Activity Report 2012

Project-Team AVIZ

Analysis and Visualization

RESEARCH CENTER
Saclay - Île-de-France

THEME
Interaction and Visualization

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Project-Team AVIZ

Keywords: Visualization, Data Analysis, Interaction, Collaborative Work, Perception, Evolutionary Algorithms

Creation of the Project-Team: February 08, 2007 , *Updated into Project-Team:* January 01, 2008 .

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2. Overall Objectives

2.1. Objectives

All human activities are being transformed by our rapidly increasing abilities to collect, manage and understand vast amounts of data. A 2003 study estimated that the amount of data produced in the world was increasing by 50% each year [1]. According to SearchEngineWatch [2], the amount of information made available through Internet search engines has grown exponentially for the last decade, and major Web search engines currently index more than 2 billion documents. However, since our brains and sensory capacities have not evolved in the meantime, gaining competitive advantage from all this data depends increasingly on the effectiveness with which we support human abilities to perceive, understand, and act on the data.

[1] Peter Lyman and Hal R. Varian. How much information. Retrieved from http://www.sims.berkeley.edu/how-much-info-2003, 2003.
[2] http://www.searchenginewatch.com

With this increase of data, the traditional scientific method of applying model-based analysis to understand the data is no longer sufficient. We have access to data that we have never encountered before and have little or no idea of applicable models. Therefore, we need to explore them first to gain insights and eventually find models. This process has already been promoted by John Tukey in his 1977 book on *Exploratory Data Analysis* [3] which has become a branch of the domain of statistics. Whereas EDA is ultimately interested in finding models, data exploration can also reveal relevant facts that are, in themselves interesting and important.

AVIZ (Analysis and VIsualiZation) is a multidisciplinary project that seeks to improve visual exploration and analysis of large, complex datasets by tightly integrating analysis methods with interactive visualization. It focuses on five research themes:

- *Methods to visualize and smoothly navigate through large datasets;*
- *Efficient analysis methods to reduce huge datasets to visualizable size;*
- *Visualization interaction using novel capabilities and modalities;*
- *Evaluation methods to assess the effectiveness of visualization and analysis methods and their usability;*
- *Engineering tools for building visual analytics systems that can access, search, visualize and analyze large datasets with smooth, interactive response.*

2.2. Research Themes

AVIZ's research on Visual Analytics is organized around five main Research Themes:

Methods to visualize and smoothly navigate through large data sets: Large data sets challenge current visualization and analysis methods. Understanding the structure of a graph with one million vertices is not just a matter of displaying the vertices on a screen and connecting them with lines. Current screens only have around two million pixels. Understanding a large graph requires both data reduction to visualize the whole and navigation techniques coupled with suitable representations to see the details. These representations, aggregation functions, navigation and interaction techniques must be chosen as a coordinated whole to be effective and fit the user's mental map.

AVIZ designs new visualization representations and interactions to efficiently navigate and manipulate large data sets.

Efficient analysis methods to reduce huge data sets to visualizable size: Designing analysis components with interaction in mind has strong implications for both the algorithms and the processes they use. Some data reduction algorithms are suited to the principle of sampling, then extrapolating, assessing the quality and incrementally enhancing the computation: for example, all the linear reductions such as PCA, Factorial Analysis, and SVM, as well as general MDS and Self Organizing Maps. AVIZ investigates the possible analysis processes according to the analyzed data types.

Visualization interaction using novel capabilities and modalities: The importance of interaction to Information Visualization and, in particular, to the interplay between interactivity and cognition is widely recognized. However, information visualization interactions have yet to take full advantage of these new possibilities in interaction technologies, as they largely still employ the traditional desktop, mouse, and keyboard setup of WIMP (Windows, Icons, Menus, and a Pointer) interfaces. At AVIZ we investigate in particular interaction through tangible and touch-based interfaces to data.

Evaluation methods to assess their effectiveness and usability: For several reasons appropriate evaluation of visual analytics solutions is not trivial. First, visual analytics tools are often designed to be applicable to a variety of disciplines, for various different data sources, and data characteristics, and because of this variety it is hard to make general statements. Second, in visual analytics the specificity of humans, their work environment, and the data analysis tasks, form a multi-faceted evaluation context which is difficult to control and generalize. This means that recommendations for visual analytics solutions are never absolute, but depend on their context.

[3] John W. Tukey. *Exploratory Data Analysis*. Addison-Wesley, 1977.

In our work we systematically connect evaluation approaches to visual analytics research—we strive to develop and use both novel as well as establish mixed-methods evaluation approaches to derive recommendations on the use of visual analytics tools and techniques. AVIZ regularly published user studies of visual analytics and interaction techniques and takes part in dedicated workshops on evaluation.

Engineering tools: for building visual analytics systems that can access, search, visualize and analyze large data sets with smooth, interactive response.

Currently, databases, data analysis and visualization all use the concept of data tables made of tuples and linked by relations. However, databases are storage-oriented and do not describe the data types precisely. Analytical systems describe the data types precisely, but their data storage and computation model are not suited to interactive visualization. Visualization systems use in-memory data tables tailored for fast display and filtering, but their interactions with external analysis programs and databases are often slow.

AVIZ seeks to merge three fields: databases, data analysis and visualization. Part of this merging involves using common abstractions and interoperable components. This is a long-term challenge, but it is a necessity because generic, loosely-coupled combinations will not achieve interactive performance.

AVIZ's approach is holistic: these five themes are facets of building an analysis process optimized for discovery. All the systems and techniques AVIZ designs support the process of understanding data and forming insights while minimizing disruptions during navigation and interaction.

2.3. Highlights of the Year

AVIZ has received two best paper honorable mentions at the VisWeek 2012 conference [22] , [26] .

AVIZ has also received a best poster award [41] and best poster honorable mention [42] .

Tobias Isenberg has been recruited as Senior Researcher and will broaden the scope of AVIZ in the direction of Scientific Visualization and Non-Photorealistic Rendering (NPR) for interactive visualization.

AVIZ has started to port its visualizations for standard Web platforms and collaborate with industry to deploy it in various domains. For example, the French Open Data Provider "Data Publica" has deployed ScatterDice to visualize employment data in France: http://labs.data-publica.com/emploi.

BEST PAPERS AWARDS :

[22] **Assessing the Effect of Visualizations on Bayesian Reasoning Through Crowdsourcing in IEEE Transactions on Visualization and Computer Graphics**. L. MICALLEF, P. DRAGICEVIC, J.-D. FEKETE.

[26] **Efficient Structure-Aware Selection Techniques for 3D Point Cloud Visualizations with 2DOF Input in IEEE Transactions on Visualization and Computer Graphics**. L. YU, K. EFSTATHIOU, P. ISENBERG, T. ISENBERG.

3. Scientific Foundations

3.1. Scientific Foundations

The scientific foundations of Visual Analytics lie primarily in the domains of Information Visualization and Data Mining. Indirectly, it inherits from other established domains such as graphic design, Exploratory Data Analysis (EDA), statistics, Artificial Intelligence (AI), Human-Computer Interaction (HCI), and Psychology.

The use of graphic representation to understand abstract data is a goal Visual Analytics shares with Tukey's Exploratory Data Analysis (EDA) [64], graphic designers such as Bertin [53] and Tufte [63], and HCI researchers in the field of Information Visualization [52].

EDA is complementary to classical statistical analysis. Classical statistics starts from a *problem*, gathers *data*, designs a *model* and performs an *analysis* to reach a *conclusion* about whether the data follows the model. While EDA also starts with a problem and data, it is most useful *before* we have a model; rather, we perform visual analysis to discover what kind of model might apply to it. However, statistical validation is not always required with EDA; since often the results of visual analysis are sufficiently clear-cut that statistics are unnecessary.

Visual Analytics relies on a process similar to EDA, but expands its scope to include more sophisticated graphics and areas where considerable automated analysis is required before the visual analysis takes place. This richer data analysis has its roots in the domain of Data Mining, while the advanced graphics and interactive exploration techniques come from the scientific fields of Data Visualization and HCI, as well as the expertise of professions such as cartography and graphic designers who have long worked to create effective methods for graphically conveying information.

The books of the cartographer Bertin and the graphic designer Tufte are full of rules drawn from their experience about how the meaning of data can be best conveyed visually. Their purpose is to find effective visual representation that describe a data set but also (mainly for Bertin) to discover structure in the data by using the right mappings from abstract dimensions in the data to visual ones.

For the last 25 years, the field of Human-Computer Interaction (HCI) has also shown that interacting with visual representations of data in a tight perception-action loop improves the time and level of understanding of data sets. Information Visualization is the branch of HCI that has studied visual representations suitable to understanding and interaction methods suitable to navigating and drilling down on data. The scientific foundations of Information Visualization come from theories about perception, action and interaction.

Several theories of perception are related to information visualization such as the “Gestalt” principles, Gibson’s theory of visual perception [58] and Triesman’s “preattentive processing” theory [62]. We use them extensively but they only have a limited accuracy for predicting the effectiveness of novel visual representations in interactive settings.

Information Visualization emerged from HCI when researchers realized that interaction greatly enhanced the perception of visual representations.

To be effective, interaction should take place in an interactive loop faster than 100ms. For small data sets, it is not difficult to guarantee that analysis, visualization and interaction steps occur in this time, permitting smooth data analysis and navigation. For larger data sets, more computation should be performed to reduce the data size to a size that may be visualized effectively.

In 2002, we showed that the practical limit of InfoVis was on the order of 1 million items displayed on a screen [56]. Although screen technologies have improved rapidly since then, eventually we will be limited by the physiology of our vision system: about 20 millions receptor cells (rods and cones) on the retina. Another problem will be the limits of human visual attention, as suggested by our 2006 study on change blindness in large and multiple displays [54]. Therefore, visualization alone cannot let us understand very large data sets. Other techniques such as aggregation or sampling must be used to reduce the visual complexity of the data to the scale of human perception.

Abstracting data to reduce its size to what humans can understand is the goal of Data Mining research. It uses data analysis and machine learning techniques. The scientific foundations of these techniques revolve around the idea of finding a good model for the data. Unfortunately, the more sophisticated techniques for finding models are complex, and the algorithms can take a long time to run, making them unsuitable for an interactive environment. Furthermore, some models are too complex for humans to understand; so the results of data mining can be difficult or impossible to understand directly.

Unlike pure Data Mining systems, a Visual Analytics system provides analysis algorithms and processes compatible with human perception and understandable to human cognition. The analysis should provide understandable results quickly, even if they are not ideal. Instead of running to a predefined threshold, algorithms and programs should be designed to allow trading speed for quality and show the tradeoffs interactively. This is not a temporary requirement: it will be with us even when computers are much faster, because good quality algorithms are at least quadratic in time (e.g. hierarchical clustering methods). Visual Analytics systems need different algorithms for different phases of the work that can trade speed for quality in an understandable way.

Designing novel interaction and visualization techniques to explore huge data sets is an important goal and requires solving hard problems, but how can we assess whether or not our techniques and systems provide real improvements? Without this answer, we cannot know if we are heading in the right direction. This is why we have been actively involved in the design of evaluation methods for information visualization [8] [61], [59], [60], [57]. For more complex systems, other methods are required. For these we want to focus on longitudinal evaluation methods while still trying to improve controlled experiments.

4. Application Domains

4.1. Application Domains

AVIZ develops active collaboration with users from various application domains, making sure it can support their specific needs. By studying similar problems in different domains, we can begin to generalize our results and have confidence that our solutions will work for a variety of applications.

Our current application domains include:

- *Genealogy*, in cooperation with North Carolina State University;
- *Biological research*, in cooperation with Institut Pasteur;
- *Digital Libraries*, in cooperation with the French National Archives and the Wikipedia community;
- *Open Data*, in cooperation with Google Open Data and Data Publica;
- *Agrifood Process Modeling*, in cooperation with the DREAM project (see section 8.2.1.1);

5. Software

5.1. Graph Cuisine

Participants: Évelyne Lutton [correspondant], Benjamin Bach, André Spritzer, Jean-Daniel Fekete.

GraphCuisine lets users steer an Evolutionary Algorithm (EA) to create random graphs that match user-specified measures. Generating random graphs with particular characteristics is crucial for evaluating graph algorithms, layouts and visualization techniques. Current random graph generators provide limited control of the final characteristics of the graphs they generate. The situation is even harder when one wants to generate random graphs similar to a given one, all-in-all leading to a long iterative process that involves several steps of random graph generation, parameter changes, and visual inspection. Our system follows an approach based on interactive evolutionary computation. Fitting generator parameters to create graphs with pre-defined measures is an optimization problem, while assessing the quality of the resulting graphs often involves human subjective judgment. GraphCuisine has been proved to be able to generate graphs that mimic a given real-world network. http://www.aviz.fr/Research/Graphcuisine

5.2. Histomages

Participants: Fanny Chevalier, Pierre Dragicevic [correspondant], Christophe Hurter.

Histomages is an image editor based on a new interaction model that considers histogram views as spatial rearrangements of image pixels. Users can select pixels on image histograms as they would select image regions and directly manipulate them to adjust their colors. Histomages are affected by other image tools such as paintbrushes. We explored some possibilities offered by this interaction model, and discussed the four key principles behind it as well as their implications for the design of feature-rich software in general [31]. http://www.aviz.fr/histomages/.

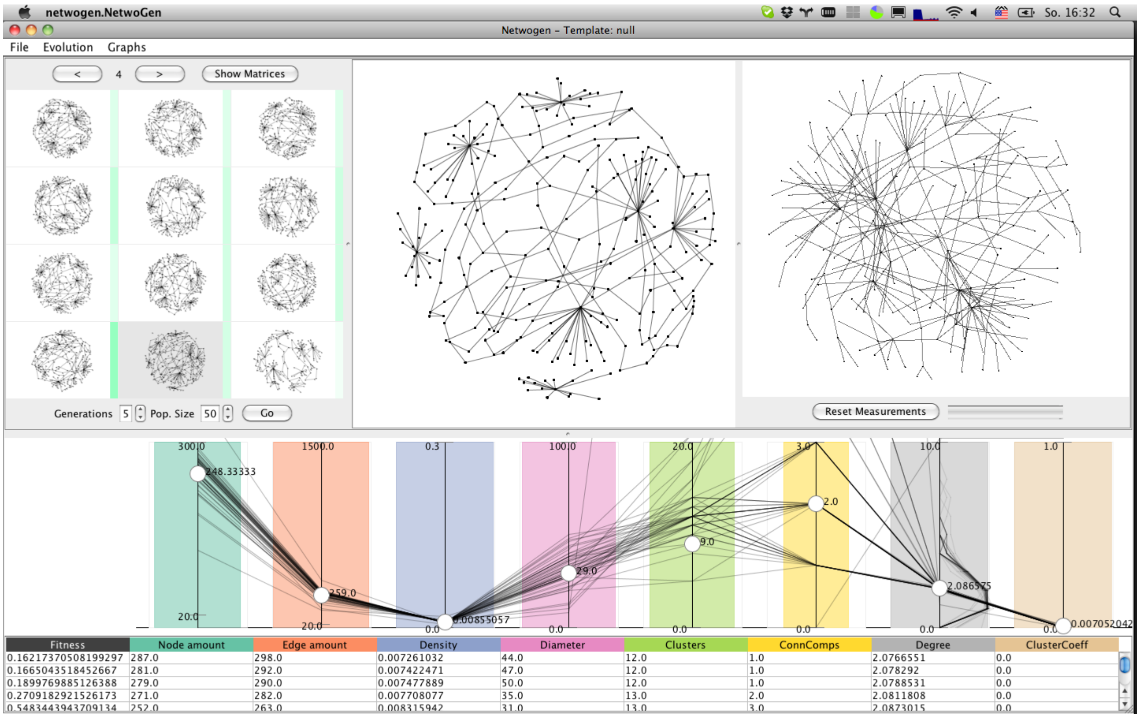

Figure 1. GraphCuisine interface showing one real graph (right), the measures extracted from it (bottom circles), several graphs with similar measures (left) and one of them selected (middle).

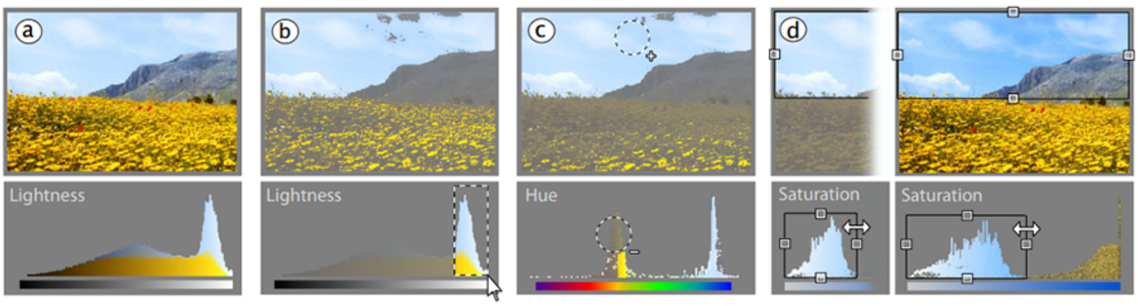

Figure 2. Example of sky enhancement with Histomages: (a) the image is duplicated and its pixels rearranged into a lightness histogram ; (b) bright pixels are selected with the rubber-band selection tool; (c) all pixels are rearranged into a hue histogram and yellow pixels are filtered out with the subtract selection brush (bottom). Missing pixels are added with the add selection brush on the image (top); (d) the sky is enhanced by resizing the selection on the saturation histogram.

Figure 3. Gliimpse: A detail of the animation between an article and its LaTeX source code.

5.3. Gliimpse

Participants: Pierre Dragicevic [correspondant], Stéphane Huot, Fanny Chevalier.

Gliimpse is a quick preview technique that smoothly transitions between document markup code (HTML, LaTeX,...) and its visual rendering. This technique allows users to regularly check the code they are editing in-place, without leaving the text editor. This method can complement classical preview windows by offering rapid overviews of code-to-document mappings and leaving more screen real-estate. A proof-of-concept editor can be downloaded for free at http://www.aviz.fr/gliimpse/.

5.4. The Obvious Toolkit

Participants: Pierre-Luc Hémery, Jean-Daniel Fekete [correspondant].

Information Visualization, Java, Toolkit

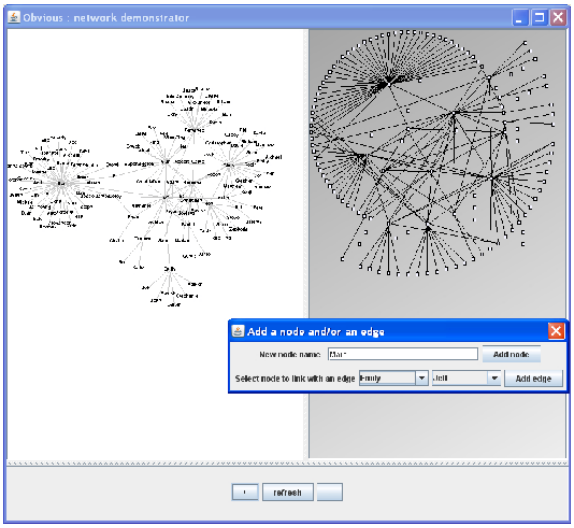

Figure 4. The Obvious toolkit showing the same graph with a Prefuse and an IVTK rendering.

The Obvious Toolkit is a new Interactive Graphics Toolkit written in Java to facilitate the interoperability between Information Visualization toolkits and components (Fig. 4).

The Obvious Toolkit is an abstraction layer above visualization toolkits. Currently, it connects the most popular toolkits in Java: Prefuse, the InfoVis Toolkit, Improvise, JUNG, as well as other libraries such as the Java Database Communication Toolkit (JDBC) and two Machine-Learning toolkits: Weka and RapidMiner.

It is meant to provide an abstraction layer for information visualization application builders so that they can postpone their choice of a concrete toolkit to use. When faced with the final choice, application builders can use one of the toolkits or connect all of them dynamically to Obvious. A paper on Obvious was presented at the IEEE Visual Analytics Science and Technology conference (VAST 2011) [55]. Obvious is available at http://code.google.com/p/obvious.

5.5. GeneaQuilts

Participants: Jean-Daniel Fekete [correspondant], Pierre Dragicevic, Anastasia Bezerianos, Julie Bae, Ben Watson.

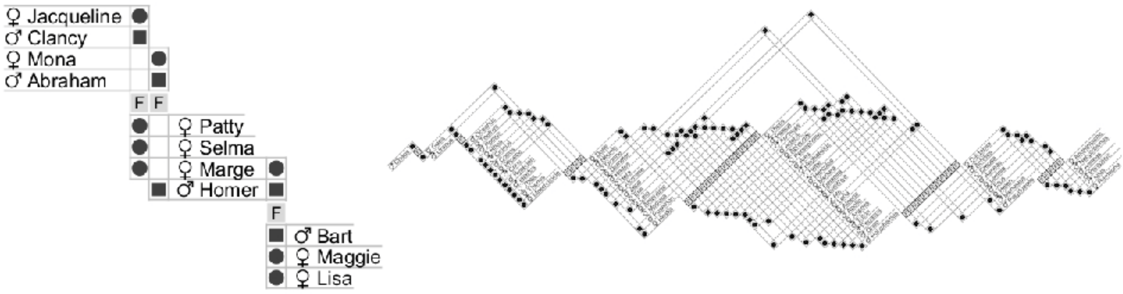

Figure 5. The genealogy of the Simpsons family (left) and of the Greek Pantheon (right), produced by the GeneaQuilts software.

GeneaQuilts [2] is a new genealogy exploration software that allows genealogists and historians to visualize and navigate in large genealogies of up to several thousand individuals (Fig. 5). The visualization takes the form of a diagonally-filled matrix, where rows are individuals and columns are nuclear families. The GeneaQuilts system includes an overview, a timeline, search and filtering components, and a new interaction technique called Bring & Slide that allows fluid navigation in very large genealogies. The tool has been featured in several InfoVis and genealogy Websites and the website has been visited over 9000 times. It has been integrated in commercial and open-source implementations (4 to date). See also the web page http://www.aviz.fr/geneaquilts/.

5.6. Diffamation

Participants: Fanny Chevalier, Pierre Dragicevic [correspondant], Anastasia Bezerianos, Jean-Daniel Fekete.

Animation, Edit histories, Wikipedia, Revision Control

The Diffamation system [3] allows rapid exploration of revision histories such as Wikipedia or subversion repositories by combining text animated transitions with simple navigation and visualization tools. Diffamation can be used for example to get a quick overview of the entire history of a Wikipedia article or to see what has happened to one's contributions. Diffamation complements classical diff visualizations: once moments of interest have been identified, classical diff visualizations can come in useful to compare two given revisions in detail.

The Diffamation revision exploration system has been presented at the plenary session of the Ubuntu Developer Summit. It is available at http://www.aviz.fr/diffamation/.

5.7. The InfoVis Toolkit

Participant: Jean-Daniel Fekete [correspondant].

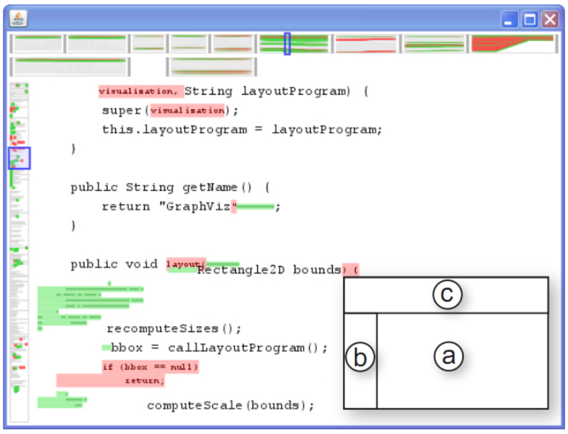

Figure 6. Screenshot the Diffamation system during a transition: (a) the document view, (b) the overview scrollbar and (c) the timeline.

Information Visualization, Java, Toolkit

The InfoVis Toolkit [5] is an Interactive Graphics Toolkit written in Java to facilitate the development of Information Visualization applications and components.

The InfoVis Toolkit implements several visualization techniques, as well as interaction techniques related. It has been used for teaching the Information Visualization course (Masters level, Univ. of Paris-Sud) and is the basis for all AVIZ contracts. It is our main development platform for information visualization; most of our Information Visualization prototypes rely on it. It is available at http://ivtk.sourceforge.net.

In the forthcoming years, it will be superseded by extensions of the Obvious Toolkit (see section 5.4).

5.8. GraphDice

Participants: Jean-Daniel FEKETE [correspondant], Pierre Dragicevic, Niklas Elmqvist, Anastasia Bezerianos.

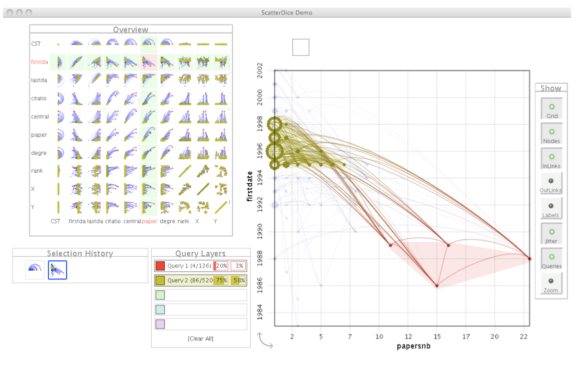

Figure 7. Screenshot the GraphDice system.

GraphDice [1] is a visualization system for exploring multivariate networks (Fig. 7). GraphDice builds upon our previous system ScatterDice (best paper award at the IEEE InfoVis 2008 conference) [4]: it shows a scatter plot of 2 dimensions among the multiple ones available and provides a very simple paradigm of 3D rotation to change the visualized dimensions. The navigation is controlled by a scatter plot matrix that is used as a high-level overview of the dataset as well as a control panel to switch the dimensions.

While ScatterDice works on any tabular dataset (e. g., CSV file), the GraphDice system show networks using a node-link diagram representation as a scatter plot with links drawn between connected nodes. For more information, see the web page at http://graphdice.gforge.inria.fr.

6. New Results

6.1. Tangible Visualization

Participants: Pierre Dragicevic [correspondant], Petra Isenberg, Yvonne Jansen, Jean-Daniel Fekete.

The goal of tangible visualization is to move data and controls to the physical world in order to exploit peoples' natural abilities to perceive and to manipulate objects, and to collaborate through these objects. This is a new topic in information visualization. Physical objects can be used either to represent data (physical visualizations) or to interact with data (physical controls). We studied both.

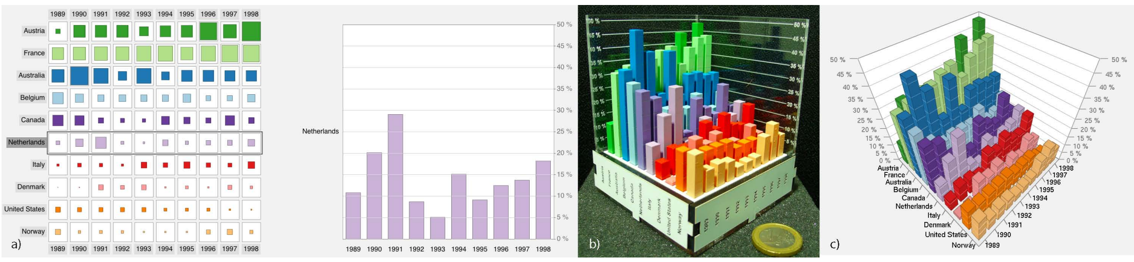

Figure 8. Education expenses of Country by Year shown under three conditions: a) on-screen 2D control; b) on-screen 3D bar chart; c) physical 3D bar chart.

Physical visualizations already exist in the form of data sculptures. Data sculptures are an increasingly popular data-driven media whose purposes are essentially artistic, communicative or educational. We are maintaining a public list of such visualizations at http://www.aviz.fr/Research/PassivePhysicalVisualizations (for passive visualizations) and at http://www.aviz.fr/Research/ActivePhysicalVisualizations (for visualizations with electronics included). But despite prolific work from the art and design communities, physical visualizations have been largely ignored in infovis research. In particular, there is no study on whether physical visualizations can help carry out actual information visualization tasks. We carried out the first infovis study comparing physical to on-screen visualizations. We focused on 3D visualizations, as these are common among physical visualizations but known to be problematic on computers. Taking 3D bar charts as an example (Figure 8), we showed that moving visualizations to the physical world can improve users' efficiency at information retrieval tasks. In contrast, augmenting on-screen visualizations with stereoscopic rendering alone or with prop-based manipulation was of limited help. Our work suggests that the efficiency of physical visualizations stem from features that are unique to physical objects, such as their ability to be touched and their perfect visual realism. These findings provide empirical motivation for current research on fast digital fabrication and self-reconfiguring materials.

We also studied how physical artifacts can help explore and interact with on-screen visualizations. One project consisted in building customizable tangible remote controllers for interacting with visualizations on wall-sized displays [36] (see http://www.aviz.fr/trc). Such controllers are especially suited to visual exploration tasks where users need to move to see details of complex visualizations. In addition, we conducted a controlled user study suggesting that tangibles make it easier for users to focus on the visual display while they interact. Another project explored the concept of stackable tangibles designed to support faceted information seeking in a variety of contexts (see http://www.aviz.fr/stackables). Each Stackable tangible represents search parameters that can be shared amongst collaborators, modified during an information seeking process, and stored and transferred. Stackables were designed to support collaborative browsing and search in large data spaces. They are useful in meetings, for sharing results from individual search activities, and for realistic datasets including multiple facets with large value ranges.

For more information, see http://www.aviz.fr/phys.

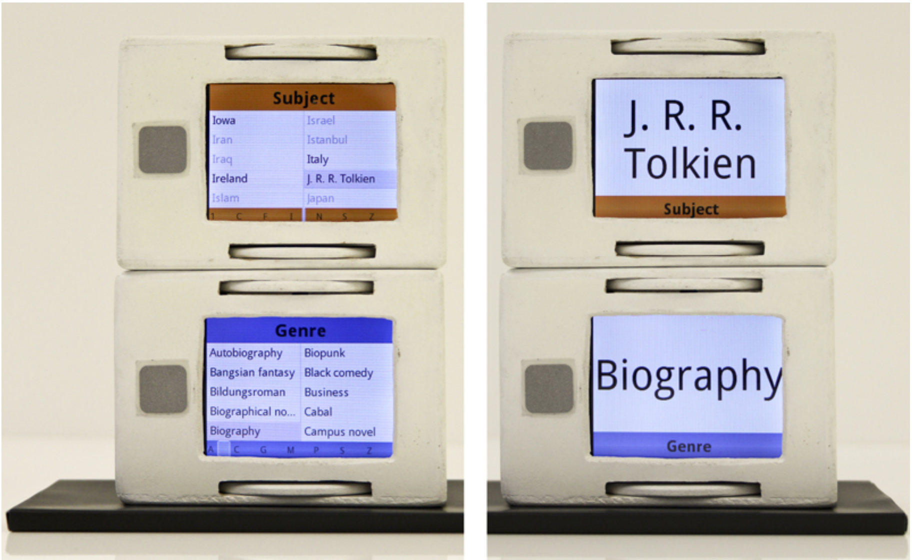

Figure 9. Four stackables. The left shows Stackables with their filter selection interface. The right two show the selected filters.

6.2. EVE : Evolutionary Visual Exploration

Participants: Evelyne Lutton [correspondant], Nadia Boukehlifa, Waldo Cancino, Anastasia Bezerianos.

Evolutionary Visual Exploration (EVE) is a new approach that combines visual analytics with stochastic optimisation to aid the exploration of multidimensional datasets characterised by a large number of possible views or projections. A prototype tool (EvoGraphDice) has been built as an extension of GraphDice, this work has been funded by the System@tics project CSDL, see Figure 10.

Starting from dimensions whose values are automatically calculated by a PCA, an interactive evolutionary algorithm progressively builds (or evolves) non-trivial viewpoints in the form of linear and non-linear dimension combinations, to help users discover new interesting views and relationships in their data. The criteria for evolving new dimensions is not known a priori and is partially specified by the user via an interactive interface: (i) The user selects views with meaningful or interesting visual patterns and provides a satisfaction score. (ii) The system calibrates a fitness function (optimised by the evolutionary algorithm)

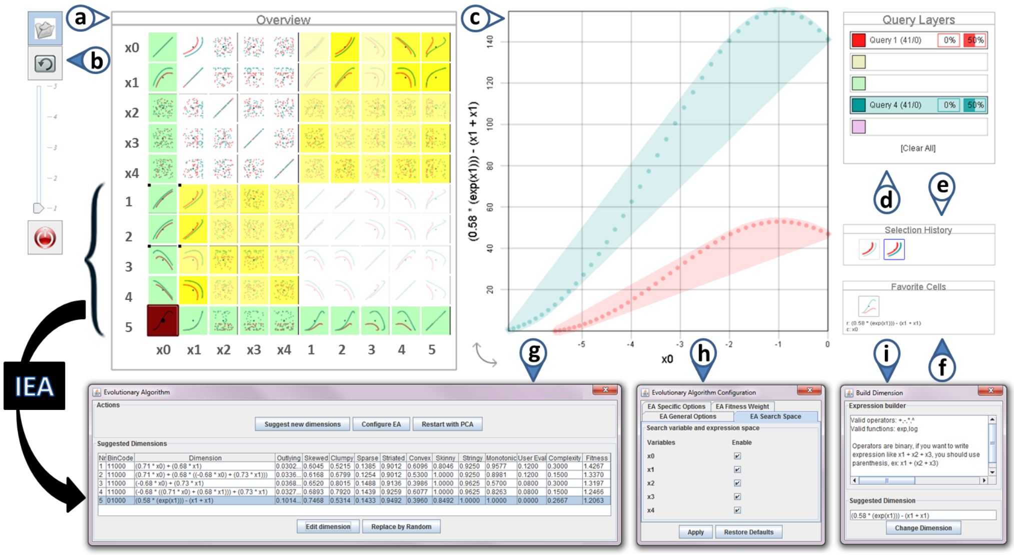

Figure 10. EvoGraphDice prototype showing an exploration session of a synthetic dataset. New extensions to the GraphDice system are indicated by coloured label arrows. Widgets: (a) an overview scatterplot matrix showing the original data set of 5 dimensions (x0..x4) and the new dimensions (1..5) as suggested by the evolutionary algorithm. (b) a tool bar with (top to bottom)"favourite" toggle button, "evolve" button , a slider to evaluate cells and a restart (PCA) button. (c) main plot view. (d) the selection query window. (e) the selection history tool. (f) the favourite cells window. (g) IEA main control window. (h) window to "limit the search space". (i) dimension editor.

to take into account the user input, and then calculates new views. Our method leverages automatic tools to detect interesting visual features and human interpretation to derive meaning, validate the findings and guide the exploration without having to grasp advanced statistical concepts. To validate our method, we conducted an observational study with five domain experts. Our results show that EvoGraphDice can help users quantify qualitative hypotheses and try out different scenarios to dynamically transform their data. Importantly, it allowed our experts to think laterally, better formulate their research questions and build new hypotheses for further investigation.

6.3. Perception of Visual Variables on Wall-Sized Displays

Participants: Anastasia Bezerianos [correspondant], Petra Isenberg.

We ran two user studies on the perception of visual variables on tiled high-resolution wall-sized displays [9]. We contribute an understanding of, and indicators predicting how, large variations in viewing distances and viewing angles affect the accurate perception of angles, areas, and lengths. Our work, thus, helps visualization researchers with design considerations on how to create effective visualizations for these spaces. The first study showed that perception accuracy was impacted most when viewers were close to the wall but differently for each variable (angle, area , length). Our second study examined the effect of perception when participants could move freely compared to when they had a static viewpoint. We found that a far but static viewpoint was as accurate but less time consuming than one that included free motion. Based on our findings, we recommend encouraging viewers to stand further back from the display when conducting perception estimation tasks. If tasks need to be conducted close to the wall display, important information should be placed directly in front of the viewer or above, and viewers should be provided with an estimation of the distortion effects predicted by our work—or encouraged to physically navigate the wall in specific ways to reduce judgement error. For more information, see http://www.aviz.fr/Research/WallVariables.

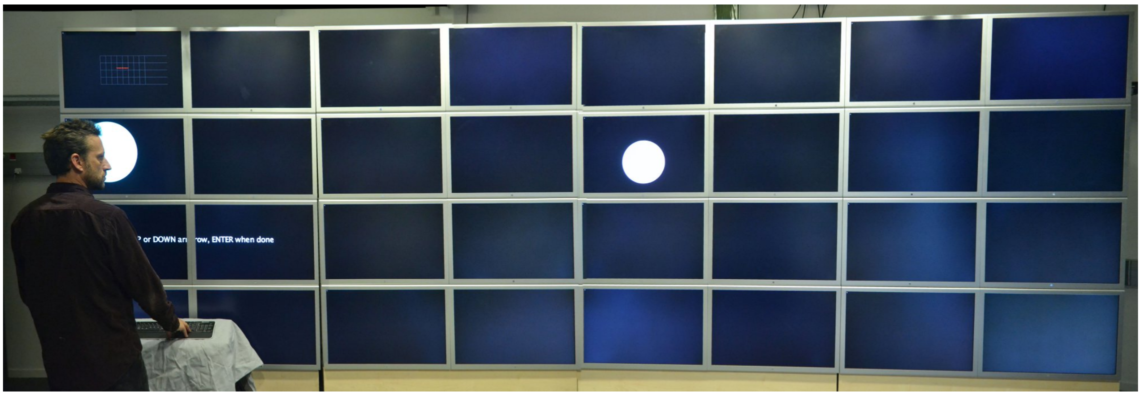

Figure 11. A participant during one trial of a user study on the WILD wall-sized display.

6.4. Sketchyness in Visualization

Participants: Tobias Isenberg [correspondant], Petra Isenberg, Jo Wood, Jason Dykes, Aidan Slingsby, Nadia Boukhelifa, Anastasia Bezerianos, Jean-Daniel Fekete.

AVIZ, in collaboration with City University London, studied how sketchiness can be used, both as a visual style and as a way to represent qualitative uncertainty.

We first studied Handy, an alternative renderer for the Processing graphics environment developed by our collaborators at the City University London [25]. It allows higher-level graphical features such as bar charts, line charts, treemaps and node-link diagrams to be drawn in a sketchy style with a specified degree of sketchiness. Our evaluation concentrated on two core aspects: the perception of sketchiness as a visual variable and higher-level impact of sketchiness on the perception of a whole graphic drawn in this style. Results suggest relative area judgment is compromised by sketchy rendering and that its influence is dependent on the shape being rendered. We showed that degree of sketchiness may be judged on an ordinal scale but that its judgement varies strongly between individuals. We evaluated higher-level impacts of sketchiness through user testing of scenarios that encourage user engagement with data visualization and willingness to critique visualization design. Results suggest that where a visualization is clearly sketchy, engagement may be increased and that attitudes to participating in visualization annotation are more positive. The results of this work have implications for effective information visualization design that go beyond the traditional role of sketching as a tool for prototyping or its use for an indication of general uncertainty.

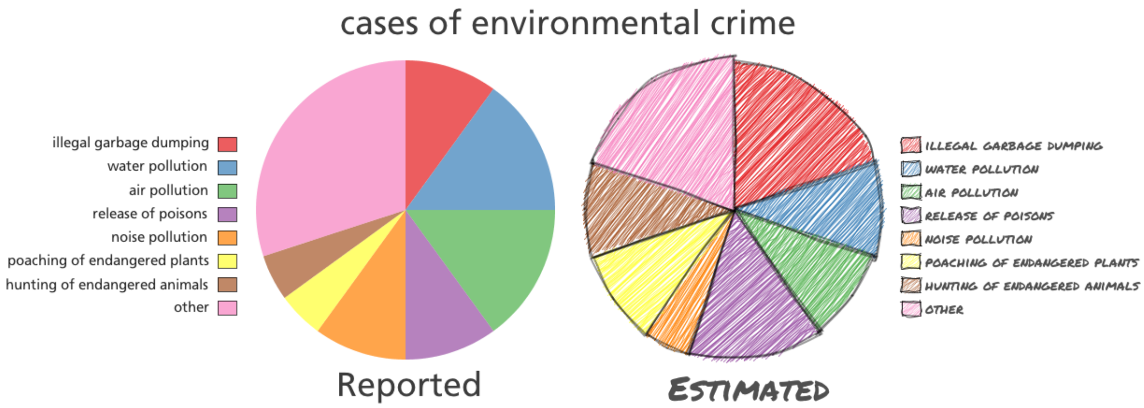

Figure 12. A pie chart drawn in regular and sketchy style.

On this last issue, we have studied whether sketchiness was an effective rendering style for conveying qualitative uncertainty [10]. We compared sketchiness to blur, intensity and dashes and obtained mixed results, showing that sketchiness is not worse than the other visual encodings but that none of them are intuitive and all of them are very limited in range, although still usable for common cases. More work is needed to asses how sketchiness can be best used and to find out more effective encodings for conveying uncertainty in a spontaneous/intuitive way.

For more information, see http://www.aviz.fr/Research/SketchyRendering and http://www.aviz.fr/Research/UncertaintySketchy.

6.5. Supporting Judgment and Decision Making with Visualizations

Participants: Pierre Dragicevic [correspondant], Luana Micallef, Jean-Daniel Fekete.

People have difficulty understanding statistical information and are unaware of their wrong judgments. Cognitive biases abound, particularly in Bayesian reasoning (see http://youtu.be/D8VZqxcu0I0 for a classic example). Psychology studies suggest that the way Bayesian problems are represented can impact comprehension, but few visual designs have been evaluated and only populations with a specific background have been involved. We conducted a study where a textual and six visual representations for three classic problems were compared using a diverse subject pool through crowdsourcing [22]. Visualizations included area-proportional Euler diagrams, glyph representations, and hybrid diagrams combining both. Our findings were inconsistent with previous studies in that subjects' accuracy was remarkably low and did not significantly improve when a visualization was provided with the text. A follow-up experiment confirmed that simply adding a visualization to a textual Bayesian problem is of little help for crowdsource workers. It however revealed that communicating statistical information with a diagram, giving no numbers and using text to merely set the scene significantly reduces probability estimation errors. Thus, novel representations that holistically combine text and visualizations and that promote the use of estimation rather than calculation need to be investigated. We also argued for the need to carry out more studies in settings that better capture real-life rapid decision making than laboratories. We proposed the use of crowdsourcing to partly address this concern, as crowdsourcing captures a more diverse and less intensely focused population than university students. Doing so, we hope that appropriate representations that facilitate reasoning for both laymen and professionals, independent of their background, knowledge, abilities and age will be identified. By effectively communicating statistical and probabilistic information, physicians will interpret diagnostic results more adequately, patients will take more informed decisions when choosing medical treatments, and juries will convict criminals and acquit innocent defendants more reliably.

For more information, see http://www.aviz.fr/bayes.

7. Bilateral Contracts and Grants with Industry

7.1. Google Research Award

Participants: Jean-Daniel Fekete [correspondant], Petra Isenberg, Jeremy Boy, Heidi Lam.

Offering data access to the public is a strong trend of the recent years. Several free data providers or repositories are now online (e.g. http://data.gov.uk, http://stats.oecd.org, http://publicdata.eu, http://opendata.paris.fr, http://www.google.com/publicdata, http://www.data-publica.com), offering a rich set of data to allow citizens to build their own understanding of complex political and economic information by exploring information in its original form. However, these initiatives have had little impact directly on the public since working with this open data is often cumbersome, requires additional data wrangling, and the spreadsheets themselves take a long time to understand before useful further work can be done with them. This proposal focuses on public data visualization to offer more engaging environments for exploration of public data and to enable stronger democratic discourse about the data contents.

The goal of this proposed research project is to bridge the gap between generic visualization sites for public data and engaging content-specific visualization of this data which can be used and individually adapted to tell a story about public data. Through the design and deployment of rich and engaging interactive visualizations from public data sources we want to truly reach the goal of the public data movement: empowering the citizens and social actors by allowing them to better understand the world they are living in, to make informed decisions on complex issues such as the impact of a medical treatment on a dangerous illness or the tradeoffs offered of power plant technologies based on facts instead of assumptions.

For more information, see http://peopleviz.gforge.inria.fr/www.

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR FITOC: From Individual To Collaborative Visual Analytics

Participants: Petra Isenberg [correspondant], Jean-Daniel Fekete, Pierre Dragicevic, Wesley Willett.

The project addresses fundamental problems of technological infrastructure and the design of data representation and interaction to build a bridge between individual and team work for visual data analysis. In collaboration with the University of Magdeburg we have begun to tackle this challenge through the design of tangible widgets that help to bridge the gap between individual and collaborative information seeking (see 6.1).

8.1.2. ANR EASEA-Cloud

Participants: Evelyne Lutton [correspondant], Waldo Cancino.

The aim of the EASEA-CLOUD project is to exploit the massively parallel resources that are offered by clusters or a grid of modern GPU-equipped machines in order to find solutions to inverse problems whose evaluation function can be intrinsically sequential. Massive parallelization of generic sequential problems can be achieved by evolutionary computation, that can efficiently exploit the parallel evaluation of thousands of potential solutions (a population) for optimization or machine-learning purposes. The project consists in turning the existing EASEA (EAsy Specification of Evolutionary Algorithms, http://lsiit.u-strasbg.fr/easea) research platform into an industrial-grade platform that could be exploited by running in "cloud" mode, on a large grid of computers (ISC-PIF/CREA is the current manager of the French National Grid). The necessary steps are to develop:

- a professional-grade API, development environment and human-computer interface for the existing academic EASEA platform,
- cloud-management tools (in order to launch an experiment on a grid of computers, monitor the experiment and bill the laboratories or companies that will be using EASEA-CLOUD for intensive computation,
- novel visualisation tools, in order to monitor an evolutionary run, potentially launched on several hundred heterogeneous GPU machines.

The consortium is made of thee partners: LSIIT/UDS (which is developing the EASEA platform), ISC-PIR/CREA (for its experience in grid and cloud computing), AVIZ/Inria (for its experience in visualization tools for evolutionary computation) and two subcontractors: LogXLabs (a software development company in order to create industrial-grade code and interfaces) an BIOEMERGENCE-IMAGIF, the "valorisation" department of CNRS Gif s/Yvette. Valorisation will take place in strong collaboration with UNISTRA VALO, the valorisation structure of Université de Strasbourg.

The project started on October 1st, 2012, for 2 years. AVIZ will develop new visualisation tools adapted to the monitoring of the optimization process.

8.2. European Initiatives

8.2.1. FP7 Projects

8.2.1.1. DREAM

Program: FP7

Project acronym: **DREAM**

Project title: Design and development of REAlistic food Models with well-characterised micro- and macro-structure and composition

Duration: 2009–2013

Coordinator: INRA - CEPIA department, Monique Axelos

Other partners: Technical Research Centre of Finland, Actilait France, ADRIA Développement France, CNRS, INRA Transfert, Société de Recherche et Développement Alimentaire Bongrain, Campden BRI Magyarország Nonprofit Kft. Hungary, Central Food Research Institute Hungary, Teagasc - Agriculture and Food Development Authority Ireland, Consiglio Nazionale delle Ricerche - Istituto di Scienze delle Produzioni Alimentari Italy, Top Institute Food and Nutrition The Netherlands, Wageningen University (WUR) The Netherlands, University of Ljubljana, Biotechnical Faculty Slovenia, Institute for Food and Agricultural Research and Technology Spain, Campden BRI UK, Institute of Food Research UK, United Biscuits (UK) Limited.

Abstract:

The overall goal of DREAM (Design and development of REAlistic food Models with well-characterised micro- and macro-structure and composition) is to develop realistic, physical and mathematical models to be used as standards that can be exploited across all major food categories to facilitate development of common approaches to risk assessment and nutritional quality for food research and industry.

The partnership involves 18 partners from 9 european countries, among which two multinationals. The project is lead by INRA, CEPIA department, and Inria participation is managed by delegation by the ISC-PIF (CNRS-CREA, UMR 7656).

See more at http://dream.aaeuropae.org/.

The role of AVIZ has been to develop evolutionary techniques adapted to the modeling of agrifood process. In 2012, the work was focussed on the development:

- of robust evolutionary methods to learn the structure of Bayesian Networks when experimental data are rare (in collaboration with Alberto Tonda, Cédric Baudrit and Nathalie Perrot of INRA/GMPA and Pierre-Henri Wuillemin od LIP6/DESIR), applied to cheese making and biscuit baking process,
- of a model of milk gel based on partial differential equations, where numerical parameters were learn by artificial evolution (in collaboration with Julie Foucquier, Sébastien Gaucel Alberto Tonda, and Nathalie Perrot of INRA/GMPA).

8.2.1.2. CENDARI

Program: Infrastructures

Project acronym: **CENDARI**

Project title: Collaborative EuropeaN Digital/Archival Infrastructure

Duration: 01/2012 - 12/2015

Coordinator: Trinity College, Dublin (IE),

Other partners: Freie Universitaet Berlin (DE), Matematicki Institut Sanu u Beogradu (Serbia), University of Birmingham (UK), King's College London (UK), Georg-August-Universitaet Goettingen Stiftung Oeffentlichen Rechts (DE), Narodni Knihovna Ceske Republiky (Czech Republic), Societa Internazionale per lo Studio del Medioevo Latino-S.I.S.M.E.L. Associazione (IT), Fondazione Ezio Franceschini Onlus (IT), Ministerium fur Wissenschaft, Forschung und Kunst Baden-Wurttemberg (DE), Consortium of European Research Libraries (UK), Koninklijke Bibliotheek (NL), UNIVERSITA DEGLI STUDI DI CASSINO (IT).

Abstract:

The Collaborative EuropeaN Digital Archive Infrastructure (CENDARI) will provide and facilitate access to existing archives and resources in Europe for the study of medieval and modern European history through the development of an 'enquiry environment'. This environment will increase access to records of historic importance across the European Research Area, creating a powerful new platform for accessing and investigating historical data in a transnational fashion overcoming the national and institutional data silos that now exist. It will leverage the power of the European infrastructure for Digital Humanities (DARIAH) bringing these technical experts together with leading historians and existing research infrastructures (archives, libraries and individual digital projects) within a programme of technical research informed by cutting edge reflection on the impact of the digital age on scholarly practice.

The enquiry environment that is at the heart of this proposal will create new ways to discover meaning, a methodology not just of scale but of kind. It will create tools and workspaces that allow researchers to engage with large data sets via federated multilingual searches across heterogeneous resources while defining workflows enabling the creation of personalized research environments,

shared research and teaching spaces, and annotation trails, amongst other features. This will be facilitated by multilingual authority lists of named entities (people, places, events) that will harness user involvement to add intelligence to the system. Moreover, it will develop new visual paradigms for the exploration of patterns generated by the system, from knowledge transfer and dissemination, to language usage and shifts, to the advancement and diffusion of ideas.

See more at http://cendari.eu/ and http://www.aviz.fr/Research/CENDARI.

8.2.2. Collaborations with Major European Organizations

Fraunhofer Institute, IGD (DE)

We are collaborating on visual analytics, setting up European projects and coordinating European initiatives on the subject.

University of Desden, (DE)

We have been collaborating with Raimund Dachselt on stackable tangible devices for faceted browsing [37], [35].

8.3. International Initiatives

8.3.1. Inria International Partners

AVIZ researchers collaborate with a number of international partners, including:

- Google, Mountain View, USA
- Microsoft Research, Redmond, USA
- Purdue University, USA
- New York University, USA
- University of Toronto, Canada
- University of Calgary, Canada
- University of British Columbia, Canada
- City University London, UK,
- University of Kent, UK
- University of Konstanz, Germany
- University of Magdeburg, Germany
- University of Groningen, the Netherlands
- University of Granada, Spain

8.3.2. Collaboration with Google

AVIZ collaborates with Google on several projects, related to the Google Research Grant (see sec 7.1) and to evaluation methodology in information visualization [20]. Heidi Lam from Google spent 3 months at AVIZ to collaborate more closely.

8.3.3. Collaboration with Microsoft Research

AVIZ collaborates with several researchers from Microsoft Research Redmond, in particular on the topic of new interactions for information visualization [21] and brain connectivity visualization.

8.3.4. Collaboration with New-York University

Jean-Daniel Fekete collaborates with Claudio Silva and Juliana Freire from NYU-Poly on the VisTrails workflow system for visual analytics (http://www.vistrails.org). Rémi Rampin, intern from the Univ. Paris-Sud Master in HCI, has spent one month at Orsay and 5 months at NYU-Poly to allow VisTrails to run Java-based applications and Toolkits. Rémi successfully connected the traditional Python-C implementation of VisTrails to the Java virtual machine using the JPype package. Jean-Daniel Fekete is not porting the Obvious Toolkit [55] in this environment to integrate all its components [28].

8.4. International Research Visitors

8.4.1. Visits of International Scientists

- Heidi Lam (Google, USA)
- Nathaly Henry-Riche (Microsoft Research, USA)
- Ronald Rensink (University of British Columbia, Canada)

AVIZ organized hosted the following international visitors for a one-day visit:

- Marian Dörk (University of Calgary, Canada)
- Shengdong Zhao (National University of Singapore)
- Oliver Deussen and Hendrik Strobelt (University of Konstanz, Germany)

8.4.1.1. Internships

Basak ALPER (from May 2012 until Sep 2012)

Subject: Visualization of Brain Data Connectivity

Institution: University of California San Diego (United States)

Stefanie Klum (from September 2011 until April 2012)

Subject: Stackable Widgets for Faceted Information Seeking

Institution: University of Magdeburg (Germany)

9. Dissemination

9.1. Scientific Animation

AVIZ members are active worldwide in the domains of Visualization, Visual Analytics, and HCI.

9.1.1. Keynotes and Invited Talks

- Jean-Daniel Fekete: *Invited talk for the 25th anniversary of Fraunhofer IGD: Visual Analytics of Large Social Networks*, Darmstadt, Germany, Nov. 14, 2013
- Jean-Daniel Fekete: *Keynote for the Digiteo Forum 2013: "Au-delà des pelotes de fils : progrès et défis de la visualisation des réseaux sociaux"*, Polytechnique, France, Nov. 13 2012
- Jean-Daniel Fekete: *Keynote for CANVAS 2012 the CANadian Visual Analytics School 2012: Advances in Social Network Visualization*, Vancouver, CA, Jul 24, 2012
- Jean-Daniel Fekete: *Summer Course at the European Business Intelligence Summer School 2012: Visualizing and Exploring Complex Multidimensional Data*, Bruxelles, BE, Jul. 19, 2012
- Jean-Daniel Fekete: *Keynote for Visual Decision Forum 2012: Recherche en visualisation: que doit-on en attendre ?*, Paris, Jul. 5, 2012
- Jean-Daniel Fekete: *Keynote for EuroVA 2012: Infrastructures for Visual Analytics: You are in a maze of twisty little passages, all alike!* EuroVa, Vienna, Jun. 4, 2012.
- Jean-Daniel Fekete: *Séminaire muséologie: Interfaces innovantes tirant partie des métadonnées*, IRI Centre Pompidou, Paris, May 15
- Jean-Daniel Fekete: *Explorer les corpus : vue d'ensemble et navigation dans de larges corpus documentaires*, EHESS Paris, Mar. 5
- Jean-Daniel Fekete: *Visualisation interactive de réseaux sociaux : dernières avancées et défis*, ISC Lyon, Feb. 2012
- Jean-Daniel Fekete: *InfoVis/DataViz: Donner du sens à la révolution Big Data*, Microsoft TechDays, Paris, Feb. 2012

- Jean-Daniel Fekete: *Advances in Social Network Visualization*, University of Kent, School of Computing Seminar, Jan. 2012
- Jean-Daniel Fekete: *Data Visualisation, visualisation d'information : un nouveau langage visuel*. ENSAD, Paris. Jan. 2012
- Évelyne Lutton: *Tomographic 3D reconstruction using cooperative co-evolution*. MIBISOC, Parma. Feb. 2012
- Petra Isenberg: *Information Visualization: An Introduction to the Field and Applications for Statistics*; StatLearn 2012, Lille
- Petra Isenberg: *Perceptual Experiments for Information Visualization Design*; University of Granada, Spain
- Pierre Dragicevic: *Novel Interactive Visualizations for Social Networks* Colloque LabEx DigiCosme. Ecole Polytechnique. Sep, 13., 2012.

9.1.2. Scientific Associations

- Jean-Daniel Fekete is the president of the French Speaking HCI Association 2009–2014
- Evelyne Lutton is the president of the EA steering committee (http://ea.inria.fr),
- Evelyne Lutton is founding member of the « Task Force on Evolutionary Computer Vision and Image Processing » within the IEEE CIS Evolutionary Computation Technical Committee (ECTC),
- Evelyne Lutton is president of the french-WIE afinity group.

9.1.3. Conference Organization

- Jean-Daniel Fekete will be general chair of the IEEE VIS 2014 conference in Paris,
- Jean-Daniel Fekete is in the Steering Committee of EuroVis 2012–2019,
- Jean-Daniel Fekete is in the Steering Committee of IEEE InfoVis 2011–2018,
- Jean-Daniel Fekete is member of the Conference Management Committee in charge of Data Analysis for ACM SIGCHI
- Petra Isenberg was on the Best Short Paper Committee for Eurographics European Conference on Visualization,
- Petra Isenberg was Publicity Chair for the ACM Conference on Tabletops and Interactive Surface,
- Petra Isenberg was Tutorials Chair for IEEE InfoVis 2012,
- Petra Isenberg and Tobias Isenberg co-organized the Workshop on Beyond Time and Error: Novel Evaluation Methods for Visualization (BELIV) at IEEE VisWeek,
- Tobias Isenberg is in the Steering Committees of NPAR and Computational Aesthetics.

9.1.4. Conference Program Committees

- Pierre Dragicevic was member of the program committee for UIST 2012,
- Pierre Dragicevic was member of the program committee for 3DUI 2012,
- Pierre Dragicevic was member of the program committee for ErgoIHM 2012,
- Pierre Dragicevic was member of the program committee for CHI 2013,
- Jean-Daniel Fekete was member of the program committee for IEEE InfoVis 2012,
- Jean-Daniel Fekete was member of the program committee for EuroVis 2012,
- Jean-Daniel Fekete was member of the program committee for AVI 2012,
- Petra Isenberg was member of the program committee for EuroVis 2012,
- Petra Isenberg was member of the program committee for EuroVA 2012,
- Petra Isenberg was member of the program committee for CHI 2013,
- Tobias Isenberg was member of the program committee for ACM NPAR 2012,

- Tobias Isenberg was member of the program committee for Computational Aeshetics 2012,
- Tobias Isenberg was member of the program committee for EG EuroVis 2012,
- Tobias Isenberg was member of the program committee for EG EuroVis 2012 short papers,
- Tobias Isenberg was member of the program committee for Graphics Interface 2012,
- Tobias Isenberg was member of the program committee for 3DCHI 2012 (ACM CHI 2012 workshop on the 3rd Dimension of CHI),
- Évelyne Lutton was member of the program committee of EuroGP 2012,
- Évelyne Lutton was member of the program committee of EvoIASP 2012,
- Évelyne Lutton was member of the program committee of GECCO 2012,
- Évelyne Lutton was member of the program committee of CEC 2012,

9.1.5. Journal Editorial Board

- Jean-Daniel Fekete was associate editor of the IEEE Transactions on Visualization and Computer Graphics
- Jean-Daniel Fekete was guest editor of IEEE Computer Graphics and Applications on the special issue on "Visualization Applications and Design Studies"
- Tobias Isenberg was associate editor of Elsevier Computers & Graphics
- Tobias Isenberg was guest editor of the special section of Elsevier Computers & Graphics for the best papers of the 2011 Joint Symposium on Computational Aesthetics, Non-Photorealistic Animation and Rendering, and Sketch-Based Interfaces and Modeling,
- Petra Isenberg and Tobias Isenberg are guest editors of a special issue of Sage Publishing's Information Visualization on visualization evaluation.
- Pierre Dragicevic was co-Editor in Chief for the Journal d'Interaction Personne-System (JIPS).

9.1.6. Conference Reviewing

3DUI IEEE Symposium on 3D User Interfaces: Pierre Dragicevic

AVI Advanced Visual Interfaces: Jean-Daniel Fekete, Petra Isenberg

BELIV Workshop on Beyond Time and Error: Novel Evaluation Methods for Visualization: Jean-Daniel Fekete, Petra Isenberg, Tobias Isenberg

CAe Tobias Isenberg

CEC IEEE Congress on Evolutionary Computation: Évelyne Lutton

CHI ACM Conference on Human Factors in Computing Systems: Pierre Dragicevic, Jean-Daniel Fekete, Petra Isenberg, Tobias Isenberg

CSCW ACM Computer Supported Cooperative Work: Petra Isenberg

EA Artificial Evolution: Évelyne Lutton

EICS ACM SIGCHI Symposium on Engineering Interactive Computing Systems: Jean-Daniel Fekete, Pierre Dragicevic

EG Eurographics Conference: Petra Isenberg and Tobias Isenberg

EuroGP European Conference on Genetic Programming: Évelyne Lutton

EuroVA Eurographics Symposium on Visual Analytics: Petra Isenberg

EuroVis Eurographics European Symposium on Visualization: Jean-Daniel Fekete, Petra Isenberg, Tobias Isenberg

EvoIASP Evolutionary Computation in Image Analysis and Signal Processing: Évelyne Lutton

EvoMusArt European Event on Evolutionary and Biologically Inspired Music, Sound, Art and Design: Évelyne Lutton

GECCO Genetic and Evolutionary Computation Conference: Évelyne Lutton

Graph Drawing Jean-Daniel Fekete, Benjamin Bach

Graphics Interface Tobias Isenberg

ICDE IEEE International Conference on Data Engineering: Jean-Daniel Fekete

IHM Interface Homme Machine IHM: Pierre Dragicevic, Jean-Daniel Fekete

InfoVis IEEE Conference on Information Visualization: Pierre Dragicevic, Petra Isenberg, Tobias Isenberg

ISVC International Symposium on Visual Computing: Petra Isenberg

ITS International Conference on Interactive Tabletops and Surfaces: Pierre Dragicevic, Petra Isenberg, Tobias Isenberg, Yvonne Jansen

MobileHCI Pierre Dragicevic

NISCO Nature Inspired Cooperative Strategies for Optimization: Évelyne Lutton

NordiCHI Nordic Forum for Human-Computer Interaction: Petra Isenberg

NPAR Tobias Isenberg

PacificVis IEEE Pacific Visualization Symposium: Petra Isenberg, Pierre Dragicevic

SIGGRAPH Pierre Dragicevic

TAVA Theory and Applications of Visual Analytics: Petra Isenberg

TEI Conference on Tangible Embedded and Embodied Interaction: Petra Isenberg

UbiComp International Conference on Ubiquitous Computing: Pierre Dragicevic

UIST ACM Symposium on User Interface Software and Technology: Pierre Dragicevic, Petra Isenberg Tobias Isenberg, Yvonne Jansen

VAST IEEE Conference on Visual Analytics, Science, and Technology: Jean-Daniel Fekete, Petra Isenberg, Tobias Isenberg

9.1.7. Journal Reviewing

DAMI Data Mining and Knowledge Discovery: Jean-Daniel Fekete

C&G Computers and Graphics: Petra Isenberg, Tobias Isenberg, Pierre Dragicevic

CG&A Computer Graphics and Applications: Petra Isenberg, Tobias Isenberg

GPEM Genetic Programming and Evolvable Machines: Évelyne Lutton

IJHCS International Journal of Human-Computer Studies: Petra Isenberg

TEC IEEE Transactions on Evolutionary Computation: Évelyne Lutton

TOCHI ACM Transactions on Computer-Human Interaction: Petra Isenberg, Pierre Dragicevic

TVCG IEEE Transactions on Visualization and Computer Graphics: Petra Isenberg, Pierre Dragicevic

Computer Graphics Forum Tobias Isenberg

9.1.8. Scientific Dissemination

- Samuel Huron and Jeremy Boy co-organized the “WIID” (Who Is Interaction Design?) conference at Centre Pompidou, Paris

9.2. Teaching - Supervision - Juries

9.2.1. Teaching

Master:

- Module “Artificial Evolution” of ENSTA (first year, level M1, 21h, taught by Évelyne Lutton).

- Module “Complex Systems” of Agro-ParisTech (second year, level M2, 12h, taught by Évelyne Lutton).
- Module “Interactive Information Visualization” of Univ. Paris-Sud (M2, 18h, taught by Pierre Dragicevic, Jean-Daniel Fekete and Petra Isenberg),
- Module “Computer Graphics” of Univ. of Groningen (M2, taught by Tobias Isenberg),
- Module “Advanced Computer Graphics” of Univ. of Groningen (M2, taught by Tobias Isenberg),
- Module “Innovative Interactive Systems” of Univ. of Groningen (M2, taught by Tobias Isenberg).

9.2.2. Supervision

PhD in progress: Benjamin Bach, *Collaborative Visualization of Large Web-based Linked Datasets*, 01/2011, Emmanuel Pietriga and Jean-Daniel Fekete

PhD in progress: Nicolas Heulot, *A Study of The Interactive Process of Visual Data Mining for Multidimensional Data*, 09/2010, Michael Aupetit and Jean-Daniel Fekete

PhD in progress: Samuel Huron, *Navigation and Annotation of Heterogeneous Time-Stamped Data*, 12/2010, Jean-Daniel Fekete and Vincent Puig

PhD in progress: Yvonne Jansen, *Tangible Information Visualization*, 12/2010, Pierre Dragicevic and Jean-Daniel Fekete

PhD in progress: Charles Perin, *Visualization and Collaborative Control of Massive Multi-Structured Temporal Data*, 10/2011, Frédéric Vernier and Jean-Daniel Fekete

PhD in progress: Jeremy Boy, *Visualization for the People*, 01/2012, Françoise Detienne and Jean-Daniel Fekete

PhD in progress: Moritz Gerl, *Non-Photorealistic and Illustrative Rendering*, Tobias Isenberg

PhD in progress: Lingyun Yu, *Interactive Computer Graphics*, Tobias Isenberg

9.2.3. Juries

- Jean-Daniel Fekete was reviewer for Thomas Mirlacher’s PhD: “Model-based engineering of animated interactive systems for the interactive television environment”, Université de Toulouse, Dec. 2012
- Jean-Daniel Fekete was reviewer for David Auber’s HdR: “Visualisation de graphes”, Univ. of Bordeaux, Dec. 9 2012.
- Jean-Daniel Fekete was jury member for Micheline Elias’s PhD: “Enhancing Human Interaction with Business Intelligence Dashboards”, Ecole Centrale Paris (ECP), Oct. 2012
- Jean-Daniel Fekete was jury member for Michael Aupetit’s HdR: “Approches topologiques pour l’analyse exploratoire de données et l’aide à la décision”, 11 Jul . 2012
- Jean-Daniel Fekete was reviewer for Guillaume Artigan’s PhD: “Visualisation Multi-Echelle de Graphes Clusterisés”, Université de Montpellier 2, Apr. 2 2012
- Jean-Daniel Fekete was reviewer for Jean Simard’s PhD: “Collaboration haptique étroitement couplée pour la déformation moléculaire interactive”, Université Paris-Sud, Mar. 2012
- Tobias Isenberg was on the PhD committee for Dr. Stefan Flöring: KnoVA: A Reference Architecture for Knowledge-Based Visual Analytics; University of Oldenburg, Germany, Jul. 2012.

10. Bibliography

Major publications by the team in recent years

[1] A. BEZERIANOS, F. CHEVALIER, P. DRAGICEVIC, N. ELMQVIST, J.-D. FEKETE. *GraphDice: A System for Exploring Multivariate Social Networks*, in "Computer Graphics Forum - Eurographics/IEEE-VGTC Symposium on Visualization 2010 (EuroVis 2010)", June 2010, vol. 10, n^{o} 3, p. 863-872 [*DOI :* 10.1111/J.1467-8659.2009.01687.X], http://hal.inria.fr/inria-00521661.

[2] A. BEZERIANOS, P. DRAGICEVIC, J.-D. FEKETE, J. BAE, B. WATSON. *GeneaQuilts: A System for Exploring Large Genealogies*, in "IEEE Transactions on Visualization and Computer Graphics", Nov-Dec 2010, vol. 16, n^{o} 6, p. 1073–1081, http://doi.ieeecomputersociety.org/10.1109/TVCG.2010.159.

[3] F. CHEVALIER, P. DRAGICEVIC, A. BEZERIANOS, J.-D. FEKETE. *Using Text Animated Transitions to Support Navigation in Document Histories*, in "CHI '10: Proceedings of the 28th international conference on Human factors in computing systems", New York, NY, USA, ACM, 2010, p. 683–692 [*DOI :* 10.1145/1753326.1753427], http://hal.inria.fr/hal-00690289.

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