GERMANY Constance

University of Constance

Database, Data Mining, and Visualization Research Group
Computer Science Department
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Core Competence

Information Visualization, Visualization of Large Databases, Visual Data Mining, Data Mining and Knowledge Discovery, High-Dimensional Indexing, Similarity Search in Multimedia Databases

Head of the Institute
Daniel A. Keim

History

The Database, Data Mining, and Visualization Research Group at the University of Constance is relatively young. It was founded in 2000 and is part of the 'data exploration and visualization' focus of the computer science department. Before coming to Constance, the data mining and visualization group was located at the University of Halle (1998 - 2000) and the University of Munich (1994-1998).

Staff

1 Full professor: Daniel A. Keim
6 Research assistants: Alexander Hinneburg (University of Halle), Christian Goldberg, Christian Panse, Tobias Schreck, Mike Sips, Markus Wawryniuk
1 PhD student (*external*): Benjamin Bustos
1 Secretary: Sabine Kuhr

Rooms and Locations

The research group occupies some 250 square meters and is located on the third floor of the main building of the university. One special lab for visualization (powerwall) is included.

Financing

The basic financing of the group is provided by the state of Baden-Wuerttemberg (Germany). Additional resources come from the Deutsche Forschungsgemeinschaft (DFG), European Union (EU), and industrial research collaborations.

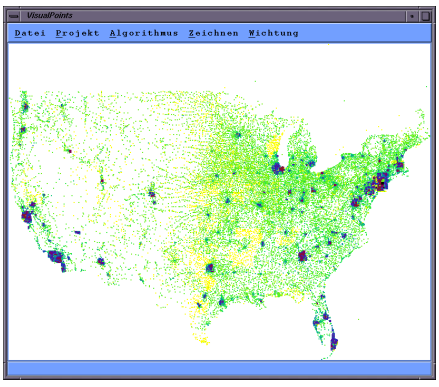
Current Structure and Important Partners

The research group is organized in four work areas: Information Visualization - Visualization of Large Databases (pixel display visualizations, cartograms, and visual optimization), Data Mining and Knowledge Discovery (visual clustering of high-dimensional data, high-dimensional clustering, and clustering of categorical and continuous data), Similarity Search in Multimedia Databases (CAD databases (car manufacturing), picture databases, and 3D model databases), and Core Database Technology (index structures and query processing in high-dimensional databases). Among others, important non-industrial partners are the University of Halle (Germany), the Worcester Polytechnic Institute (USA), and the Computer Technology Institute (Greece).

Current Research

Current research focus of the group are information visualization techniques for large scale data

exploration and their integration with automated data mining techniques. Important ongoing projects are: PixelMaps: Visualizing large amounts of spatially referenced data on a limited-size screen display often results in poor visualizations due to the high degree of overplotting of neighboring data points. The VisualPoints system and PixelMaps implement a new visualization approach. The basic idea is to intelligently use the unoccupied pixels of the display instead of overplotting data points. Cartogram Visualizations: Cartograms are a well-known technique for showing geography-related statistical information. The basic idea is to distort a map by resizing its regions according to a statistical parameter, but in a way that keeps the map recognizable. We deal with the continuous cartogram problem which strictly retains the topology of the polygon mesh. Pixel Bar Charts: In E-Commerce applications, large data sets need to be explored to understand the sales process. Aim of the project is to simultaneously show a maximum amount of data by representing a data value with each pixel. For this purpose, the idea of bar diagrams has been generalized in order to represent multiple variables and visualize the dependences among them. 3D Similarity Search: This project focusses on methods for similarity search of 3D models. The idea is to search similar 3D models based on feature vectors which characterize important features. In addition, the search on arbitrary combinations of feature vectors has to be supported. High-Dimensional Clustering: In this project, we develop new algorithms for an effective clustering of high-dimensional data with a specific focus on arbitrarily oriented projected clusters. In addition, we use visualization technology to improve the automated clustering algorithms, tightly integrating advanced clustering algorithms and state-of-the-art visualization techniques for a better understanding and effective guidance of the clustering process.

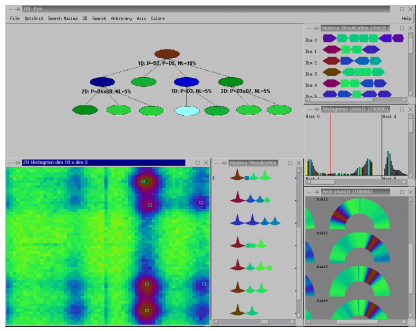


Important Recent Project Participations

- "Visual Data Mining", DFG project, www.informatik.uni-halle.de/dbs/hdeye
  The project is part of the DFG research group
- "Information Fusion", fusion.cs.uni-magdeburg.de/contact_e.xml
- "Similarity Search on 3D-Databases", DFG project, www.cg.cs.tu-bs.de/v3d2/projdescr/aehnlichkeitssuche
- "PANDA", EU-IST network project, dke.cti.gr/panda/index.htm
- "Pixel Bar Charts", project in collaboration with HP Research Labs, CA
- "PixelMaps", project in collaboration with AT&T Research Labs, NJ

Important Recent Industrial Partners

MIT GmbH (Germany), Hewlett Packard Research Labs (USA), AT&T Research Labs (USA)



Future of the Lab

The amount of data collected in corporate and public databases is increasing at an accelerated rate. As a result, the difficulties of exploring these large data sets are growing. The database, data mining, and visualization group will help to solve large scale data exploration problems by developing novel information visualization techniques and combining them with state-of-the-art automated data mining techniques. Real world applications will provide the motivation and basis for evaluating our work.