



Geovisualization and time

new opportunities for the space-time cube

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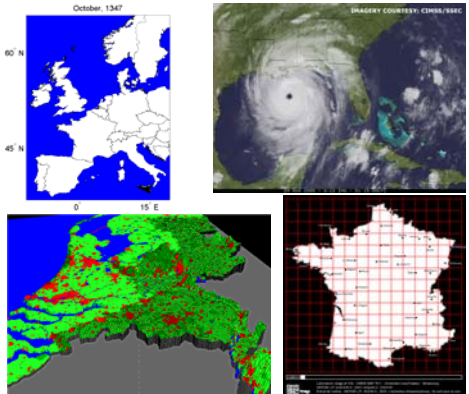


Geovisualization and time

new opportunities for the space-time cube

- Introduction
- Geovisualization
- STC - time geography
- STC - applications
- STC - approach
- STC - Google Earth options
- Conclusions


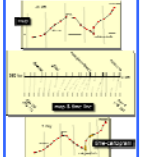
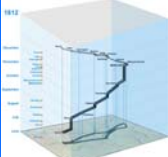





Interest in time

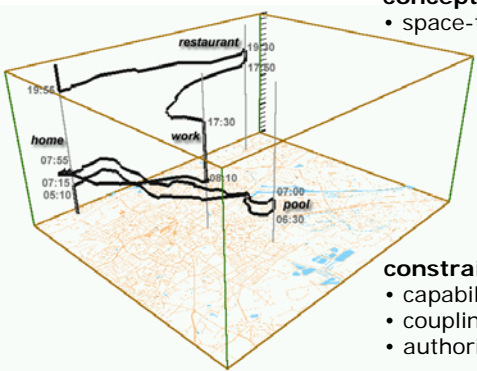




Hägerstrand's time geography

- Time as a measurement of human activity
what did people do and how long did it take?
- Time as a measure of distance
 - isochrones (lines of equal temporal distance)
 - chrono-geographic representation (space time cube)

Space-Time-Cube





concepts

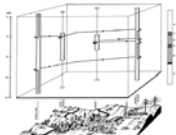
- space-time-path

constraints

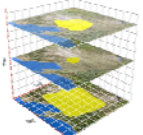
- capability
- coupling
- authority

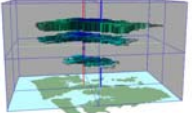
A selection of applications




(parks-thrift, 1980)




(johnson, 2000)



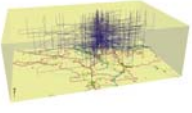
(forrer, 1998)





(moore et al, 2003)



(andrienko, 2002)



(kwan, 2000)

Minard's data in a Space-Time-Cube

The image shows a 3D visualization of Minard's data. A blue path is shown in a 3D space, representing the movement of Napoleon's army. An inset shows a 2D map of the path, with a red line indicating the route. The 3D view shows the path rising and falling, representing the changing size of the army over time and space.

Geovisualization environment

- Different maps and other graphics are used to stimulate (visual) thinking about geospatial patterns, relationships and trends because it offers an alternative view on geospatial data sets
- The Space-Time-Cube is only one possible representation of spatio-temporal data in a geovisualization environment

The image shows a postage stamp with a portrait of a man and a globe. The stamp is from the USA and has a value of 32 cents. It is part of a collection of stamps related to geovisualization.

Geospatial data at work

The image shows a map of a region with various locations marked. A legend on the left lists locations such as 'Ridders', 'baarle', 'rigoloto', 'floris', 'herzog', 'roofruider', 'calleja', 'Geschiedenis', 'kastelen hertog van gelre', 'leger', 'herzogin', 'Frankrijk', 'haarlemmermeer', 'herzogdom', and 'castle'. A timeline at the bottom shows the years 1515 and 1583.

Space-Time-Cube and different types of time

The image shows a 3D visualization of a Space-Time-Cube. The vertical axis represents time, with a legend below it showing different historical periods: 'archaic' (400-300), 'classic' (300-0), 'hellenistic' (0-300), and 'roman' (300-2000). The horizontal axis represents excavation time, with a legend below it showing different excavation methods: '1800', '1900', '2000', and 'excavation time'.

[with Alexandra Kousoulakou]

Space-Time-Cube and cultural heritage

The image shows a 3D visualization of a Space-Time-Cube. The vertical axis represents time, with a legend below it showing the years 1870 and 1980. The horizontal axis represents space, with a legend below it showing '1870' and '1980'. The 3D view shows a map of a city with various buildings and structures, representing cultural heritage data.

Space-Time-Cube and public transport

The image shows a screenshot of a software interface for public transport data visualization. The interface includes a 'Time box' with a 'Dayst' dropdown menu, a 'Hourline' chart, a 'Layers' panel, and a 'Tool box'. The main view shows a 3D visualization of a city with public transport routes and stations.

[Yedendra Babu Shrinivasan]

Space-time-cube and tracking objects

[Ulanbek Turdukulov]

Space-Time-Cube and Multiple linked views

Trackpoint	012	013	014	015	016	017	018	019	020	021	022	023	024	025	026	027	028	029	030	031	032	033	034	035	036	037	038	039	040	041	042	043	044	045	046	047	048	049	050	051	052	053	054	055	056	057	058	059	060	061	062	063	064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079	080	081	082	083	084	085	086	087	088	089	090	091	092	093	094	095	096	097	098	099	100
Trackpoint	012	013	014	015	016	017	018	019	020	021	022	023	024	025	026	027	028	029	030	031	032	033	034	035	036	037	038	039	040	041	042	043	044	045	046	047	048	049	050	051	052	053	054	055	056	057	058	059	060	061	062	063	064	065	066	067	068	069	070	071	072	073	074	075	076	077	078	079	080	081	082	083	084	085	086	087	088	089	090	091	092	093	094	095	096	097	098	099	100

Toys for sports

GPS Visualizer

- Home
- Calculators & routes
- EAD
- DRAW A MAP
- Geolocate an address
- Examples
- DRAW A PROFILE
- Google Earth overlays
- GPS links
- CONVERT A FILE
- Split a Garmin file
- GPSTraker

Ads by Google: Topographic Maps, Topo Maps, Garmin GPS Maps, GPS Mapping

Do-It-Yourself Mapping

GPS Visualizer is a free, easy-to-use online utility that creates maps and profiles from GPS data (tracks and waypoints), street addresses, or simple coordinates. Use it to see where you've been, plan where you're going, or visualize geographic data (business locations, scientific observations, events, customers, real estate, etc.).

GPS Visualizer can read data files from many different sources: GPX, OziExplorer, Geocaching.com (.loc), IGC sailplane logs, Garmin ForeRunner (.gml/.hnt), Timex Trainer (.v1.3+), Cetus GPS, PathAway, cotaGPS, CompuGPS, TomTom (.gpx), IGC Bando (.rdn), Entac, Trine, Suunto X9/X9i (.sdf), NetStumbler/WiFiForum, and of course tab-delimited or comma-separated text. You can also enter waypoint data or street addresses manually, if you just need to plot a few points.

GPS Visualizer can draw maps in SVG, JPEG/PNG, and Google Maps format, and can also create map overlays and KML files for Google Earth. For non-Google maps, GPXs are easier to deal with, but SVGs are interactive -- to view them, make sure you've installed Adobe's free SVG Viewer plug-in. (NOTE: if you're using Mozilla or Firefox for Windows, you'll need to download the latest beta version of the plug-in.)

To the left is a map that was created by GPS Visualizer (click to enlarge). You may also want to check out the other examples of GPS Visualizer's output, or a sample SVG map (if you have the plug-in installed).

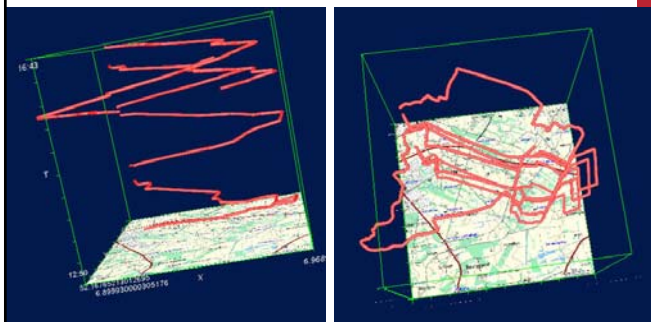
Draw a map · Draw a profile
(Help links are available on the next page)

STC-working environment (gpx-input)

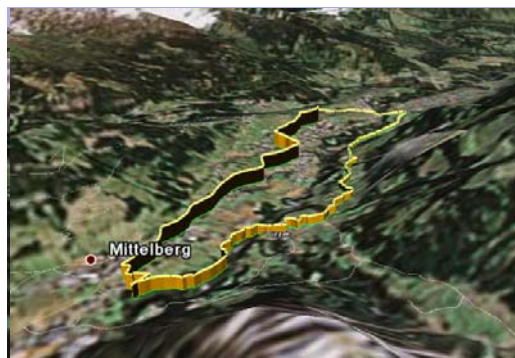
STC - basic functionality

STC in action

STC and multiple runs



STC + google in the mountains



Challenges

Functionality

- how to reveal patterns
- what about non-trajectory data
- does it answer all temporal questions

Usability aspects

- can the user understand the cube when multiple space-time-paths are displayed?
- overall context: how many multiple linked views can the user handle?