

A Method to Estimate a Best Fit Trajectory from Multiple Individual Trajectories

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SUMMARY

In applications like extracting hiking trails from crowd sourced data, collecting trajectories on animal movement or precise mapping of road lines, there are multiple trajectories, obtained from e.g. Global Navigation Satellite Systems (GNSS), that describe the same physical path. Due to e.g. observation techniques, occasional observational blunders and difficulty in identifying exactly the same physical path, individual trajectories will normally differ from one another. This paper proposes a method on how to estimate a best fit trajectory based on available individual trajectories. The precision of the estimated trajectory is quantified in form of standard deviations. Occasional observational blunders and failure in following the same physical path are addressed through statistical testing. A priori stochastic information regarding the individual trajectories is utilized in a weighting scheme. The proposed method is first verified using a simulated dataset. Results from processing of a relatively complex dataset stemming from individual runs with a GPS multi-sport watch, point out some advantages and drawbacks of the method. The method appears to handle well both observational blunders and changing requirements regarding following the very same physical path during data collection. Detection and subsequent deletion of erroneous observations might however introduce small jumps along the estimated trajectory. Depending on the applications, the effect of occasional small jumps can be handled by post smoothing.

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