A Hybrid Trajectory Model

Trajectory Computation Layer
Compute high-level trajectories (like meaningful episodes) from low-level and raw GPS tracking feeds.

Semantic Annotation Layer
Annotate trajectory episode with the suitable geographic data sources (like POI, ROI, LOI).

Semantic Trajectory Analytic Layer
Compute additional statistical information (e.g., mean, variance, other distribution info) of movement characteristics.

Trajectory Query and Visualization
Query and visualize trajectories at different levels, from spatio-temporal to semantics.

Semantic Trajectory Construction & Annotation

Data Preprocessing
Design preprocessing algorithms for the movement data captured by GPS/GSM tracking devices.

Trajectory data cleaning, such as outlier removal
Trajectory data smoothing or/and compression

Trajectory Identification
Cut the cleaned GPS sequential data into several segments, in which each segment represents a separate trajectory.

Raw GPS gap
Predefined time interval
Predefined space extent
Automatic segmentation based on statistical correlations

Trajectory Segmentation
Further segment a trajectory into several self-homogeneous episodes.

Velocity-based episode identification
Density-based episode identification
Direction-based episode identification
Time series based method

Semantic Enrichment
Extend semantic knowledge for stops and moves to achieve semantic trajectories, i.e., by integrating knowledge from geographic sources.
Spatial join with ROI (Regions of Interest)
Map matching with LOI (Road Networks)
Hidden Markov Model with POI (Points of Interest)

Trajectory Query & Visualization

2. Zhixian Yan, José Macêdo, Christine Parent, Stefano Spaccapietra. Trajectory Ontologies and Queries. Transactions in GIS, 12(s1), Pages 75-91, 2008