

The background of the slide is a complex, abstract composition. It features a network of thin, reddish-brown lines forming a web-like structure. Scattered throughout are numerous small, green circular dots. On the left side, there is a vertical strip with a grid of small, light-colored squares. In the upper left corner, there is a small, semi-transparent inset showing a cluster of orange and red dots. The overall color palette is muted, with earthy tones and a soft, hazy atmosphere.

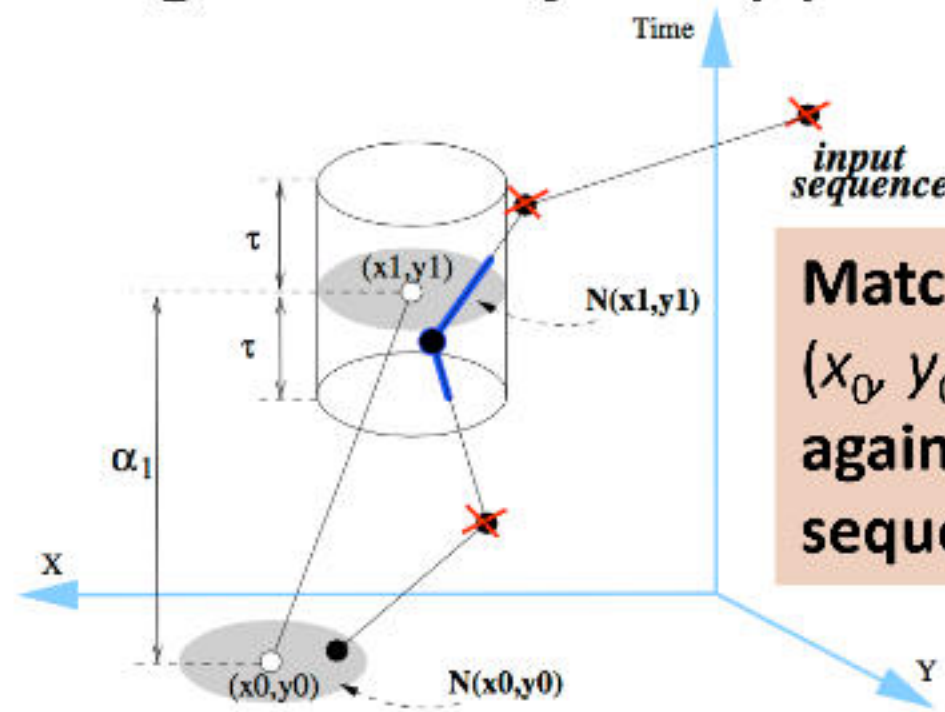
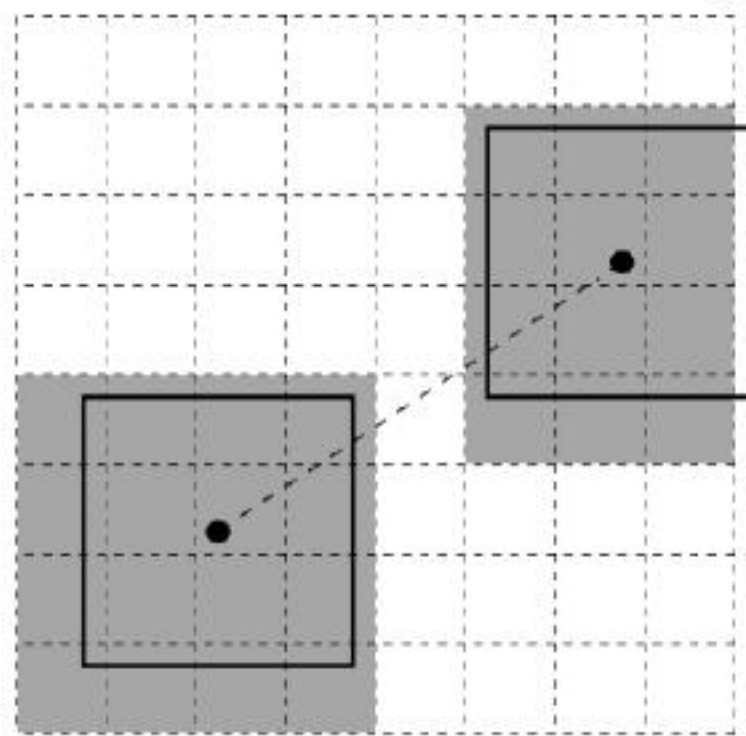
++ Mining and Aggregating Patterns over Multiple Trajectories

Partition-Based Trajectory Pattern Mining

轨迹

Partition-Based Trajectory Pattern Mining (e.g., Mining T-Patterns) [1]:

- First partition the space into equal-width grids and obtain Regions-of-Interests (RoIs)
- Then transform each input trajectory into a time-annotated symbolic sequence
- Use constraint-based sequential pattern mining to find trajectory patterns



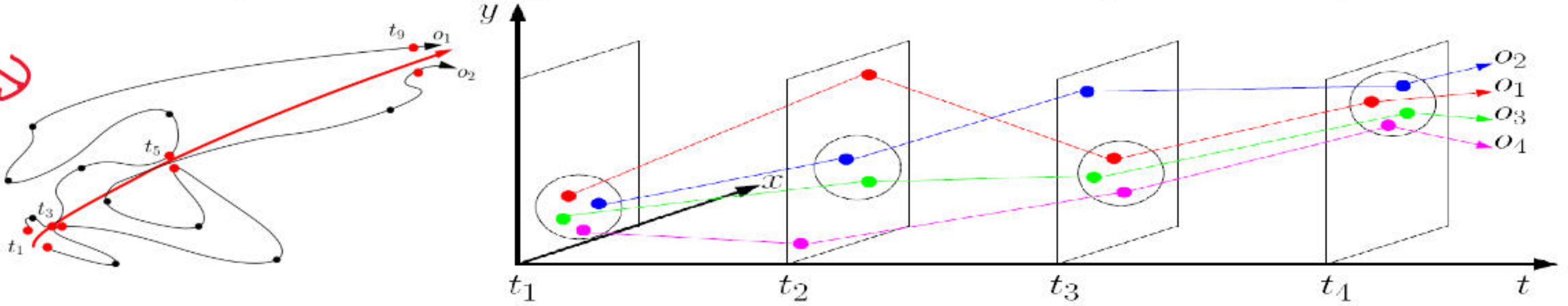
Matching T-pattern
 $(x_0, y_0) - \alpha_1 \rightarrow (x_1, y_1)$
against an input ST-sequence

Railway Station $\rightarrow 15min \rightarrow$ Castle Square $\rightarrow 2h15min \rightarrow$ Museum
Railway Station $\rightarrow 10min \rightarrow$ Middle Bridge $\rightarrow 10min \rightarrow$ Campus

[1] F. Giannotti, M. Nanni, F. Pinelli, D. Pedreschi, Trajectory Pattern Mining, KDD'07

Detecting Moving Object Clusters

- **Flock and convoy:** Both require k consecutive time stamps (连续的, 非常严格)
 - **Flock:** At least m entities are within a circular region of radius r and move in the same direction 需要连续, 需要在一定范围.
 - **Convoy:** Density-based clustering at each timestamp; no need to be a rigid circle 需要连续.
- **Swarm:** Moving objects may not be close to each other for all the consecutive time stamps 不需要一直连续
 - Efficient pattern mining algorithm can be derived for mining such swarm patterns

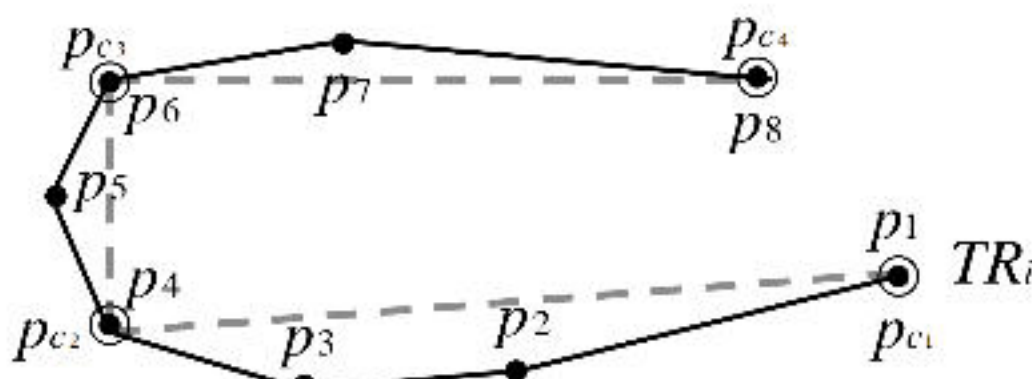


Z. Li, et al.: Swarm: Mining Relaxed Temporal Moving Object Clusters. VLDB'10

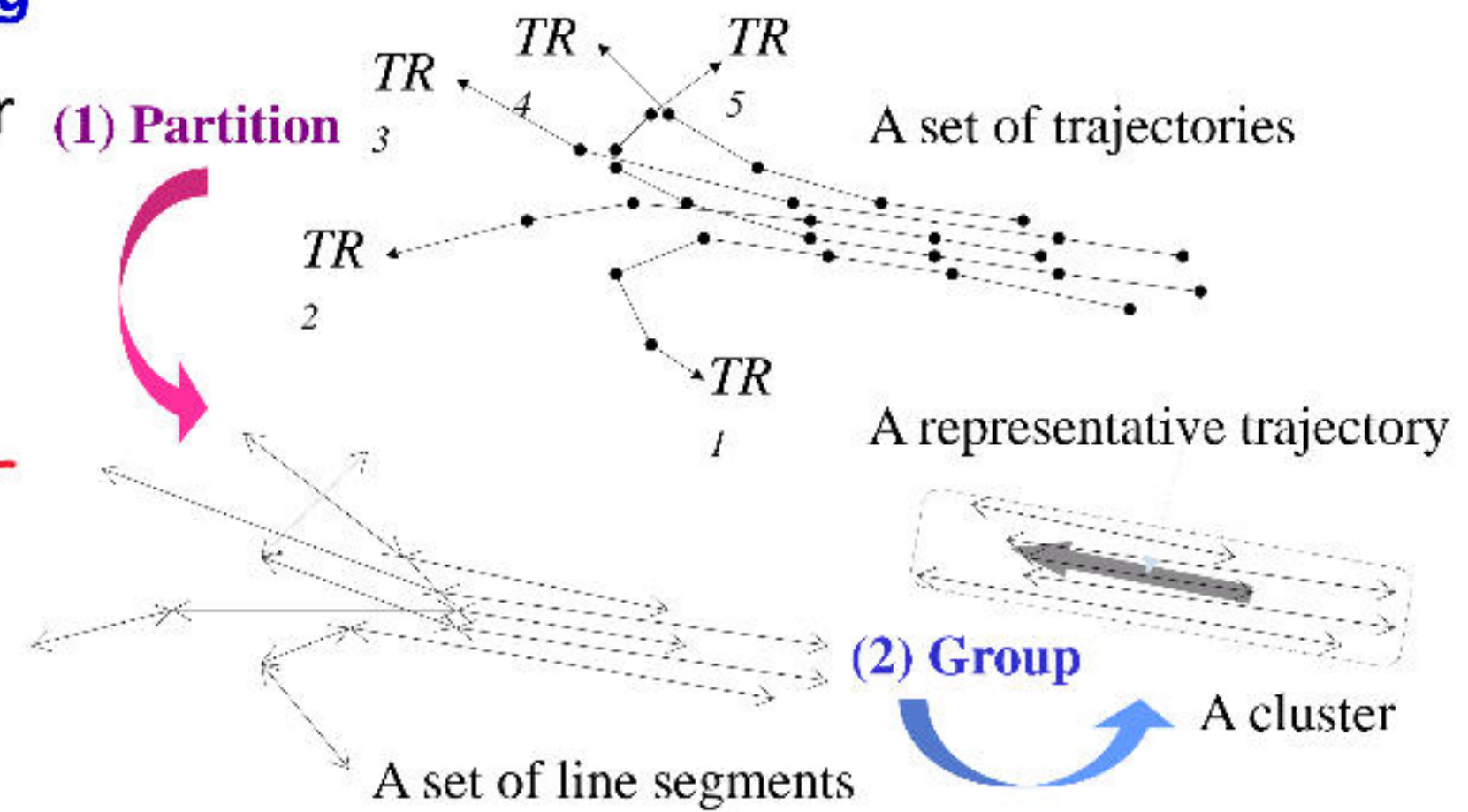
Trajectory Clustering: A Partition-and-Group Framework

- Grouping trajectories *as a whole* \Rightarrow cannot find *similar portions* of trajectories
- **Solution:** discovers common *sub*-trajectories, e.g., *forecast hurricane landfall*
- Two phases: *partitioning* and *grouping*
- Identify the points where the behavior of a trajectory changes rapidly \Rightarrow *characteristic points*

- Based on the minimum description length (MDL) principle



● : characteristic point — — : trajectory partition



J.-G. Lee, et al., "Trajectory Clustering: A Partition-and-Group Framework", SIGMOD'07