sdmay19-37: Are Cross Country Courses Getting Less Hilly?
Week 2 Report
September 15 - September 22

Team Members

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

Summary of Progress this Report

We conducted our first site survey to begin the process of choosing which combination of topographic technologies to use for our purpose. We also made progress on making LAS file formats usable for our analysis in both GIS software as well as programmatically, becoming more familiar with ArcGIS, our main analysis tool, in the process. We also began exploring different possibilities/ideas for course mapping/visualization software.

Pending Issues

We still need to get our differential GPS units working properly so we can test their data against our LIDAR baseline. With regards to data handling, ideally by next status report we would want to be able to have a uniform way to quickly compare elevation data between GPS coordinates, LAS files, and even Google Maps.

Past Week Accomplishments

- Connor
    - Met with Dr. Amy Kaleita for instruction on how to use her donated Ashtech Promark II differential GPS unit
    - Planned site survey at Lee Park in Ames to test our Garmin Montana 680t GPS against multiple phone GPS units
        - Coordinated satellite constellation position to minimize Dilution of Precision with the weather conditions
    - Executed site survey and reported results to team in weekly meeting
- Thomas
    - Tested phone-based GPS apps.
    - Performed site survey testing different GPS devices.
- David
    - Looked into the underlying structure of LAS files such that we can quickly convert it to a set of x, y, z coordinates
    - Research into finding how to tell where Google Maps data comes from (it changes depending on where you are looking).
        - All of Google's elevation data in the U.S. is at least as good as the resolution of the SRTM NASA space mission.
    - Looked into using a Python library specifically made for reading and modifying LAS files.
- Jacob
    - Worked on writing a script to convert a raster file to a las file, then compare the raster data to the

gps data.
- A lot of the work I was doing was setting up the environment and then working on the conversion, both of which are harder than I originally thought.
- Andrew
  - Looked into ways of being able to use data we collect for software tools to create courses and display information to potential users.
- Ryan
  - Worked on the manual way of converting LIDAR img file to a text file containing coordinates in Decimal Degrees and elevation in cm
  - Now understands how ArcGIS works and how to prevent ArcGIS from crashing in the future

Plans for Upcoming Reporting Period

- Connor
  - I'll be conducting a second site survey with the aid of differential GPS equipment.
- Thomas
  - Assisting Connor with second survey.
- David
  - Be able to access x, y, z values in Python from an LAS file
- Jacob
  - Continue working on a script to convert a raster file to a las file so that we can compare that data to the GPS data
- Andrew
  - Discuss with team a plan for how to utilize each of our skills better and refocus our efforts to make better progress (myself especially)
- Ryan
  - Quite busy this week so not planning to get much done. Help with deciding which data source is best.
- All
  - We will be able to quantify the disparity in precision between the different GPS/aerial topography technologies we have available to us and will decide which datasets we'll be analyzing.

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
Connor Smith	Coordinated initial site survey and testing of GPS equipment	7	14
Thomas Chambers	Field test using GPS software on phone. (2 hours) Research on geodetic reference points (2 hours) and phone GPS software (1 hour).	5	9
Ryan Hilby	Spent time in ArcGIS converting the LIDAR img file to a text file containing elevation data. Processing	6	11
David Kirshenbaum	LAS and Google Maps research, specifically	5	10

	for how to use them within Python.		
Jacob Feldman	I worked on writing a script to convert a raster file to a las file, then compare the raster data to the gps data.	7	11.5
Andrew Mumm	Research implementation of the data we collect	2	6

Gitlab Activity Summary
Nothing to report.