

Warehousing and Querying Trajectory Data Streams With Error Estimation

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- Trajectory Data
- Prime Numbers Encoding for Paths
- Warehousing Steps
- Experimental Evaluation
- Conclusions

Outline

- Data Pertaining to time and position of moving objects
 - GPS systems
 - Traffic management
- Two dimensional
 - In general partitioning is a well accepted solution
 - Segmentation
 - Regioning

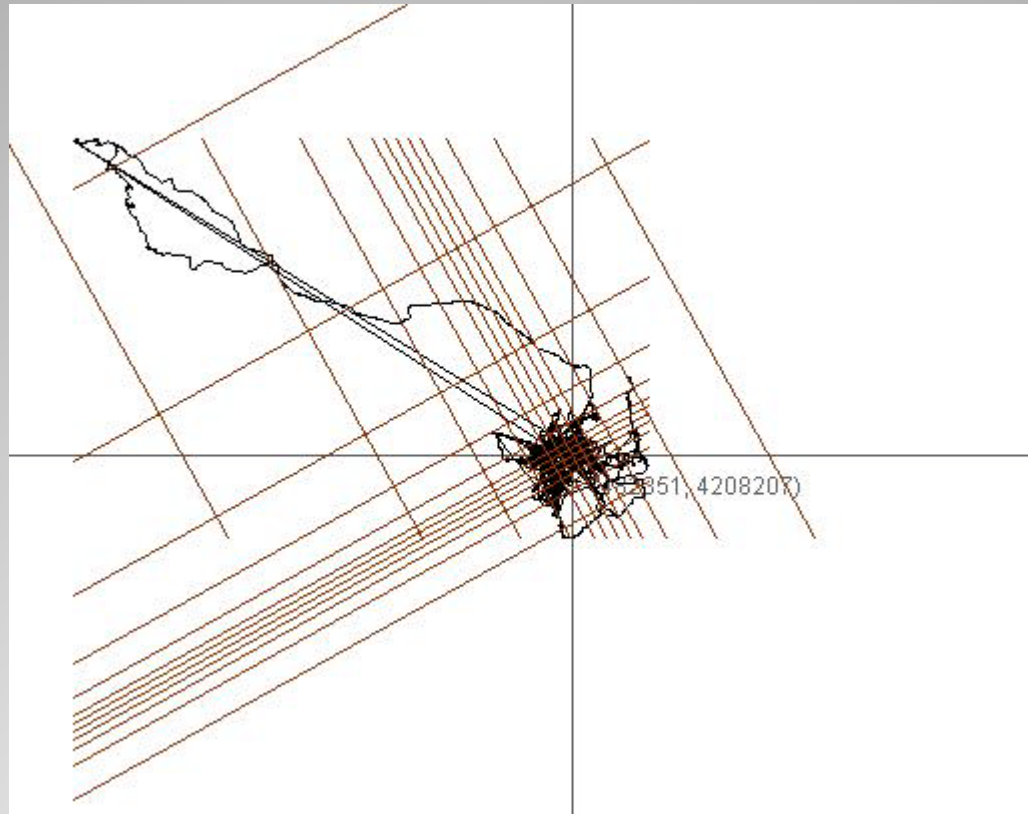
Trajectory Data



Trajectory Data

- Regioning
 - IPCA: Identifies Preferred Directions for Data
 - Differential Regioning
- Prime Number Encoding:
 - Trajectories represented as products of prime numbers

**Our Solution: Regioning+
Encoding**



Regioning: regions close to principal directions are finer

- $T1 = ABC$ crossing three regions A, B, C . Assign to regions A, B and C respectively the prime numbers $3, 5, 7$
- For trajectory $T1$ the witness $W1$ is 52 since $52\%3 = 1 = pos(A)$ and $52\%5 = 2 = pos(B)$ and $52\%7 = 3 = pos(C)$
- Store the encoded trajectories using a binary tree

Encoding: prime numbers

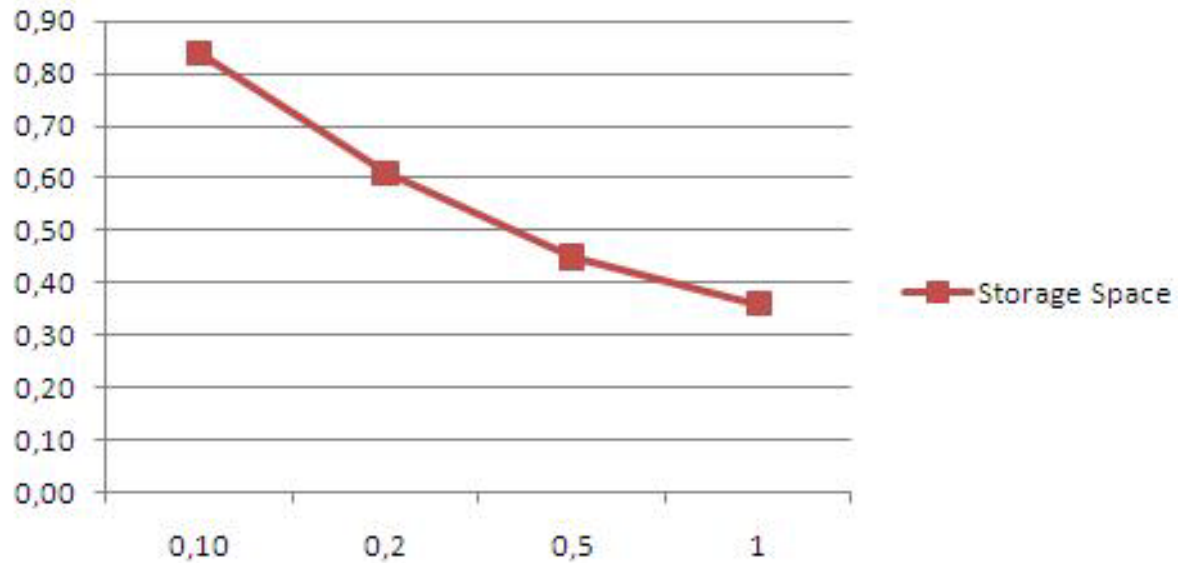
- Building Specialized cuboids: TRAC
 - Distinct Count Problem
- Measures
 - the number of distinct trajectories (*Intersections*),
 - the average traveled distance (*Distance*),
 - the average time interval duration (*Duration*)

Trajectory Warehousing

- Precomputed cuboids pertaining to most interesting recent data
- Merging cuboids at different granularity levels when needed
- Iceberg assumption

TRACs

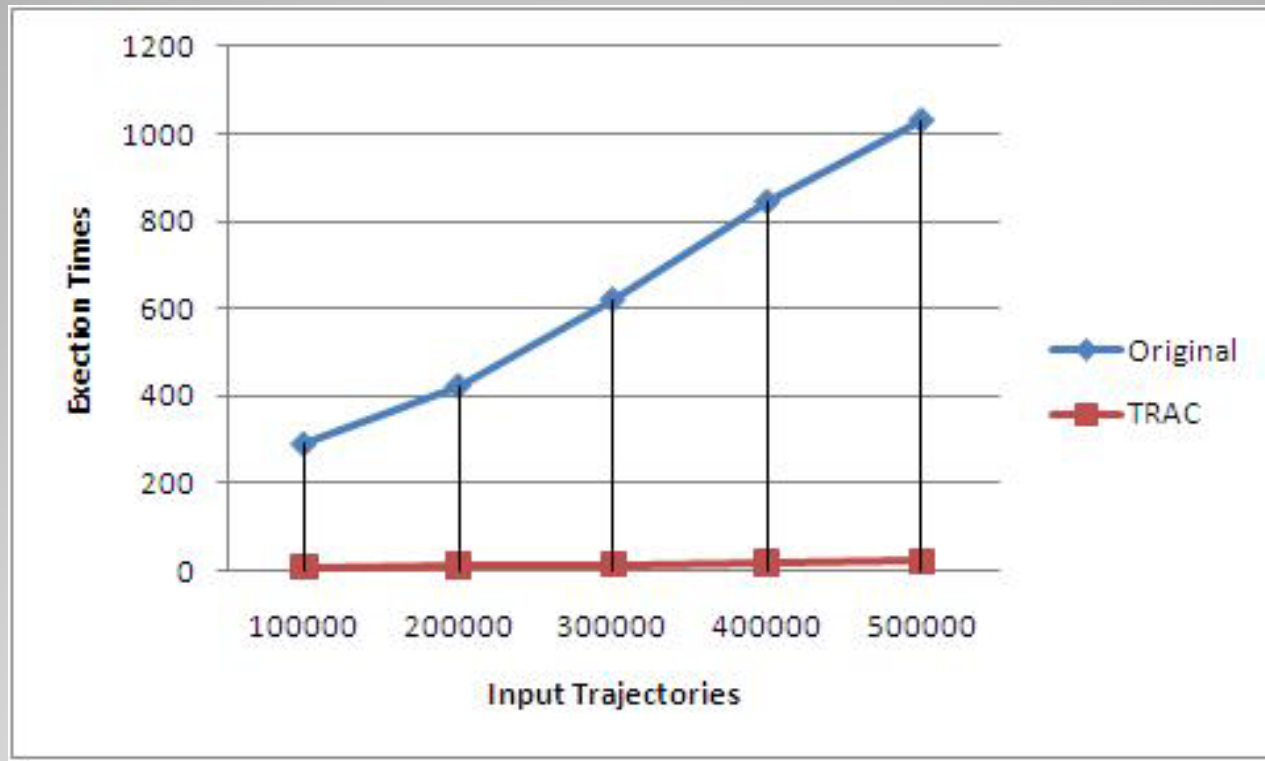
Space vs Region Dimensions



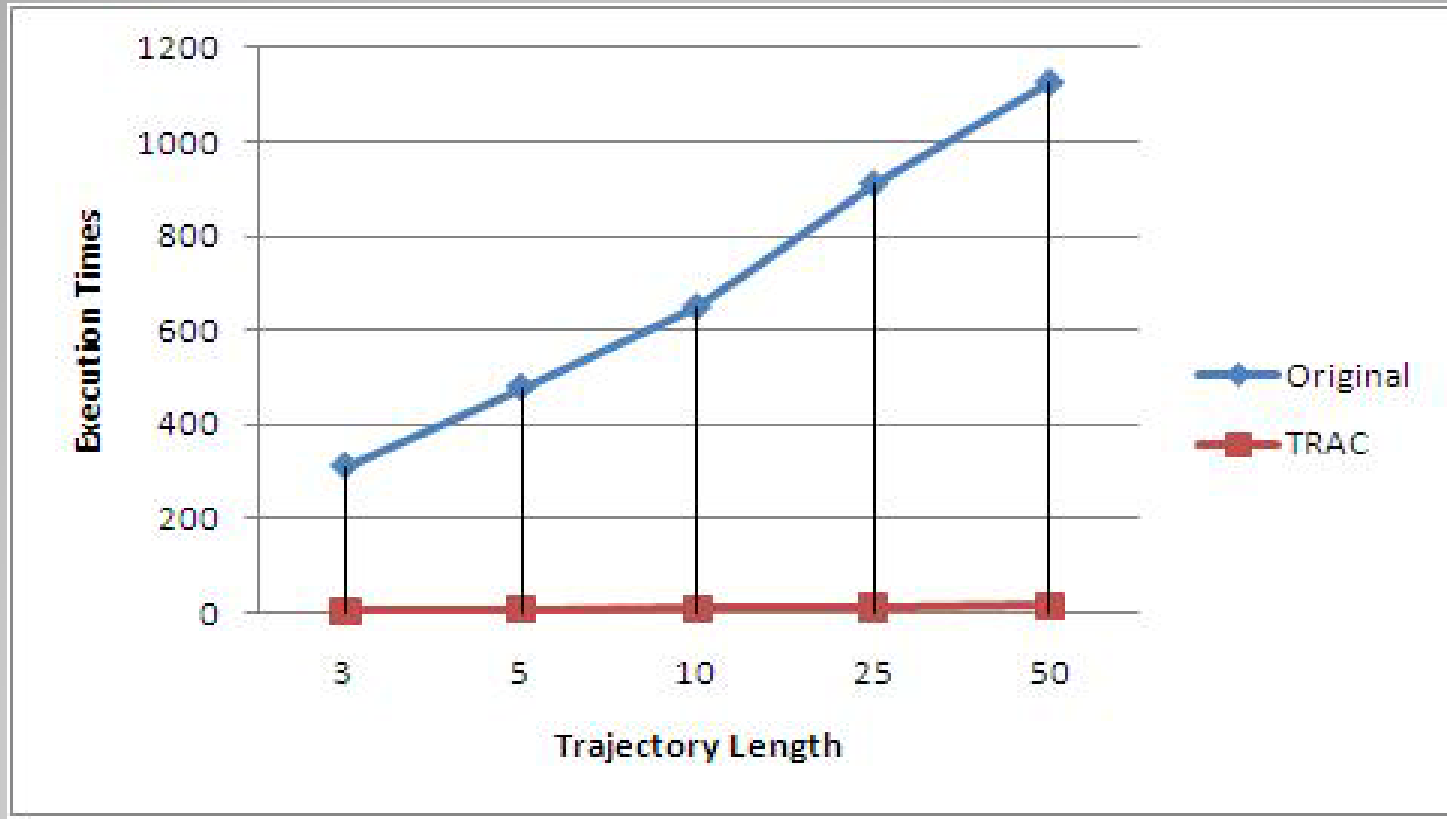
Performances



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Performances

- Data reduction by regioning
- Efficient Querying via Encoding
- Warehousing in order to allow trajectory querying effectively
- Good performances
 - Accuracy
 - Efficiency

Conclusions