ChoroChronos

A research network for spatio-temporal databases

EU FP4-TMR research network (1996-2000); www.dblab.ntua.gr/~choros/

"… allow European researchers working on **spatial** and **temporal databases** to achieve a higher understanding of each other's work, integrate their results and methodologies, and advance the state of the art in this area … This will culminate in the design and partial implementation of an architecture for **Spatiotemporal Database Systems** (STDBMS). …"
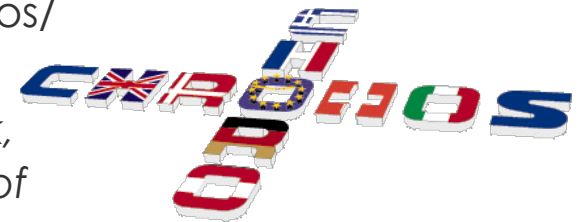
- Frank AU, et al. (1999): Chorochronos: A Research Network for Spatiotemporal Database Systems. SIGMOD Record 28(3): 12-21.

- Güting RH, et al. (2000): A foundation for representing and querying moving objects. ACM Trans. Database Syst. 25(1): 1-42.

- Koubarakis M, et al. (2003): Spatio-Temporal Databases: The CHOROCHRONOS Approach. LNCS 2520, Springer.

$$T = \{ \langle p_1, t_1 \rangle, \langle p_2, t_2 \rangle, \ldots, \langle p_n, t_n \rangle \}$$
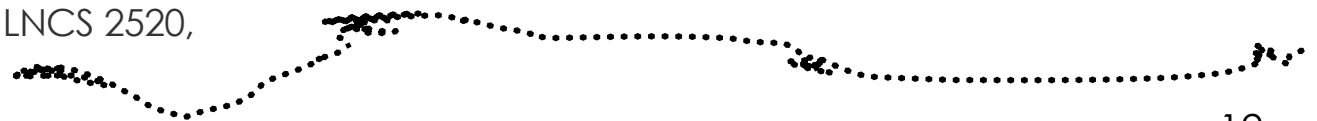
GeoPKDD / MODAP

Geographic privacy-aware knowledge discovery and delivery
EU FP6-IST research project(2005-2009)

*"… develop theory, techniques and systems for **geographic knowledge discovery** and delivery, based on new **privacy-preserving methods** for extracting knowledge from large amounts of raw data referenced in space and time. …"*

Mobility, data mining, and privacy; FP7-ICT project (2009-2013)

*"… stimulate an interdisciplinary research area combining a variety of disciplines such as **data mining**, **geography**, **visualization**, **data/knowledge representation**, and transforming them into a new context of mobility while considering privacy which is the social aspect of this project. …"*

- Giannotti F & Pedreschi D (2008): Mobility, Data Mining and Privacy - Geographic Knowledge Discovery. Springer.

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MOVE

Knowledge discovery from moving objects
EU COST-ICT research network (2009-2013)

*"… develop improved methods for **knowledge extraction from massive amounts of data regarding moving objects**. …"*
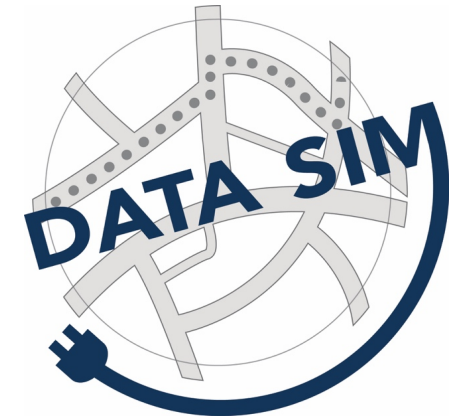
- Andrienko G et al. (2013): Visual analytics of movement. Springer.
- Parent C, et al. (2013): Semantic trajectories modeling and analysis. ACM Comput. Surv. 45(4): 42:1-42:32.
- Pelekis N & Theodoridis Y (2014): Mobility data management and exploration. Springer.
- Renso C, et al. (2013): Mobility Data: Modeling, Management, and Understanding. Cambridge University Press.

DATASIM

Data science for simulating the era of electric vehicles
EU FP7-ICT research project(2011-2014)

*"… providing an entirely new and highly detailed **spatio-temporal microsimulation methodology for human mobility**, grounded on massive amounts of **big data** of various types and from various sources, with the goal to forecast the nation-wide consequences of a **massive switch to electric vehicles** …"*

- Andrienko N & Andrienko G (2012) A visual analytics framework for spatio-temporal analysis and modelling. Data Mining and Knowledge Discovery, 27(1), 55-83..

- Bellmans T et al. (2012): An Agent-Based Model to Evaluate Carpooling at Large Manufacturing Plants. Procedia Computer Science, 10, 1221-1227.

- Knapen L et al. (2012) Analysis of the co-routing problem in agent-based carpooling simulation. Procedia Computer Science, 10, 821-826.
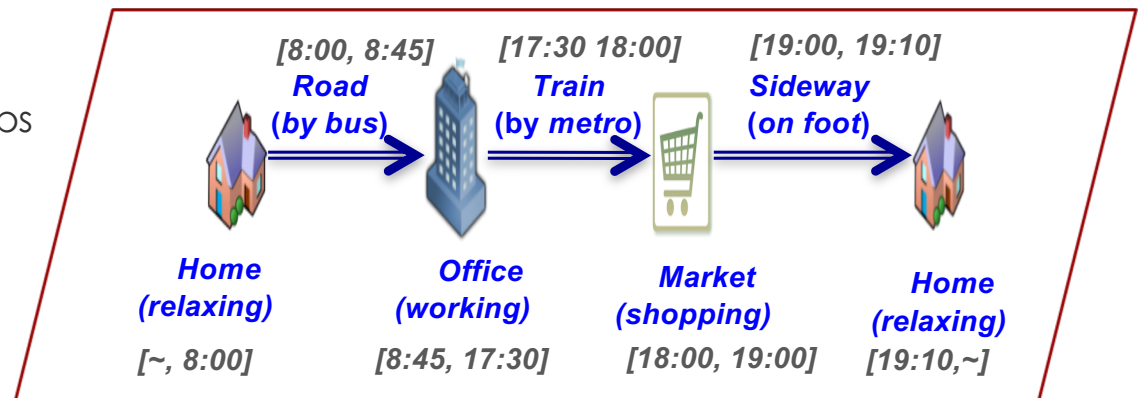
SEEK

Semantic enrichment of trajectory knowledge discovery
EU FP7-PEOPLE research network (2012-2015)

"… *A **flood of data pertinent to moving objects** is available today, …*
Behavioral patterns can be extracted through a knowledge discovery process
where positioning data collected from mobile devices are first transformed in
***semantically enriched trajectory data** stored in a database …*"

- Parent C, et al. (2013): Semantic trajectories modeling and analysis. ACM Comput. Surv. 45(4): 42:1-42:32.
- Pelekis N et al. (2016): Simulating our LifeSteps by example. ACM Transactions on Spatial Algorithms and Systems, 2(3), article nr 11.

| *[8:00, 8:45]* | *[17:30 18:00]* | *[19:00, 19:10]* |
| *Road (by bus)* | *Train (by metro)* | *Sideway (on foot)* |

Home (relaxing) *Office (working)* *Market (shopping)* *Home (relaxing)*

[~, 8:00] *[8:45, 17:30]* *[18:00, 19:00]* *[19:10,~]*

datACRON / DART

Big data analytics for time-critical mobility forecasting
EU H2020-ICT research project(2016-2018); datacron-project.eu

*"… develop novel methods for **real-time detection and prediction of trajectories** and important events related to moving entities, together with advanced visual analytics methods, **over multiple heterogeneous, voluminous, fluctuating, and noisy data streams** from moving entities …"*

Data-driven aircraft trajectory prediction research
EU H2020-SESAR research project (2016-2018); dart-research.eu

*"… deliver understanding on the suitability of **applying big data techniques for predicting multiple correlated aircraft trajectories** based on data driven models and accounting for ATM network complexity effects. …"*

- Andrienko G et al.. (2018): Clustering Trajectories by Relevant Parts for Air Traffic Analysis. IEEE Transactions on Visualization and Computer Graphics, 24(1), 34-44.
- Vouros GA, et al. (2018): Big Data Analytics for Time Critical Mobility Forecasting: Recent Progress and Research Challenges. EDBT 2018: 612-623.

Track & Know

Big data for mobility tracking knowledge extraction in urban areas
EU H2020-ICT research project (2018-2020); trackandknowproject.eu

*"… research, develop and exploit a new **software framework**
that aims at increasing the efficiency of Big Data applications
in the **transport, mobility, motor insurance and health sectors** …
Track&Know integrates multidisciplinary research teams from
Mobility Data management, Complex Event Recognition,
Geospatial Modelling, Complex Network Analysis, Transportation Engineering and
Visual Analytics to develop new models and applications. …"*

- Li J et al.. (2018): COPE: Interactive exploration of co-occurrence patterns in spatial time series. IEEE Transactions on Visualization and Computer Graphics, 25(8), 2554-2567.

- Markovic N et al.. (2018): Applications of trajectory data from the perspective of a road transportation agency: Literature review and Maryland use case. IEEE Transactions on Intelligent Transportation Systems, 20(5), 1858-1869.

MASTER

Multiple aspects trajectory management and analysis
EU H2020-RISE research network (2018-2022); www.master-project-h2020.eu

*"… An ever-increasing number of diverse, real-life applications, ranging from mobile phone calls to social media and land, sea, and air surveillance systems, produce **massive amounts of spatio-temporal data representing trajectories of moving objects**. Trajectories … can be enriched and are evolving to more comprehensive and semantically significant objects. In the MASTER project we envision **holistic trajectories**, meaning trajectories characterized by the fact that **the spatio-temporal and semantic aspects are intimately correlated and should be considered as a whole**…"*
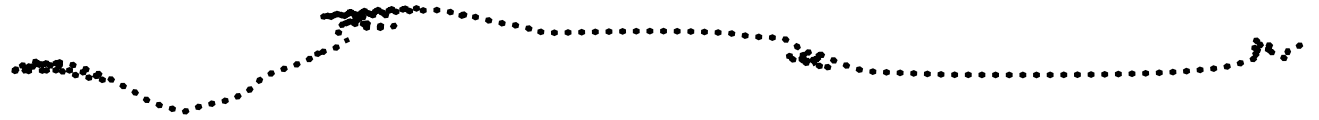
- dos Santos Mello R et al. (2019): MASTER: a multiple aspect view on trajectories. Transactions in GIS.

- Petry LM et al. (2019): Towards semantic-aware multiple-aspect trajectory similarity measuring. Transactions in GIS.

As time passes…

- From ChoroChronos ....

$$T = \{ <p_1, t_1>, <p_2, t_2>, …, <p_n, t_n> \}$$

- … to MASTER

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