

Preface

Still, a majority of GI systems persist to be static. We are focused on a precise and accurate description of 2D or 3D reality, but many applications disregard temporal development and continuous changes in system, data, models, and relationships. Even for capturing reality in time series, inefficient forms of storage, retrieval, processing, analysing, modelling, and visualisation are still frequently applied.

Time is the key element of contemporary GIS. Mobile and wearable electronics, sensor networks, UAVs and other mobile snoopers, IoT, and many other resources produce a massive amount of data every minute, which is naturally located in space as well as in time. While we are observers of usually mild improvement of spatial resolution of our data, we face substantial improvement of its temporal resolution. More frequent remotely sensed imagery, statistical data, or environmental measurements change our view of the world. Data time series are transformed into almost (from the human perspective) continuous data streams, which require changing of the concept of spatial data recording, storage, and manipulation.

However, dynamics is not bound only by sometimes elusive human mobility data. The long tradition of environmental monitoring, statistical surveys, or business records has produced series of scenes, each valid only for some shorter or longer time interval. The analysis and modelling of the dynamics have to overcome a stepwise approach. The temporal dimension is required to become an integral part of the system; otherwise, it is unable to fully understand the dynamics of human–environment interactions, to generate sophisticated predictions and to take appropriate measures.

Although time geography was established 50 years ago, the transformation from visual language into a full spatio-temporal information system is still limited. Dynamic spatial systems require solutions to many issues, such as efficient dealing with repeated spatial data; the archiving of historical data sets and retrieving data from archives; matching various spatial data snapshots to create a time-consistent model; quality conceptualisation and reproduction of spatio-temporal processes; detection of spatio-temporal patterns and spatio-temporal hot spots with appropriate inclusion of mutual interaction of space and time; analysis of individual group dynamics; distinguishing global and local changes; detection of changes in spatial

patterns over time; measurement of interactions between moving objects; visual exploration of large spatio-temporal datasets; and/or predictions of data movement.

Issues of dynamics do not stand alone. Extension of spatio-temporal systems and applications is accompanied by acquisition of usually heterogeneous and inconsistent resources, sometimes also influenced (highly determined) by social characteristics of the local context. The fundamental question is how to protect the privacy of sensitive spatio-temporal data from human monitoring. The large societal impact may be made through the release of Open Spatio-Temporal Data to support wide-scale research and public participation.

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