Anatomy of a Visualization-On-Demand Server

A Service Oriented Architecture to Visually Explore Large Data Collections

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LIRIS – Information Systems & Image Laboratory
- +280 researchers
- Located in Lyon, France
- More info: http://liris.cnrs.fr/

Project’s areas of research:
- Information Visualization (Infovis)
- Human/Computer Interactions (HCI)
- Personalization

Project goal: Reusing user characteristics to build novel visual interactive environments.

Funded by French Ministry of Research 2006-2009
Producing (interactive) visual representations of abstract data to reinforce human cognition and perception

http://www.infovis-wiki.net/

- Pluri-disciplinary

- Successful Cases
  - Finance
  - Log monitoring
  - Social Network Analysis
  - Visual Data mining
  - ..

http://www.visualcomplexity.com/
Context – Infovis/HCI Data Pipeline

Data (query result..)

Selection (keyword..)

Layout (graph..)

Rendering (image..)

Mandatory in order to produce any visually interactive environment
Example – IMDB Visualization

+10 000 movies

Edges are movies and keywords

Auto-organized graph layout

Multi-resolution approach

Details on demand
Sequence diagram

User

Data

Application

Procedure call

Libraries

Data source choice

Web Interface

Data extraction

Data selection

Data structure transfer

Data layout

Graph Library

Time consuming!!

2D rendering

Interactive Environment

3D rendering

2D rendering transfer

3D rendering

Visualization

Data access

Data perception

Image Rendering Library
Context – Global trends

- We live in an open Information Society
  - Relentless information volume and size increase
  - Broader range of users

+ Brand New usages
  - Anywhere, anytime, device, context.
  - Web 2.0 – users becomes producers

= How to survive or be reactive enough in such an environment?
  - Developer
  - Researcher
  - User
Study Case – Developer

We are stuck with private and local environments

Conferences Articles (CHI, Infovis, Vis, ..)

Diversity is good.. but requires variety of skills (=time=€)!

V4Miner pour la fouille de données
Thanh-Nghi Do and Jean-Daniel Fekete

http://www.cs.umd.edu/hcil/jazz/
How to evaluate of a single step of the flow?

FROM:....

Dear all,

It is our pleasure to announce our latest software release for cohesive subgraph visualization available for download at:

http://www.comp.nus.edu.sg/~atung/csv_binary.zip

This is an implementation of our algorithm described in [1] and have potential application for visualizing large graphs like social network, protein-protein interaction graphs etc.

Regards,
....

Study case – User

CHI 2008 Panel: The Next Challenge: from Easy-to-Use to Easy-to-Develop. Are You Ready?

The main challenge of next years is to allow users of software systems, who are non-professional software developers, to create, modify or extend software artefacts.

http://services.alphaworks.ibm.com/manyeyes/
**Study Case – Summary**

Why not letting people focus on what they are good at?

- **Developer:** programming, code reusing in multi-environment
- **Researcher:** test/evaluate contribution in a complete dataflow
- **User:** become producers

How to make it less monolithic? And reuse parts assembled in another way? How to reuse existing solutions without starting again a new development cycle?
Our approach

Visualization as a service
Our approach – (still early work)

- Cutting the data pipeline into smaller independent steps
  - Steps become reusable black boxes
  - Input/Output publication

- Services are available at a remote location
  - Description of reliability, evaluation, ..
  - Centralization of computing efforts, maintenance, ..
  - Reusable regardless the context

FROM private/tightly coupled knowledge TO shareable one

- Visualization On-Demand (analogy to VoD)
  - Reuse VoD architectures contribution
  - Quality of visualization (QoViz)
From local functions..

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Interactive Environment

Visualization

Data access

Data perception

2D rendering

2D rendering transfer

3D rendering

2D rendering

Graph Library

Image Rendering Library

Time consuming!!
... to remote services

Local

User

Data

Application

Remote

Server

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2D rendering

Image Rendering Library

3D rendering

2D rendering transfer

Visualization

Data access

Data perception
All is about tradeoff

Main Issues become:

- Tradeoff between local and remote (computation time, bandwidth, availability, ..)
- New Tools: API, playground, application samples.
Implementation – VizOD API

DEMO: API use

RPC Call
- REST XML answer (ID graphml, URL des données)
- HTTP GET and POST communication

- **sendFile**: sending data
- **modifyGraph**: graph attributes modification
- **getGraph**: graph retrieval
- **getStatistics**: file size, computing time
- **getHistory**: graph history, performed actions
- **filterImage**: image analysis
Implementation – Playground

Demo: create your own graph

Quickstart to the API

Debugging interface
Conclusions

- **Our contribution**: Visualization as a service (VizOD)
  - A Information Systems paradigm applied to Infovis/HCI
    - Cross field approach
    - Let room to implementation! (such as a library, pattern, book, ..)
    - Knowledge reuse, fostering innovation

- **Next step**: Reusing user characteristics to build novel visual interactive environments
  - We now have elements or “bricks” – needs for architects!
  - Towards a Visual User Profile (VizUP)
Perspectives

- Keep working on service formalization
  - RDF description
  - Mashup-like interface

- New *evaluation* methods?
  - How to evaluate the results? (forms? statistics? Long term evaluations?..)
  - How to reinforce the system?

- New *business* model?
  - Service can be of high add-value
  - Resource (such as Amazon Service)
Contribute!

- If you have a brick (format conversion, graph layout algorithm, image analysis technique, ..)
- If you want to assemble bricks
- If you want to evaluate bricks assembly
- …

Towards an open platform
- Unique service directory
- Sharing library evaluation, mashups, ..

API Release: fall 2008
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Thank You!

Any question?