



Cue Sheet Generator

Background

Cyclists often publish and share favorite rides in the form of *cue sheets*, which are similar to driving directions with distances and turns. For an example cue sheet, see <http://www.eugenegears.org/ridesheets/308e.pdf>. Many cyclists record their rides with GPS devices, and there are lots of programs and web services for turning GPS records into maps,¹ but so far there is no satisfactory service for turning GPS records into cue sheets.

Example Scenario

Edie Murks wants to lead a group ride on the Wolf Creek loop. Since the route is not familiar to all the riders, she wants to provide maps and cue sheets. She has previously captured a GPS track of her planned route in Ascent. She exports that track from Ascent in GPX XML format, then loads the GPX trace into CueMaker. CueMaker displays the track on a Google map and begins displaying cues to the right of the map; this takes a few minutes as CueMaker determines where the track turns from one road to another. When the initial cue list is ready, Edie clicks on the map to add a few cues that are not turns. She clicks near the fire station on Spencer

¹Programs that display GPS tracks of rides as maps include *Garmin Training Center* and *Ascent*. Web-based services include *MapMyRide.com* and *RideWithGPS.com*, among others.

Creek to indicate that there is a restroom there, and on summit of Wolf Creek to indicate that the group will wait for slower riders before descending the other side. When she is satisfied, she saves the GPX file with annotations for possible future use, and exports the cue sheet to a CSV (comma-separated values) file, which she will edit and print from Excel.

Basic Requirements

There is only one fundamental requirement: Convert a GPS track (in GPX or KML format) into a list of turns, labeling each turn by distance from start, direction of turn, and road or street name (e.g., left on Franklin at mile 13.7).

Desirable features include:

- Turns should be detected automatically. The user should not need to manually indicate each turn, although some user interaction may be acceptable.
- The user should be able to insert additional cues where there is no turn, e.g., to indicate a rail-road crossing or a food stop.
- A map display is not absolutely required, but is highly desirable.

Room for Creativity

There is some freedom in designing the user interface and experience, but the main opportunities for innovation in this project are probably technical (see below).

Main Challenges

The technical challenges in this project are substantial, but I think it is doable. Google Maps, and perhaps other web-based mapping services, provide a *reverse geocoding* API. This should be enough to determine when a GPS track leaves one road or street and begins to follow another. Doing so accurately and efficiently will require some ingenuity. If you enjoyed learning about efficient data structures and algorithms in CIS 313 and CIS 315 (or CIS 621), I think you may enjoy putting them to work here. (I have some ideas about how to do this, which I would be happy to share.)

Bonus: I know for sure that cyclists would use an application that does this well. If you like the idea of it being widely used, but can't invest the effort in making a really robust and polished application yourself, I know the developers of one of the GPS mapping sites (they happen to be alumni of CIS 422/522) and I know their users are clamoring for such a service.