sdmay19-37: Are Cross Country Courses Avoiding Hills?

Week 1 Report
August 27 - September 14

Team Members

Connor Smith — *Ground Truth Engineer*
Thomas Chambers — *Ground Truth Engineer*
David Kirshenbaum — *Data Handling Engineer*
Jacob Feldman — *Data Handling Engineer*
Andrew Mumm — *Data Analysis Engineer*
Ryan Hilby — *Data Analysis Engineer*

Summary of Progress this Report

We've met several times with our adviser, Dr. Hornbuckle, for conversations ranging from a more in-depth explanation of the project's scope to devising the process flows that we'll be executing over the course of the semester. We've refined a series of hypotheses we plan to test relating both to physical characteristics of courses as well as more qualitative questions we plan to pose to experts in the cross country community. We have also met with Dr. Bradley Miller to seek his advice and assistance regarding the data collection required for this project. We've also been familiarizing ourselves with a variety of GIS software suites with the goal of settling on one software to use for the inputting of our topographic data.

Pending Issues

There are no glaring issues to report from any team members at this early point in this project.

Past week Accomplishments

- Connor
  - Researched differential and RTK GPS technologies.
    - Read instruction manual and operational guide for RTK GPS unit to be used
  - Accessed LIDAR data for Story County and experimented with elevation profile generation in GIS.
  - Planned the logistics of the coming week's site surveys including location selection, atmospheric timing, and satellite constellation position.
  - Presentation prep for lightning talks.
  - Worked to lay out specific hypotheses to be tested over the course of the project.
- Thomas
  - Obtained and researched documentation on ProMark2 differential GPS unit that will be used
  - Researched lidar data and ArcGIS program
- David
  - Researched and evaluated the accuracy of Google Earth's elevation data and reported to team.
    - For our use case I imagine it is not accurate enough, however we can't be sure until we analyze it with our GPS data.
- Jacob
  - Researched the accuracy of several different data sources (Google Maps elevation data, Lidar data, etc.)
    - Also spent time learning about how the data was presented and how to manipulate it, visualize it, and understand it.

- Andrew
    - Collection of information/familiarizing myself with my role, the tools we will use, and approaches to take
- Ryan
    - Researched different GIS software packages including ArcGIS, QGIS, and Whitebox GAT
    - Downloaded .las LIDAR data from the Iowa Lidar Mapping Project and tried different ways of displaying data in a map or a profile in the various GIS programs.
    - Read up on documentation on converting .las data into a raster map using different interpolations.
- All
    - Met twice with Dr. Hornbuckle to discuss the general philosophy behind the project as well as to solidify the project plan.
    - Met with Dr. Bradley Miller and received guidance on utilizing GIS techniques for our project
        - He provided us with two different types of GPS equipment to test in our ground truth survey to see what type of equipment is needed to produce the topographic profile accuracy required.
    - Prepared and delivered lightning talk presentations

Plans for Upcoming Reporting Period

- Connor -
    - I'll be leading the effort of testing the different GPS devices we've had given to us on the ISU XC course and exporting this data to the data handling team.
- David
    - I want to explore the possibility of using tools outside of GIS software. The reason being is because we are engineers and are probably more familiar with programming than mapping software. Also, it feels more appropriate for a CPRE senior design project, will discuss with team.
- Andrew
    - I will be looking into how we can utilize the data we collect and validate in a way that will be able to be used by us for our own applications. I believe for this project we will need to have a solid application that others can use easily. I will be looking into different applications of the data and also determining what truly is the best format of data that we should be using for said software/tools.
- Ryan
    - I will be continuing to research with ArcGIS/QGIS and the img file of the LIDAR data of Story County. Hopefully we can find a way to export values from the img file into a different program to manipulate values.
- Thomas
    - Testing GPS equipment and begin collecting data or at least begin plan to collect data that can be compared to Iowa DNR's elevation data.
- Jacob
    - I will be looking into ways to automate conversion/processing of data. There are a few different libraries I am going to look into, including a couple of Python libraries: libLAS and pyLAS.
- All -
    - Meeting with Dr. Amy Kaleita to retrieve an RTK GPS system for use in our surveying

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Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours

Connor Smith	GPS research, Iowa DNR LIDAR data experimentation, logistical planning of first site surveys with new GPS units	7	7
Thomas Chambers	Researched ProMark2 GPS unit and ArcGIS use	4	4
David Kirshenbaum	Evaluated legitimacy of Google's elevation data	5	5
Jacob Feldman	Evaluated accuracy of different data sources for topographic profiles	4.5	4.5
Andrew Mumm	Familiarized with tools to be used for project	4	4
Ryan Hilby	Researched different GIS programs and the conversion of .las data in to a raster map via different types of interpolations	5	5

Gitlab Activity Summary

David composed a write-up analyzing the value of Google Earth's topographic data, posting it as an issue for the team to review.