Personalized Protection of Identifiers on Public Trajectories

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Goals

Goal one

- Remove user identifying information from trajectories.

Goal two, following Goal one

- Ensure enough information after removal of user information that:
  - Similar sub-trajectories used to get from point A to B can be found
  - Analysis of which roads are congested, and when; can be performed.

Related work

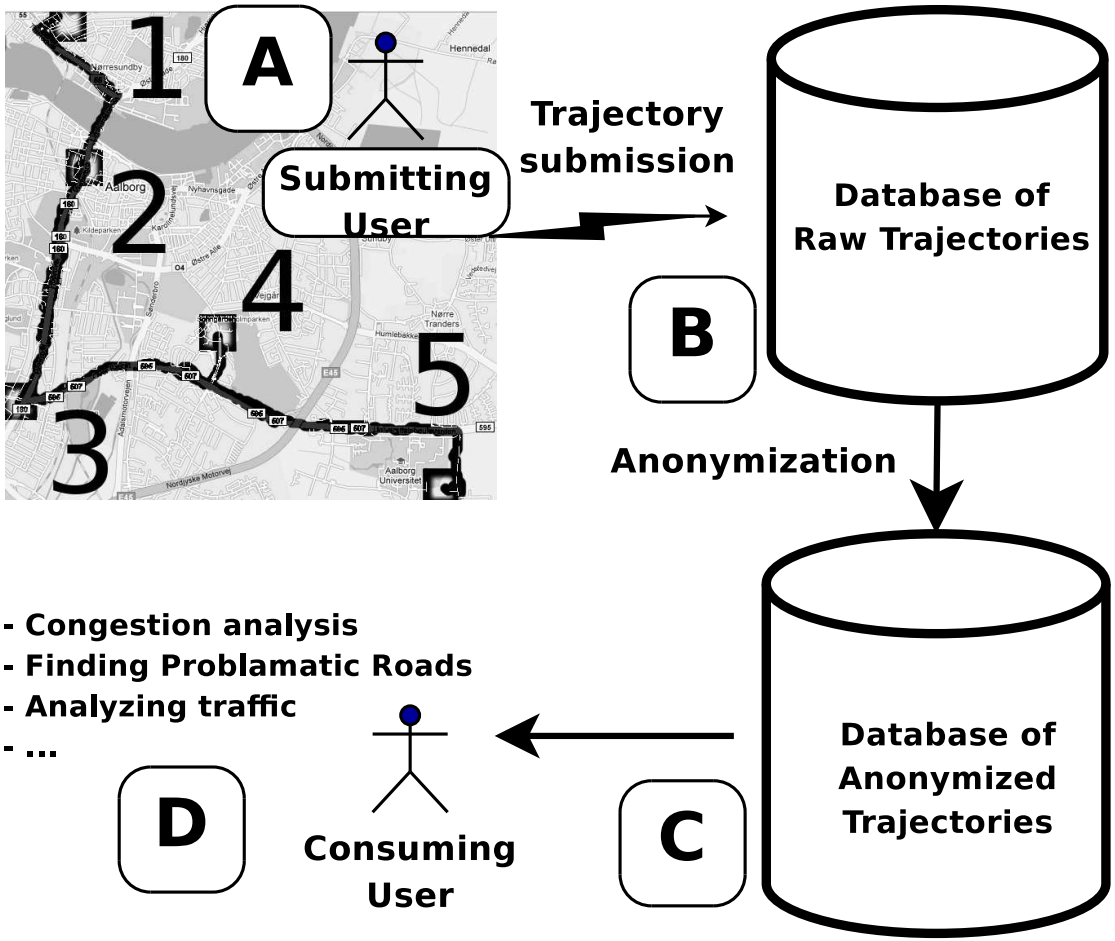
- Protection of Identifiers on Trajectories
- Trajectory classification

Protection of Identifiers on Trajectories

Post processing of trajectories

- Add information
  - Add fake trajectories
- Remove information
  - Remove sensitive segments of trajectories
  - collapse similar trajectories into one

Problem setting



- t-anonymity
- POI
- Protection types and schemes
- Settings

t-anonymity

Definition

Given $\mathbf{T}$, the set of trajectories, and a POI p.
Let $\Gamma \subseteq \mathbf{T}$, be the set of all trajectories which contains p.
Let $\Gamma^* \subseteq \Gamma$ and $\mathbf{TF}$ be some time frame, containing p, associated with Γ^*.
Γ^* is said to satisfy t-anonymity with respect to $\mathbf{TF}$ iff:

1. It contains at least $t-1$ other trajectories contained within $\mathbf{TF}$.
2. The collection of timestamps entering p (τ_s) has at least one unique element. This has to hold for the collection of exiting timestamps (τ_e) as well.

POI

Definition

Let $\mathbf{P}$ be the collection of all POIs.
Each POI $p \in \mathbf{P}$ is a tuple (p_{cover}, d_s, d_t) where p_{cover} is the set of edges $e \in \mathbf{E}$ which the POI covers and
$d_s, d_t \in \mathbb{N}$ is the spatial and temporal sensitivity respectively.

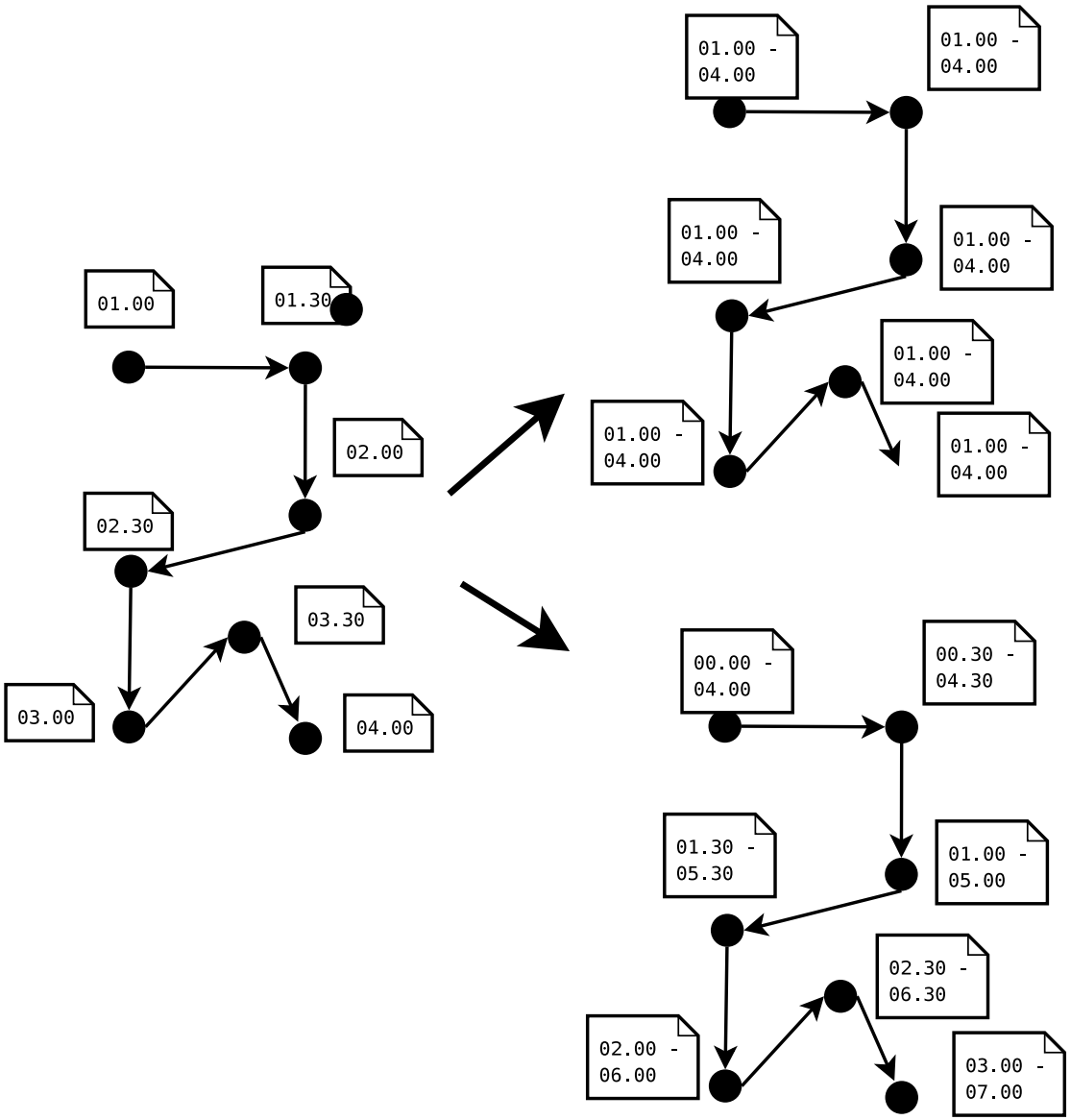
Protection Schemes & Types

Protection Types

1. Area containing POI (spatial)
2. k-anonymity (spatial)
3. Timeframe containing the POI and its visitation time. (temporal)
4. t-anonymity (temporal)

Protection Schemes

- AS - Always Sensitive.
- ASTI - Always Sensitive within a time interval.
- RS - Rarely Sensitive.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00.30 - 04.30
01.30 - 05.30
01.00 - 05.00
02.30 - 06.30
02.00 - 06.00
03.00 - 07.00

POI Types

POI type	Protection type	Scheme
Hospital	1,3	AS
Private home (house)	1-3	ASTI, RS
Neighborhood	1,3	ASTI, RS
City part	1,3,4	ASTI, RS
City	1,3	ASTI, RS
Route w/o endpoints	1,3	AS, ASTI, RS
Route w. endpoints	1-4	AS, ASTI, RS

1. Area containing POI
2. k-anonymity
3. Timeframe containing the POI and its visitation time.
4. t-anonymity

Settings

Users Can

- Set Temporal sensitivity
- Set Spatial sensitivity
- Define which edges in a road map that a POI covers
- Set the scheme to be used with a POI
- Can have multiple profiles.

Conclusion

- Novel Privacy Profile to specify spatial-temporal sensitivity of a POI.
- Introduced t-anonymity
- Introduced Protection types and schemes.

Future Work

- Algorithm
- Performance study

End of Presentation

Thank You For Listening