Written by Xia Wenxuan, 2021

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https://github.com/gegeji

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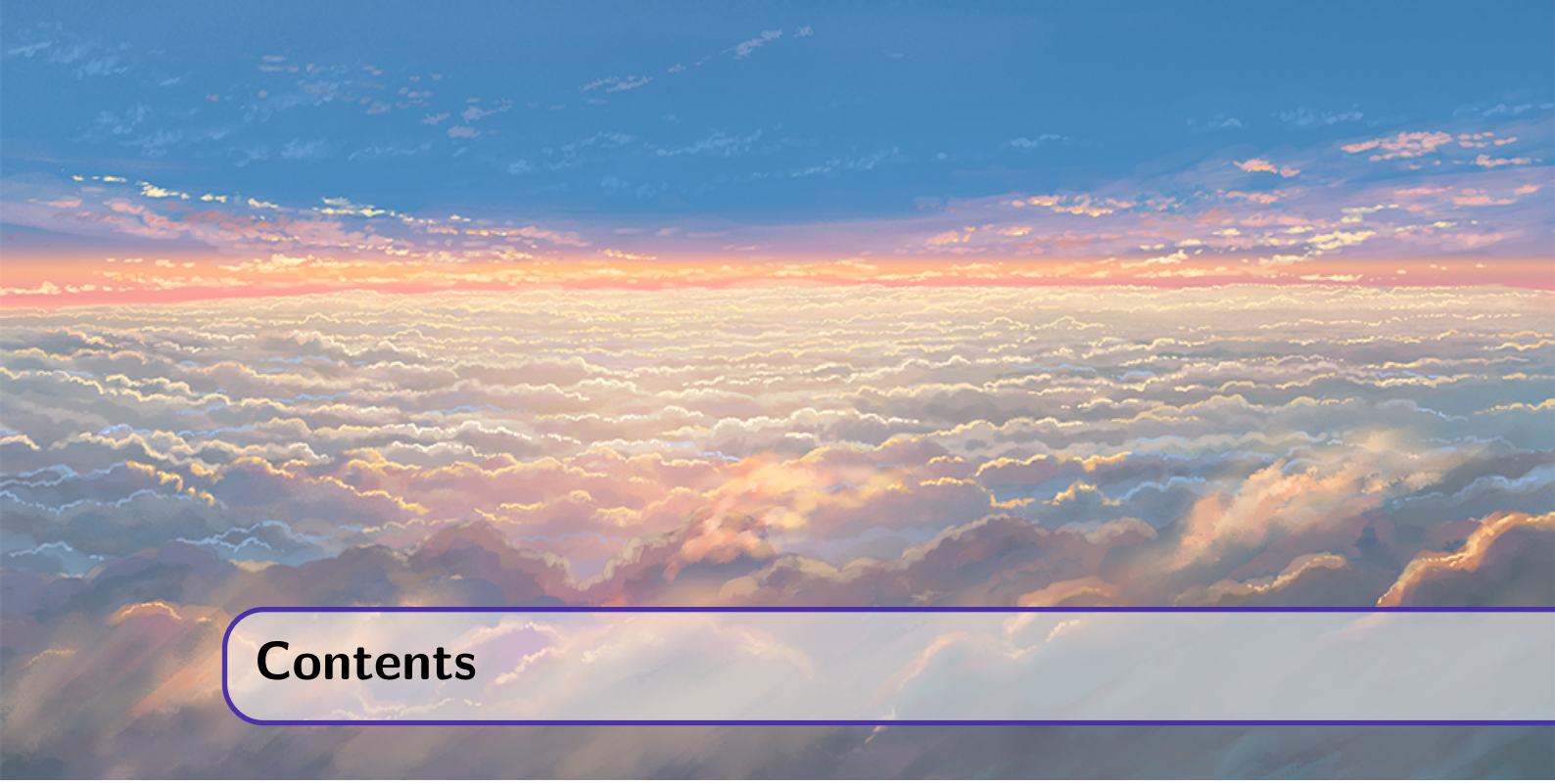


Contents

I Map Matching

1 Hidden Markov Map Matching 4

1.1 论文动机 4

1.1.1 原始数据 4

1.2 其他论文的方法 4

1.3 论文贡献 5

1.4 模型 5

Map Matching

1 Hidden Markov Map Matching 4
1.1 论文动机
1.2 其他论文的方法
1.3 论文贡献
1.4 模型

1. Hidden Markov Map Matching

Source: [1].

1.1 论文动机

1.1.1 原始数据

the raw input data consists of vehicle *locations* measured by GPS, Each measured point consists of a time-stamped latitude/longitude pair.

The *roads* are also represented in the conventional way, as a graph of nodes and edges. The *nodes* are at intersections, dead ends, and road name changes, and the edges represent road segments between the nodes. Some *edges* are directional to indicate one-way roads. Each node has an associated latitude/longitude to indicate its location, and each edge has a polyline（折线）of latitude/longitude pairs to represent its geometry.

1.2 其他论文的方法

create a (possibly smoothed) curve from the location measurements and attempt to find matching roads with similar geometry

■ **Example 1.1** White et al. present four algorithms, starting with the simple, nearest match scheme. Their second algorithm **adds orientation information to the nearest match approach**, comparing the measured heading to the angle of the road. Their third algorithm evolves the second algorithm to **include connectivity constraints**, and their fourth algorithm does **curve matching**.

their most sophisticated algorithm, the fourth one, was outperformed by the simpler second algorithm when tested on a total of about 17 km of driving data.

■

builds up a topologically feasible path through the road network. Matches are determined by a similarity measure that weights errors based on distance and orientation. The algorithm was found to perform flawlessly, even though the GPS data was collected while *Selective Availability* was turned on, leading to noisier location measurements than are available now.

Kim and Kim [10] look at a way to measure how much each GPS point belongs to any given road, taking into account its distance from the road, the shape of the road segment, and the continuity of the path. The measure is used in a fuzzy matching scheme with learned parameters to optimize performance.

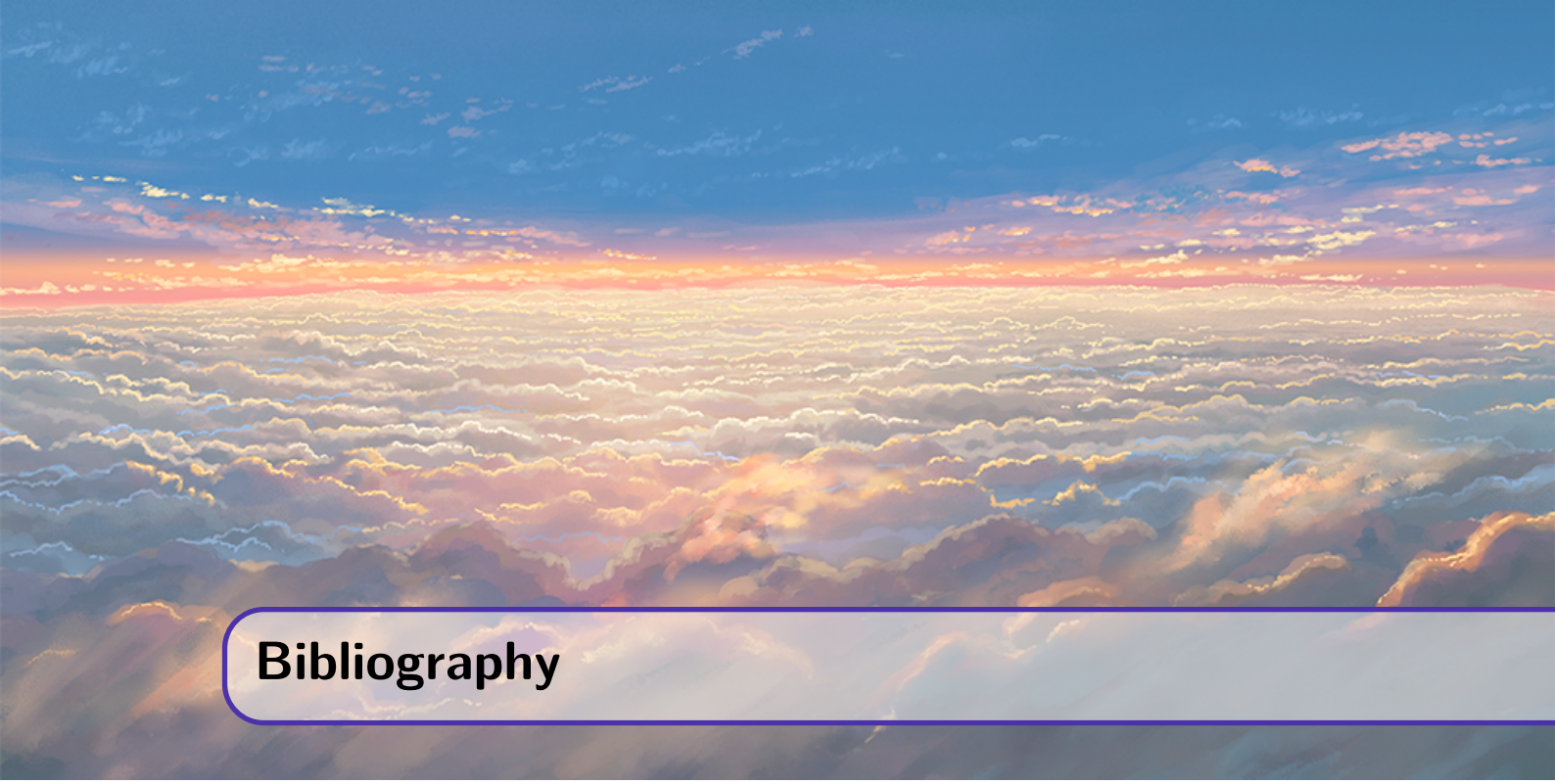
Brakatsoulas et al. [3]. Their algorithm uses variations of the Fréchet distance to match the curve of the GPS trace to candidate paths in the road network.

1.3 论文贡献

maintaining a principled approach to the problem while simultaneously making the algorithm robust to location data that is both **geometrically noisy and temporally sparse**.

a test of our map matching algorithm where we vary the levels of noise and sparseness of the sensed location data over a 50 mile urban drive

1.4 模型



Bibliography

[1] Paul Newson and John Krumm. “Hidden Markov Map Matching Through Noise and Sparseness”. In: *17th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL GIS 2009), November 4-6, Seattle, WA*. 2009, pages 336–343. URL: https://www.microsoft.com/en-us/research/publication/hidden-markov-map-matching-noise-sparseness/ (cited on page 4).