

Spatiotemporal Trajectory Modeling: List of Functions to be Implemented

Basic Functions:

Function Name	Parameters	Signature	Valid for	Area Of Usage
findStepSize	Trajectory	Float	All	Necessary for other functions
findEndTime/findStartTime	Trajectory	Timestamp	All	Filter, Indexing
findMBR	Trajectory	Geometry	All	Filter, Indexing
findTrajectoryType	Trajectory	("Point", "Line", "Polygon")	All	Unsupported Operation Check
addSegment	Trajectory, tg_pair	Trajectory	All	Call by Similarity Functions
geomAt	Trajectory, Timestamp	Geometry	All	Call by other functions
dropHead/dropTail	Trajectory	Trajectory	All	Call by other functions

Similarity Functions:

Function Name	Parameters	Signature	Valid For	Area Of Usage
OMAX	Trajectory, Trajectory	Float	Polygon, Polygon	Filter and Refine[1]
Jaccard	Trajectory, Trajectory	Float	Polygon, Polygon	Filter and Refine[1]
JaccardStar	Trajectory, Trajectory	Float	Polygon, Polygon	Filter and Refine[1]

EuclideanDistance	Trajectory, Trajectory	Float	Point, Point	Time relaxed similarity measure [5] [6] [7]
zNormalize	(tg_pair[], INTEGER, INTEGER)	Geometry[]	Point	Applied for partial or whole trajectory for avoiding scaling issues [4]
editDistance	Trajectory, Trajectory	Float	Point, Point	Time relaxed similarity measure [4] [6] [7]

POSTGIS and Other Functions:

Function Name	Parameters	Signature	Valid For	Area Of Usage
Intersection	Trajectory, Trajectory	Trajectory	All, All	For calculating J/OMAX/J*
Union	Trajectory, Trajectory	Trajectory	All, All	For calculating JACCARD
Area	Trajectory	Float	Polygon	For calculating union area, intersection area and maximum area
Volume	Trajectory	Float	Polygon	For Jaccard(We use area currently)
geomAtTime	Trajectory	Point	Point	Linear interpolation [2]
mDistance	Trajectory, Trajectory	Float[]	Point	ST Data Types [3]
length	Trajectory	Float	Point	ST Data Types

				[3]
duration	Trajectory	Interval	Point	ST Data Types [3]

References:

- [1] Pillai, Karthik Ganesan, Rafal A. Angryk, and Berkay Aydin. "A filter-and-refine approach to mine spatiotemporal co-occurrences." *Proceedings of the 21st ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems*. ACM, 2013.
- [2] Ramsey, Paul. "PostGIS manual." *Refractions Research Inc* (2005).
- [3] Güting, Ralf Hartmut. "Spatio-Temporal Data Types." *Encyclopedia of Database Systems*. Springer US, 2009. 2730-2731.
- [4] Nikos Pelekis, Ioannis Kopanakis, Gerasimos Marketos, Irene Ntoutsi, Gennady Andrienko, and Yannis Theodoridis. 2007. Similarity Search in Trajectory Databases. In Proceedings of the 14th International Symposium on Temporal Representation and Reasoning (TIME '07). IEEE Computer Society, Washington, DC, USA, 129-140.
- [5] C. Hundt, B. Schmidt and E. Schömer, "CUDA-Accelerated Alignment of Subsequences in Streamed Time Series Data," Parallel Processing (ICPP), 2014 43rd International Conference on, Minneapolis MN, 2014, pp. 10-19.
- [6] Lei Chen, M. Tamer Özsu, and Vincent Oria. 2005. Robust and fast similarity search for moving object trajectories. In Proceedings of the 2005 ACM SIGMOD international conference on Management of data (SIGMOD '05). ACM, New York, NY, USA, 491-502.
- [7] Zhang, Zhang, Kaiqi Huang, and Tieniu Tan. "Comparison of similarity measures for trajectory clustering in outdoor surveillance scenes." *Pattern Recognition, 2006. ICPR 2006. 18th International Conference on*. Vol. 3. IEEE, 2006.