COLLEGE OF ENGINEERING

Electrical Engineering & Computer Science

TRIDENT : A NOVEL SOLUTION TO MULTI-PATHING GPS SIGNALS

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Abstract

We developed an algorithm to increase the accuracy of GPS data collected near obstructions. The algorithm stacks data collected by three GPS units into separate queues. Then, for each data point in the queue, we check for multipathing by testing the data with various statistical tests. Finally, if the data meets the tests' requirements, the data is marked as good and displayed to the user. We were able to field test the algorithm and collect accurate results.

Background

- Obstructions can reflect GPS signals away from the surveyors. This phenomenon is known as multipathing. This can decrease the quality of the data collected and produce inaccuracies.
- Currently, if data contains multipathing, surveyors need to throw away the entire set of data and spend significant time recollecting data.
- Currently, there are no existing methods that can detect, or filter multipathing.
- The goal of this project is to solve the problem of multipathing.

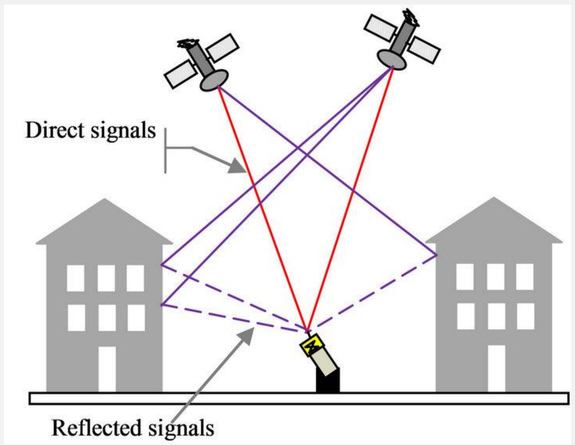
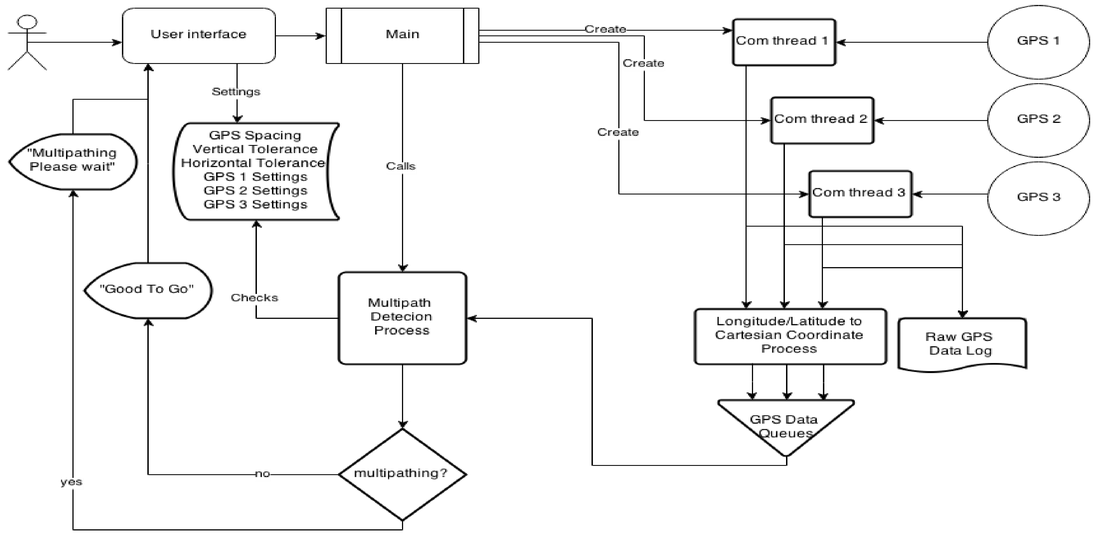


Figure 1: A visual representation of multipathing. When signals get reflected by obstructions such as buildings or trees, the distance travelled by the signal is much longer than the direct signal. This reflection of signal is called multipathing.

Algorithm Flowchart



Results

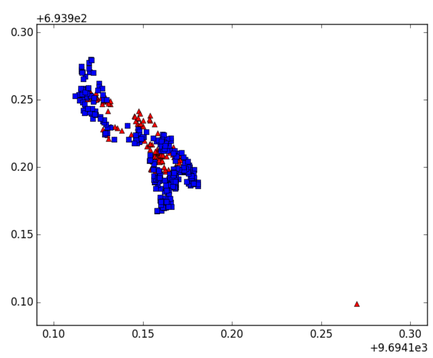


Figure 4. Unanalyzed Data (Red) overlaid by analyzed Data (Blue)

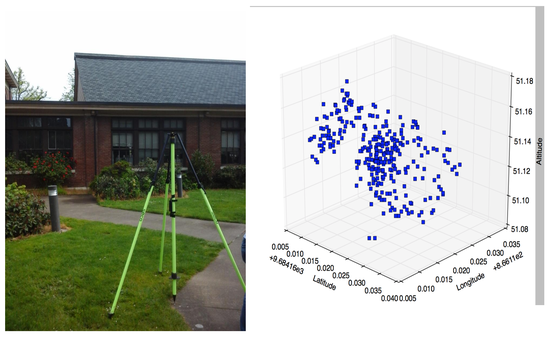


Figure on the left shows control point 1. This point is known to contain very little multipathing signals. Figure on the fight are non-multipathing signals detected by the algorithm.

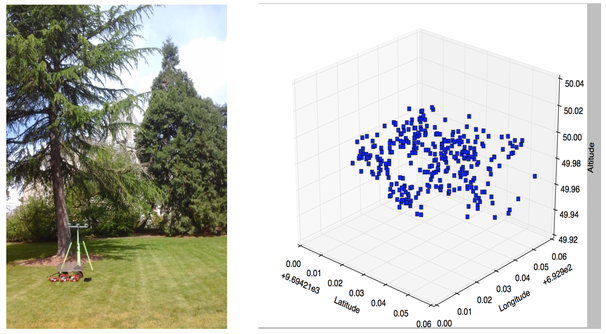


Figure on the left is control point 2, where it contains a mixture of multipathing and non-multipathing signals. The number of clean data points we have in our graph is less than control point 1.

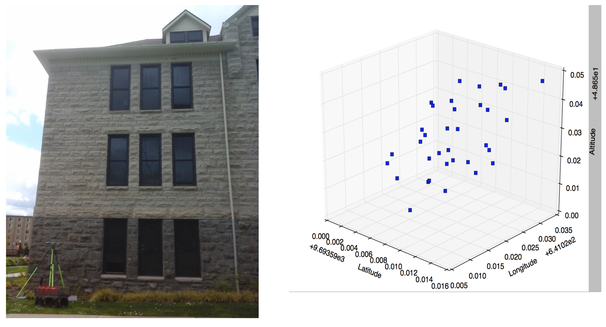


Figure 3 is control point 3, where there are lots of multipathing signals and very little clean data. Our algorithm is able to filter out multiple multipathing signals, producing clean data.

Graphical User Interface

Conclusion

- Our algorithm is able to filter multipathing signals out of incoming gps data
- Future works includes further testing of the algorithm to increase accuracy
- More extensive field tests to get more feedback from surveyors

Our Client

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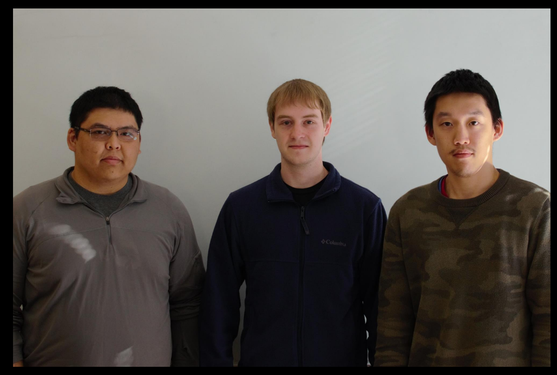
Meet the team



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