

Geo-temporal Visual Analysis

Arianit Kurti

arianit.kurti@msi.vxu.se

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Visual Analytics

Outline

- Introduction
- Concept keywords
- Overview of current research efforts
 - Visual analytics of Paleoceanographic conditions (Theron, 2006)
 - Visual Analysis of Historic Hotel Visitation Patterns (Weaver et al., 2006)
 - Avian Flu Case Study with nSpace and GeoTime (Proulx et al. 2006)
 - FemaRepViz: Automatic Extraction and Geo-Temporal Visualization of FEMA National Situation Updates (Pan and Mitra, 2006)
- Summary
- Discussion

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Outline

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Introduction

- The real problem that today's industry is facing is the vast amount of data.
- The challenge is to find tools and techniques to represent these data in a way that would easily make sense.
- The goal of visual analytics is to enhance human being's acquisition of insight into abstract data. (Spence, 2001)

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Introduction

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Concept keywords

- Information visualization discipline that deals with relating of abstract data with the geo-location is geo-temporal analysis.
- Visualization is => "The use of computer supported, interactive, visual representation of data to amplify cognition" (Kerren, 2007)
- Geo temporal visualization uses the underlying geo-information (spatial and temporal aspects of data) as layered representation.

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Concept keywords

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Overview of current research efforts

- Geo-temporal visualization can be used in different domains: meteorology, service economy, medicine, oceanography etc.
- There are different tools available for performing geo-temporal analysis.
- List of different tools free and commercial can be found at: <http://iv.homeunix.org/software.php>

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Overview

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Visual analytics of Paleoceanographic conditions (Theron, 2006)

- Motivation:
 - Natural disasters prediction and damage minimization
- The data set:
 - High integration of different data sets from sources like ocean drilling, ocean tracers, astronomic curves etc.
- Data transformation:
 - Modern Analog Techniques based on a nearest neighbor prediction
- The software tool used:
 - PaleoAnalog, a Java-Based program. (free)
<http://carpe.usal.es/>

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Representation and interaction

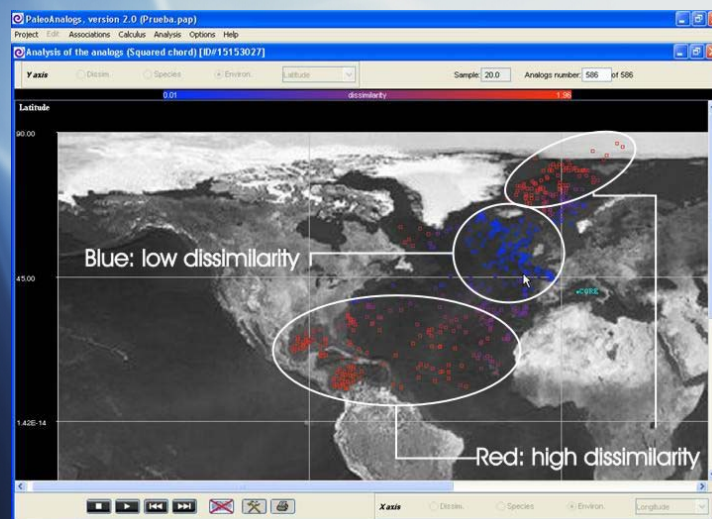
- Space and time reasoning
- Focus+Context
- Filtering and Axis interaction
- Animation
- Brushing
- Parallel coordinates

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Analogs geographic distributions



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Visual Analysis of Historic Hotel Visitation Patterns (Weaver et al., 2006)

- Motivation:
 - Exploration and patterns development using archived document (hotel guest registry)
- The data set:
 - Entire hotel guest registry of Rebersburg Hotel Between June 1898 and November 1900.
- Data transformation:
 - A glyph-based technique called reruns
- The software tool used:
 - Improvise, a Java-based software (Open Source)
<http://www.personal.psu.edu/faculty/c/e/cew15/improvise/>

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Hotel visualization interface

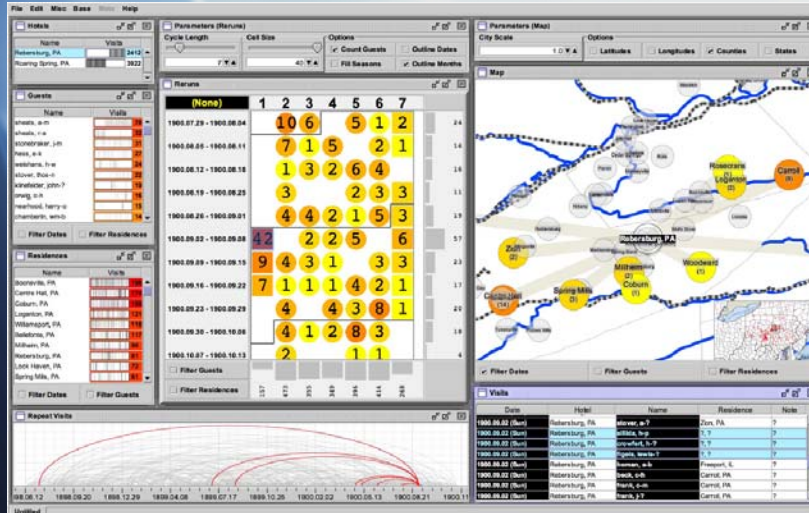
- Table view
 - Guests
 - Residence
- Reruns view
 - Total visits on each day
 - Histograms for summarized data
- Multi-layer map
 - Crow-flies path
- Arc diagrams
 - Repeated visits
- A drill-down table view
 - Individual registry entries

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The hotels visualization



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Avian Flu Case Study with nSpace and GeoTime (Proulx et al. 2006)

- Motivation:
 - Epidemiology analysis
- The data set:
 - Publicly available data from internet sources (text based data)
- Data transformation
 - TRIST (The Rapid Information Scanning Tool) and Sandbox.
- Software tools used:
 - GeoTime and nSpace

GeoTime Demo:

http://www.oculusinfo.com/Taxi_Nov28.htm

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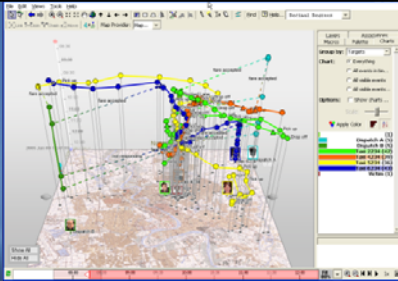
nSpace and GeoTime

- nSpace is a analytic tool that combines several visualization techniques to create a unified workspace.
- GeoTime a tool for concurrent temporal and spatial analysis
 - Events are in a X, Y and T coordinating space.

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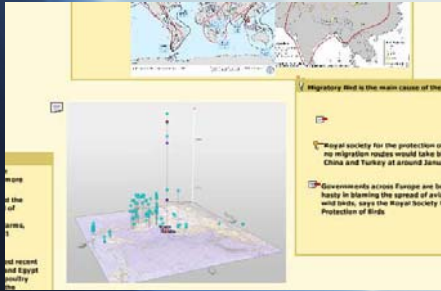
13



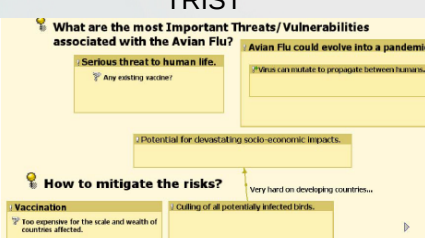
GeoTime



TRIST



nSpace



Sandbox

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Stories in GeoTime (Eccles et al., 2006)

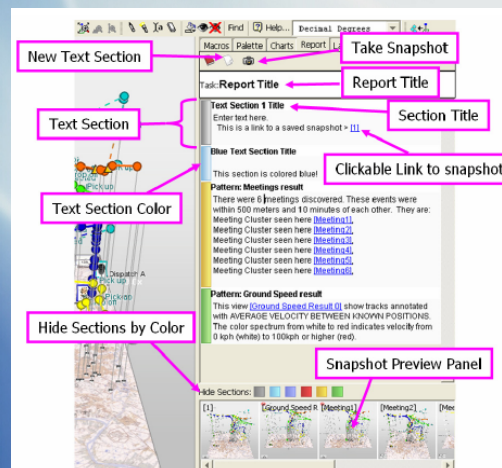
- Related to previous paper. Same tools used.
- Extension of GeoTime software with a story system that would help the analyst to identify, extract, arrange and present stories within data.
- Main component story window that enables to present the stories about events in time and space.

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The story window in GeoTime Scene



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FemaRepViz (Pan and Mitra, 2006)

- Motivation:
 - Natural disasters warning systems
- Data set:
 - Daily report from FEMA website
- Data transformation:
 - Creation of concept maps and geo-temporal visualization from extracted text
- Software tool used:
 - FEMARepViz (it seems to be a closed authors tool)

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Information extraction

- Information Extractor using FactXtractor that is based on GATE
 - (General Architecture for Text Engineering)
<http://gate.ac.uk/>
- Use of GeoTagger as a geocoding web service.
 - Mapping of the location name to its geographic coordinates
- Striped dependency tree
 - At least one node is a relation argument

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Processed FEMA national situation updates



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Summary

- Different visualization tools:
 - Open Source and free
 - PaleoAnalog
 - Improvise
 - Commercial
 - GeoTime
 - Other
 - FemaRepViz

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Summary

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Discussion

- In all recent projects there is a close space-time relation.
- Some of the tools have geo-information layer (map) locally some of them “outsource” from commercial and free GIS systems (ESRI, GoogleMaps, GoogleEarth)
- All the tools are domain independent.
- All tools tend to offers new techniques to support decision-making.