their algorithm is functioning correctly for that single start point.
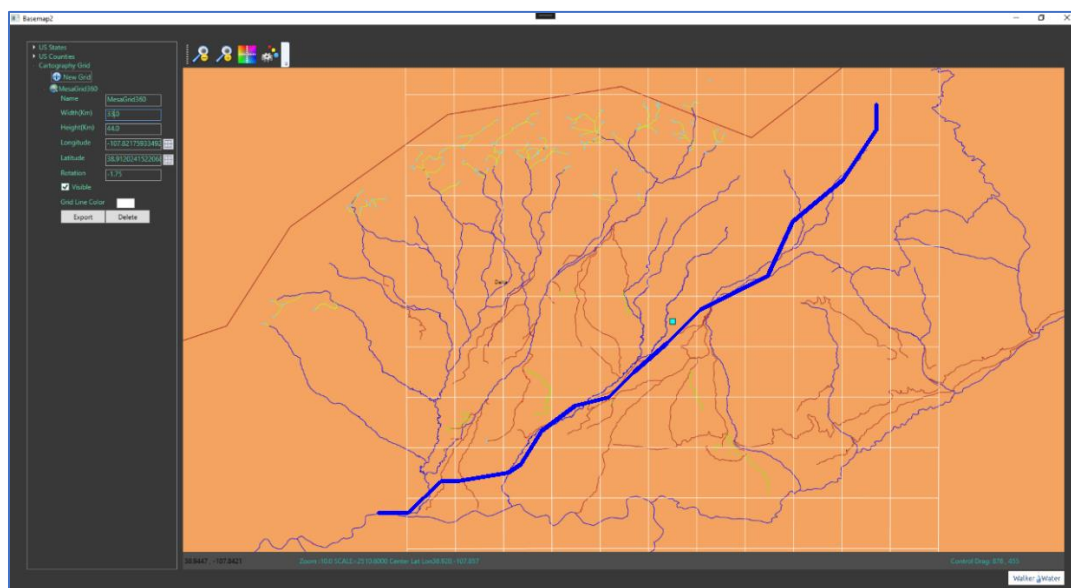
Work Description

While a lot was accomplished last Fall Session, there remains much to be done to complete this algorithm. Instead of one marble, we need to model thousands, if not millions, of them starting at every high point in the watershed basin. The image below illustrates a 3-dimensional mesh of elevations, and the accumulation of water as it works its way down the drainage system. Our plan would be to animate these motions over a series of time steps.
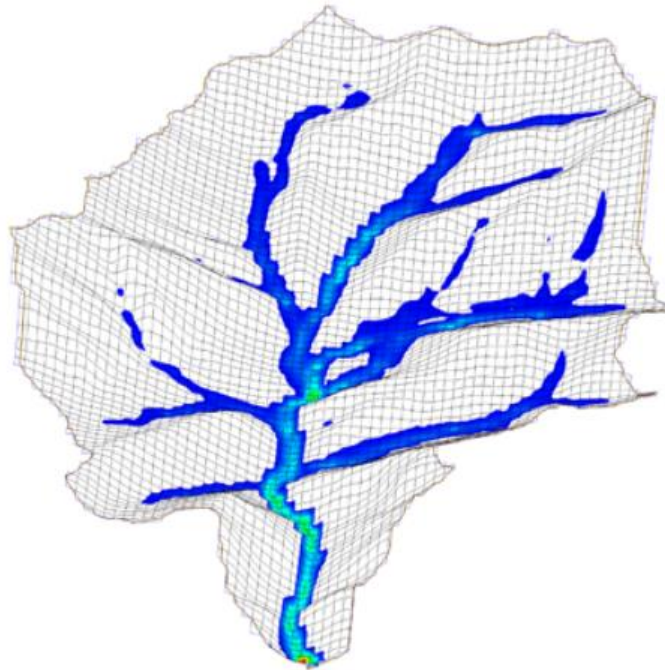
The goal is to map snow melt as it comes off the mountain and determine how much of that melt ends up in our reservoirs. There are numerous variables that influence the quantity that is eventually stored in the reservoir. They include the type of geologic material over which the water flows, the dryness of that ground since if it is very dry it will absorb water into the subsurface. These are more complicated parts of the modeling system, and first blush will be to set these additional variables to have no influence, so that we are simply trying to determine the pathways of the water and where it ends up. Later implementations will take into consideration the hydrologic components.

Student Skill Set

Our 3D software is written in C# using OpenGL. However, the previous work was written in C++ and that is acceptable for us at this time.

Team Size

The team size should be a minimum of 3 but certainly could support 5 or 6 members.

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Internship Possibilities

Walker Water would be delighted to offer internships. This would be a function of our financial condition at the time, and we anticipate this may be a possibility. That may depend on how the students receive our project and the larger scope of what we do.

Work Location

Work can be performed remotely. We deploy a git repository that supports collaboration amongst team members who can be located anywhere. Since we live in Cedaredge, we would not ask nor require anyone to visit our office. However, it would be advantageous for students to see how our valley operates since it is arguably the most complicated irrigation distribution systems in the U.S.

NDA

We will require an NDA for this project. The 3D software is proprietary and as such we want to protect our investment.

Intellectual Property

Walker Water will retain ownership of all code developed theretofore.

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