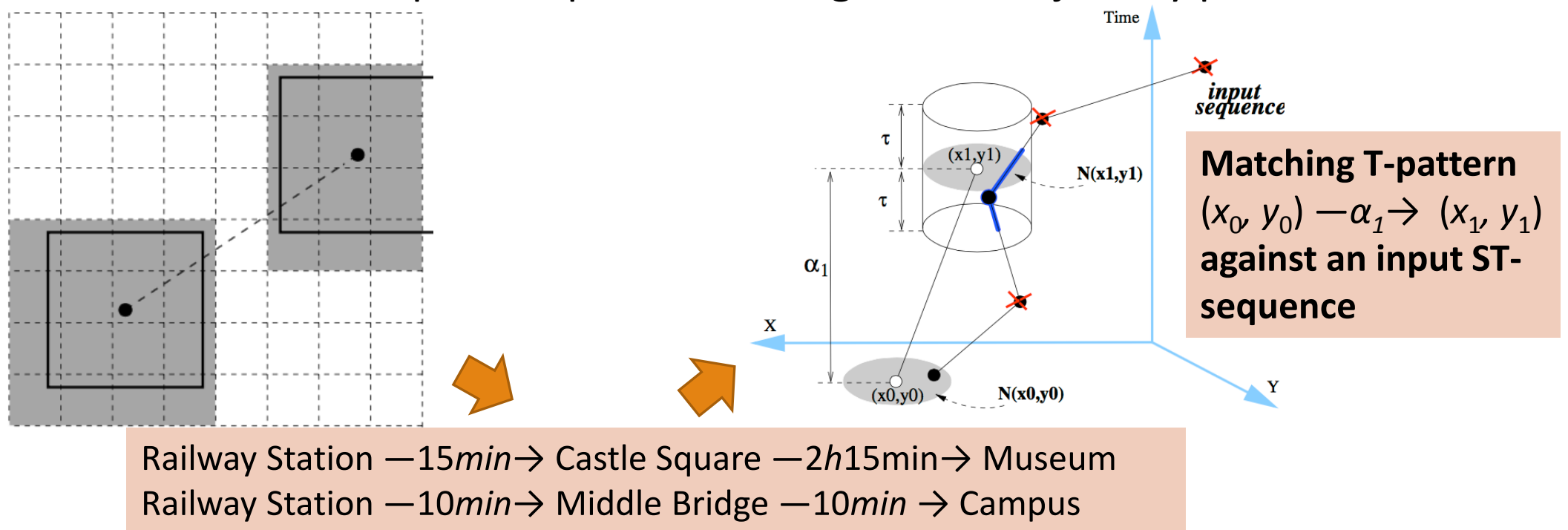# Mining and Aggregating Patterns over Multiple Trajectories

Partition-Based Trajectory Pattern Mining

❏ **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
$(x_0, y_0) \overset{\alpha_1}{\longrightarrow} (x_1, y_1)$
against an input ST-sequence

Railway Station —$15min\rightarrow$ Castle Square —$2h$15min$\rightarrow$ Museum
Railway Station —$10min\rightarrow$ Middle Bridge —$10min \rightarrow$ 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

    ❑ **Flock:** At least m entities are within a *circular* region of **radius r** and move in the same direction

    ❑ **Convoy:** *Density-based clustering* at each timestamp; no need to be a rigid circle

❑ **Swarm:** Moving objects may not be close to each other for all the consecutive time stamps

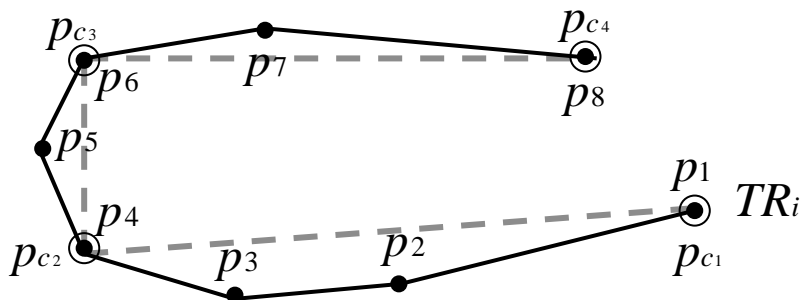   ❑ Efficient pattern mining algorithm can be derived for mining such swarm patterns
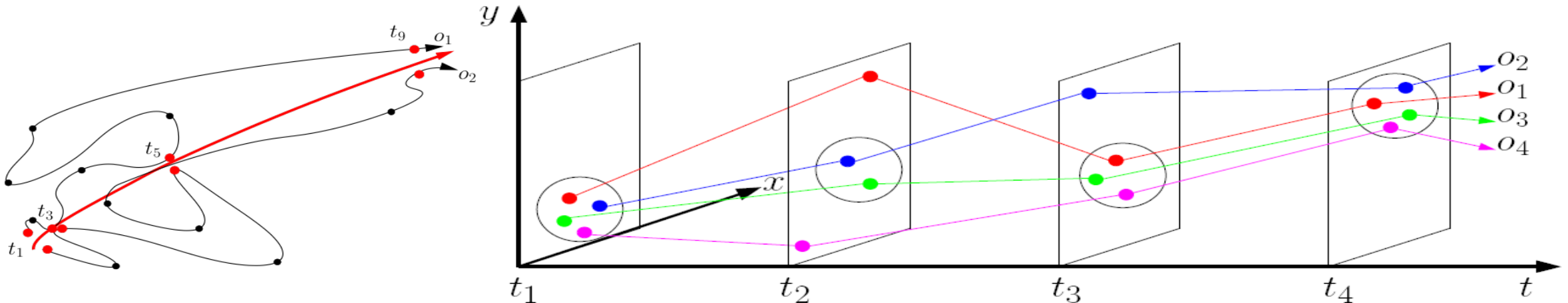
Z. Li, et al.: Swarm: Mining Relaxed Temporal Moving Object Clusters. VLDB'10
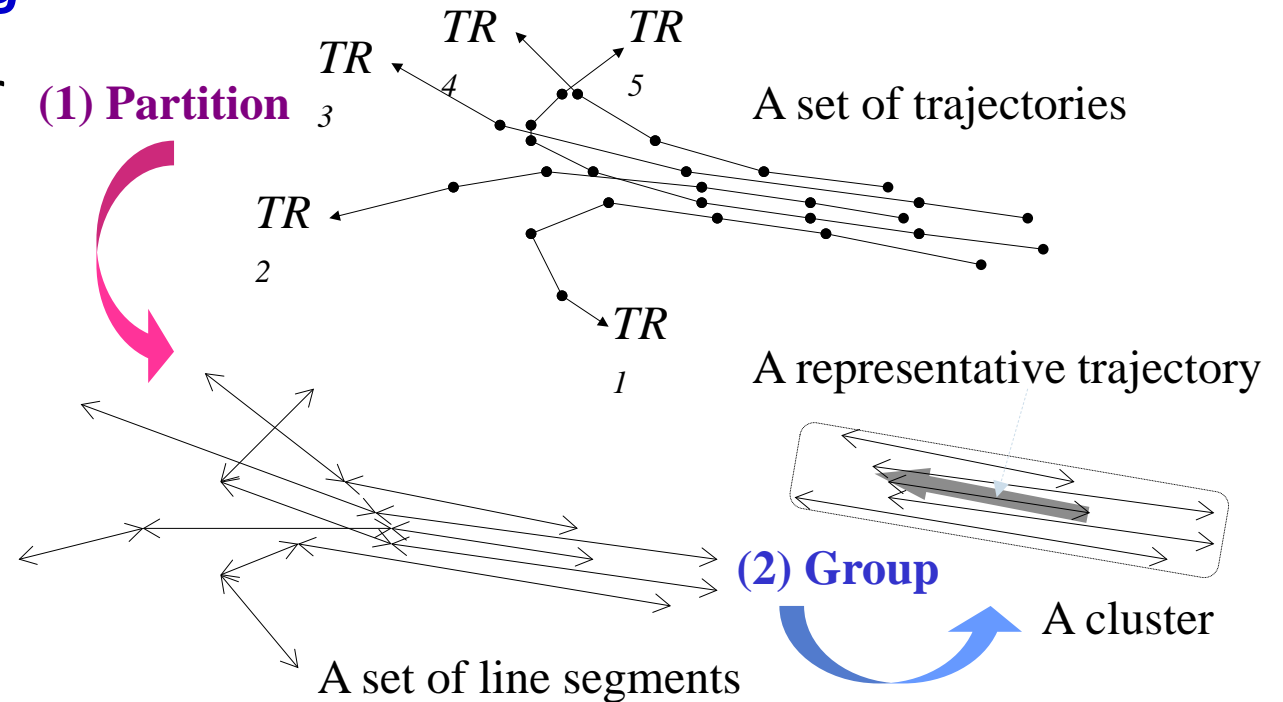
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Trajectory Clustering: A Partition-and-Group Framework

- ❑ Grouping trajectories **as a whole** ⇒ 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 ⇒ *characteristic points*

  - ❑ Based on the minimum description length (MDL) principle

(1) Partition

TR_3 TR_4 TR_5

A set of trajectories

TR_2

TR_1

A representative trajectory

(2) Group

A cluster

A set of line segments

p_{c_3} p_6 p_7 p_{c_4} p_8

p_5

p_4 p_1

p_{c_2} p_3 p_2 TR_i

p_{c_1}

⊚ : characteristic point − − − : trajectory partition

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

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