Senior Project Proposal
Marquette Trail Counter
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Objective:

Marquette Trail Counter (MTC) will be a tool to monitor and analyze trail usage data collected by a network of motion capture devices planted at strategic locations across the forest. This data is currently being collected manually with an Android application, and this project would need to automate that process. The end goal is to have a centralized location for researchers to query data, present it in multiple formats, and make various calculations such as most commonly used paths, least frequently used time slots, or average speed.

The data we are collecting are done by a few dozen motion detectors placed throughout the trails, and they record a time stamp of any movement captured. This project will analyze these series of locations and time stamps to create meaningful representations of trail usage.

Technologies:

- MySQL
- Javascript/HTML/CSS
  - NodeJS
  - Google Heat maps API (https://developers.google.com/maps/documentation/javascript/examples/layer-heatmap)
- Python
  - Numpy package for data analysis
  - IPDB package for debugging
  - pytest package for unit tests

What We Hope To Learn:

While we have the ability to write basic websites, we hope to use this opportunity to create a truly modern, responsive design with a focus on user experience (UX). Ease of use is exactly why this project is needed in the first place, and it cannot be forgotten throughout the process of building it. Mobile Android development is another aspect we'd like to add to our developer toolbox. UX is less of a concern here compared to the website, but still important. We also hope to become familiar with scientific computing when it comes to analyzing data for the above mentioned calculations under the Objective section. Piping output from Python analysis to Javascript (and vice versa) for the forward facing website will be another challenge.

Features:

- User Experience (15 pts)
  - Responsive website design that works on different devices (5 pts)
  - Good UX that requires no prior user knowledge (10 pts)
- A place to store and query the data (20 pts)
  - MySQL database hosted on Euclid (5 pts)
  - Successfully interface the website (javascript) with database (5 pts)
  - Successfully interface the Android app with database (5 pts)
  - Files stored and updated on Euclid as-is without MySQL database integration (5 pts)

- Android Application Support(8 pts)
  - Remote data transfer (8 pts)
- Python data analysis (35 pts)
  - Calculate individual and average speed (10 pts)
  - Calculate individual paths (10 pts)
  - Build graph data and send it to the website (15 pts)
- Website Data Visualization (30 pts)
  - Graph trail usage by time/location as given by Python analysis (10 pts)
    - Intuitive user input forms, like start and end dates (5 pts)
    - Corresponding graphs as output (5 pts)
  - Google heat maps (20 pts)
    - Show by various time settings like month, day, hour, etc. (12 pts)
    - Zoom, toggle satellite map, show/hide path (5 pts)
    - Label each node location (3 pts)

Grading Scale:

Total Possible Score: 108 points (pts)
A: 97
B: 86
C: 75
D: 64