

# Weekly report: November 9-20, 2014

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## 1 Goals for the week

- Update plots with dates when caps were changed.
- Determine a trip detection algorithm.
- Use the results from GPS data simplification algorithm for trip detection
- Implement changes in webike page.

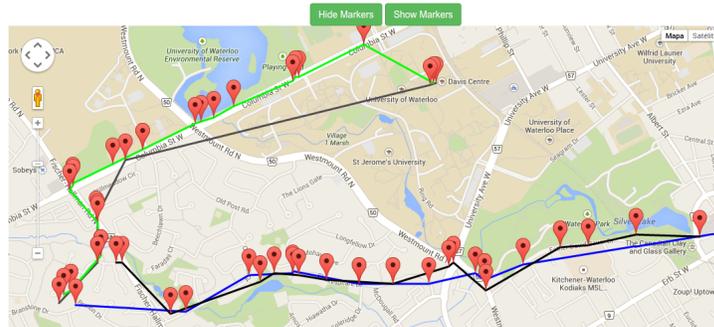
## 2 Activities

- Update plots with additional information. The code is available to be run in the “scripts” folder. The files are called “dataAvailable\_over5points.py” and “dataAvailable\_trips.py” to obtain both plots (they need to be run with python3).
- Find papers and studies about trip detection and determine their potential applicability to the project.
- Analyze the accuracy of the GPS data simplification as a tool for trip detection.
- Confirm efficiency of trip detection algorithm.
- Implement GPS data simplification in webike page.
- Analyze a way to obtain feedback from users about trips.
- Analyze initial usage of ebikes right after users got it.
- Analyze design of database to improve data fetching speed and include additional information about trips.

### 3 What I learnt

- There are a few papers that focus on trip detection but in the end they are not highly connected to the current technology available such as the API's from Google Maps which could be used to efficiently increase accuracy of trip detection. However, these API's could have limitations when data needs to be processed by the Google Engines such as a limited amount of location points that could be analyzed for free.
- Also, the algorithms presented in the trip detection papers considered having all the data which will not be applicable after using the GPS data simplification algorithm. This would represent a disadvantage since it will have a higher processing time and it would be required to store all the noisy GPS data.
- The GPS data simplification is proved to be very efficient when detecting “significant turns” which results in accurate indicators about the trips. Generally, the paths obtained after applying the algorithm follow the roadmap (obtained from Google Maps). However, as expected, there are some small variations which are commonly generated by GPS data. Additionally, some trips were detected where the path did not accurately describe a potential biking route; further analysis was done on these cases and the main reason for this problems was due to missing data (problem related to data collection in the phone).
- The trip detection algorithm designed by Tommy had to be modified (tweaking parameters) in order to identify all the trips. I realized that there were several one-way trips which were not consistent with bike usage. The algorithm improved its accuracy but I will be working on improving it by comparing its results against the log kept by professor Golab.
- I implemented the algorithm in the web page (still locally) and draw routes with different colors and distinctions. Also, additional information was included in order to offer a better user experience. Additionally, this data is useful when analyzing the logic of the algorithm and I have used it widely to identify possible flaws in the algorithms used. A picture of the web page is presented next:

Trip Number	Start Time	Finish Time	Total Time (minutes)	Total Distance (km)	Color
1	08:46	08:54	8	2.53	Green
2	17:38	17:48	10	2.82	Black
3	18:41	18:57	16	3.76	Blue
4	22:08	22:19	10	3.34	Black



- The data added to the web page will also be used a way to obtain feedback from the user. By displaying information about each trip the user will be able to more efficiently identify each trip.
- In order to save input from the user it will be required to add some elements to the database. Based on the original design I consider it to be efficient to have a field where we identify if each point in time belongs or not to a bike trip (this has to be reviewed depending if we will be keeping “noisy” GPS data or not). Additionally, another field were we can save the changes suggested by the user of the bike in order to “join trips”.
- Also, I think it would be efficient to have a table where we keep track of the available data.

#### 4 Proposed goals for next week

- Write the scripts to modify the database according to the agreed changes including the routines required to fill the additional fields.
- Push changes to the production server.

#### 5 References