

Untitled EnKF paper

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Abstract

Write abstract here.

1 Introduction

Contents:

- Provide context and motivation for investigation.
- Outline aims and objectives.

Points of distinction to highlight:

- Defining an approach for defining whether an agent is active or inactive in an ensemble of models.
- Comparing error in ensemble mean with mean of errors of ensemble-member models.
- Explaining the importance of an appropriate summary statistic (median instead of mean) when calculating the average error over time.
- Explaining the importance of considering time-steps when a sufficient number of filters are still running when collecting summary statistics of multiple filter runs.
- Using EnKF to improve the accuracy with which an ABM simulates a pedestrian system.

2 Background

- Discuss previous relevant work:
 - Ward et al. (2016)
 - Malleson et al. (2020)
 - Clay et al. (2020)

3 Methods

3.1 Model

Explain about `StationSim_GCS`.

3.2 Ensemble Kalman Filter

- Explain about the Ensemble Kalman Filter (Evensen, 2003), which is based on the Kalman Filter (Kalman, 1960).

4 Experiments

4.1 Benchmarking

4.2 Untitled Section

- Talk about measures used when running experiments with multiple EnKFs to ensure that outliers don't skew results:
 - Median instead of mean error.
 - Only considering time-steps when a sufficient number of models are active.

5 Results

5.1 Benchmarking

6 Conclusion

References

- Jonathan A Ward, Andrew J Evans, and Nicolas S Malleson. Dynamic calibration of agent-based models using data assimilation. *Royal Society open science*, 3(4):150703, 2016.
- Nick Malleson, Kevin Minors, Le-Minh Kieu, Jonathan A Ward, Andrew West, and Alison Heppenstall. Simulating crowds in real time with agent-based modelling and a particle filter. *Journal of Artificial Societies and Social Simulation*, 23(3), 2020.
- Robert Clay, Le-Minh Kieu, Jonathan A Ward, Alison Heppenstall, and Nick Malleson. Towards real-time crowd simulation under uncertainty using an agent-based model and an unscented kalman filter. In *International Conference on Practical Applications of Agents and Multi-Agent Systems*, pages 68–79. Springer, 2020.

Geir Evensen. The ensemble kalman filter: Theoretical formulation and practical implementation. *Ocean dynamics*, 53(4):343–367, 2003.

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