

LANGUAGE OF NETWORKS

**1st interdisciplinary international conference & exhibition on networks.
In the framework of Ars Electronica 2004 „TIMESHIFT – The World in Twenty-Five Years“.**

conference: september 1 and 2, 2004

exhibition: september 1 – 7, 2004

www.aec.at/networks

www.fas.at

curated by Gerhard Dirmoser, Lothar Krempel, Ruth Pfosser, Dietmar Offenhuber

a joint project of

 **ARS ELECTRONICA**

FAS.research



Sozialwissenschaftliche Forschungsgesellschaft mbH

LANGUAGE OF NETWORKS

Conference, September 1, 2004

Time		Place	see Page
10:00-11:00	Round Table / Press Conference How Innovations Happen	Sky Media Loft	7
10:00-19:00	Cave Presentations Salzburg Sommer Joker Vladimir Batagelj (SI) Jeff Johnson (USA) Lothar Krempel (DE) Andrej Mrvar (SI) Gerhard Wührer (AT) EURO2004 Football Tournament Ulrik Brandes (DE)	CAVE	7
13:00-13:30	Introductory Lecture Networks: Science-Art Lothar Krempel (DE)	Seminarraum	7
14:00-16:30	Panel I Information Visualization Ulrik Brandes (DE) - Network Visualization and Graph Drawing Lothar Krempel (DE) - Communicating Empirical Information with Color Anne Nigten (NL) - Mental Maps W. Bradford Paley (USA) - Information Visualization: Meaning, Evolution, and Design; How to Engage Cognition Using Early Vision René Weiskircher (AT) - Network Visualization and Graph Drawing	Seminarraum	8
14:00-16:30	Panel II Mapping Research and Innovation Jürgen Gädler (DE) - 2003 DFG Funding Ranking: Methods, Findings and Perspectives Nikolaos Kastrinos (EL) - Mapping the Social Sciences and Humanities in Europe: Needs, Challenges and Prospects Wolfgang Neurath (AT) - Social Network Analysis (SNA): A New Method for Exploring Patterns of Innovation Stefan Thurner (AT) - Complex Systems Theory, Evolution and Innovation	Sky Media Loft	9
17:00-19:00	Panel III Networks and Art <i>(in German)</i> Gerhard Dirmoser (AT) - Depictions of Networks in the Field of Art - A Contribution to Diagrammatics Urs Hirschberg (CH) - Networks of Collective Authorship Astrit Schmidt-Burghardt (DE) - Art's Family Trees. On the Genealogical Transformation of Information	Seminarraum	10
17:00-18:30	Workshop I Science Communication Harald Katzmaier (AT) & Elke Ziegler (AT)	Sky Media Loft	6
18:30-19:00	Presentation DMA - Digital Media for Artists Gerhard Funk (AT) & Joachim Smetschka (AT)	Art & Tek	6
19:30-20:30	Evening Lecture Group Dynamics at the Amundsen-Scott South Pole Station <i>(English-German translation)</i> Jeff Johnson (USA)	Sky Media Loft	7

LANGUAGE OF NETWORKS

Conference, September 2, 2004

Time		Place	see Page
10:00-19:00	Cave Presentations Salzburg Sommer Joker Vladimir Batagelj (SI) Jeff Johnson (USA) Lothar Krempel (DE) Andrej Mrvar (SI) Gerhard Wührer (AT) EURO2004 Football Tournament Ulrik Brandes (DE)	CAVE	7
09:00-12:00	Workshop II Software for SNA: Pajek Vladimir Batagelj (SI) & Andrej Mrvar (SI) Present an Introduction to the Use of Pajek (available at: http://vlado.fmf.uni-lj.si/pub/networks/pajek/)	Seminarraum	6
14:00-16:30	Panel IV Networks and Power Brian Holmes (FR/USA) - Control Networks, Productive Diagrams: The Limits of Representation Harald Katzmaier (AT) - The Structure of Rugged Power Landscapes - Complexity Theory, Social Network Analysis and the Mathematics of Power Wouter de Nooy (NL) - Who Shall Survive in the Literary Field? Josh On (USA) - Network vs. Class	Sky Media Loft	11
17:00-19:30	Panel V Sociometry <i>(in German)</i> Anton-Rupert Laireiter (AT) - Psychological Network Research Brigitte Marschall (AT) - Encounter as Life: Socio-theatrical Forms of Action in the Improvisational Theater of J. L. Moreno Michael Schenk (DE) - Network Analysis of Social Structures	Seminarraum	12
17:00-19:30	Panel VI Networks and Business Harald Katzmaier (AT) - A New Science Goes Business: Key-Account Management, Sales and Marketing by Means of Social Network Analysis Don Steiny (USA) - Networks and Meaning Gerhard Wührer (AT) - Marketing, Communication, and Project Networks in Technology Clusters - the Example of Upper Austria Michael Stampfer (AT) - Funding (the) Sources in Innovation Systems	Sky Media Loft	13
Exhibition, September 1 - 7, 2004			
10:00-21:00	Language of Networks Mapping Science, Art and Society	Art & Tek	14-16 & 20

GERFRIED STOCKER (AT)

You See What You Get



Networks and clusters have become two of the most hyped-up concepts of our modern Information Society. There are hardly any aspects of our lives in which major expectations are not being invested in the synergies potentially accruing from efficient network linkages. The process of mastering the accompanying complexity of a powerfully accelerated world is increasingly a matter of dealing with new technologies in culturally competent fashion.

Motivated by the fascination of dynamic systems and the possibilities of digital visualization, artists as well have been turning their attention for quite some time to the analysis and depiction of data flows and network topologies. This trend has been further reinforced by the increasing number of artists who have acquired the advanced technical skills to program their own software algorithms. Enabling us to see structures that remain hidden at first glance and to perceive the reciprocities and dynamics of data is an undertaking in which sociopolitical concerns dovetail with artistic work on formal and aesthetic solutions.

This is a domain in which the interdisciplinary approach that is so characteristic of Ars Electronica appears to be particularly promising. Thus, I am especially pleased that this conference – indeed, its core concept as well as the way in which it has been organized – is a successful example of collaboration among representatives of artistic, technological and social fields.

Netzwerke und Cluster sind Hype-Begriffe unserer modernen Informationsgesellschaft geworden. Kaum ein Bereich unseres Lebens, in dem sich nicht große Erwartungen auf die Synergiepotentiale effizienter Vernetzung begründen. Die damit einhergehende Komplexität einer stark beschleunigten Welt zu meistern ist zunehmend eine Sache kulturell kompetenten Umgangs mit neuen Technologien.

Motiviert von der Faszination dynamischer Systeme und den Möglichkeiten digitaler Visualisierung, haben sich seit geraumer Zeit auch KünstlerInnen der Analyse und Darstellung von Datenströmen und Netzwerktopologien zugewandt. Die zunehmende Zahl von KünstlerInnen, die mit hoher technischer Kompetenz ihre eigenen Softwarealgorithmen programmieren, hat diesen Trend noch verstärkt. Dem ersten Blick verborgen bleibende Strukturen sichtbar und die Wechselwirkungen und Dynamiken von Daten nachvollziehbar zu machen, ist eine Arbeit, in der sich gesellschaftspolitische Anliegen mit der künstlerischen Arbeit an formalen und ästhetischen Lösungen verbinden.

Ein Feld, in dem das für die Ars Electronica charakteristische interdisziplinäre Arbeitsprinzip besonders viel versprechend erscheint. Es freut mich daher besonders, dass diese Konferenz bereits in ihrer Idee und Entstehung ein erfolgreiches Beispiel für die Zusammenarbeit von VertreterInnen aus Kunst, Technologie und Gesellschaft ist.

HARALD KATZMAIR (AT)

Mapping the Economy & Society of the 21st Century

You can't find a new land with an old map!



Working with economical, technological and social networks is extremely fascinating. We live in a universe of relations, and all types of relations can be analyzed and visualized as networks. Even after years of analyzing many networks it sometimes happens that I am completely overwhelmed by the complex and diverse beauty of network topologies. Networks between organizations, companies and persons become transformed in ramified stream reliefs replete with reflecting symmetries and broken orders.

The tableau of social and economical relationships of our society reveals a number of to date undiscovered patterns and regularities. In view of meganetworks comprising 70,000 individuals and more than 20,000 organizations we sometimes feel as if FAS.research were a space ship from which we look down at the earth and recognize patterns that otherwise evade perception.

Die Beschäftigung mit ökonomischen, technologischen und sozialen Netzwerken ist eine durch und durch faszinierende Tätigkeit. Wir leben in einem Universum von Beziehungen, und Beziehungen gleich welcher Art lassen sich als Netzwerke analysieren und visualisieren. Selbst nach Jahren der Analyse von vielen Netzwerken kommt es vor, dass es mir den Atem verschlägt angesichts der komplexen und vielschichtigen Schönheit von Netzwerktopologien. Verflechtungen zwischen Organisationen, Firmen und Personen verwandeln sich in verzweigte Flussreliefs voller gespiegelter Symmetrien und gebrochener Ordnungen.

Das Tableau der sozialen und ökonomischen Beziehungen unserer Gesellschaft offenbart eine Vielzahl bislang unentdeckter Muster und Regularitäten. Angesichts von Mega-Netzwerken mit 70.000 Personen und über 20.000 Organisationen kommt es uns manchmal so vor, als wäre die FAS.research ein Raumschiff, von dem aus wir einen Blick auf die Erde werfen und Muster erkennen, die sich sonst der Wahrnehmung entziehen.



The analysis of networks is not just an exciting, scientifically challenging activity but also one that is of great benefit for industry and public administration. With the knowledge of network analysis marketing, key-account and sales, lobbying and PR can be placed onto entirely new foundations. Never before was it possible to pinpoint with such precision important persons (opinion leaders, super spreaders, hubs). The knowledge of the laws according to which new ideas, technologies, products, opinions, fashions, etc. are propagated, has increased by leaps and bounds in recent years. And this is just the beginning. With the merging of social network analysis and complexity theory to a general science of dynamic networks, we are presently witnessing the emergence of an innovative transdisciplinary scientific paradigm of the early 21st century.

It is a great pleasure for me and the whole team of FAS.research to take part in introducing segments of this fascinating world of networks to a broader public by organizing "Language of Networks". We are delighted that we have succeeded, together with Ars Electronica Center (AEC), in bringing renowned representatives from the world of network research to Austria. For the first time policy maker in the field of research and technology, artists, social scientists, educators, psychologists, mathematicians and computer scientists as well as users will be able to come together to discuss the state of the art of networks.

For making the symposium and exhibition possible thanks go to the sponsors and the colleagues from AEC and to all speakers and persons who provided contributions for the exhibition. I would like to extend a special word of thanks to Wolfgang Neurath from the Council for Research and Technology Development. He was who gave the incentive to this event and secured the financing.

I wish all of you an exciting, inspiring symposium and visiting the exhibition interesting insights into the world of networks!

Yours,

Harald Katzmaier

Die Analyse von Netzwerken ist nicht nur eine abenteuerliche und wissenschaftlich herausfordernde Tätigkeit sondern auch für Industrie und öffentliche Verwaltung von großem Nutzen. Mit dem Wissen der Netzwerkanalyse können Marketing, Key-Account & Vertrieb, Lobbying und PR auf völlig neue Fundamente gestellt werden. Noch nie zuvor war es möglich, so punktgenau wichtige Personen (Opinion Leader, Super Spreader, Hubs) zu identifizieren. Das Wissen darüber, nach welchen Gesetzen sich neue Ideen, Technologien, Produkte, Meinungen, Moden etc. ausbreiten, ist in den vergangenen Jahren sprunghaft gestiegen. Und das ist erst der Anfang: Mit dem Zusammenwachsen der Social Network Analysis und Complexity Theory zu einer allgemeinen Wissenschaft von dynamischen Netzwerken sind wir gegenwärtig Zeugen des Entstehens eines innovativen transdisziplinären Wissenschaftsparadigmas des jungen 21. Jahrhunderts.

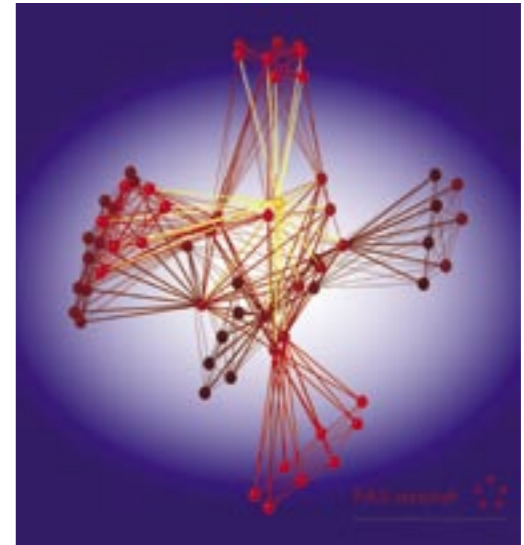
Es ist eine große Freude für mich und das gesamte Team der FAS.research, durch die Organisation von „Language of Networks“ daran mitzuwirken, dass Ausschnitte aus dieser faszinierenden Welt der Netzwerke einem breiteren Publikum vorgestellt werden können. Wir freuen uns sehr, dass es uns gemeinsam mit dem Ars Electronica Center (AEC) gelungen ist, namhafte VertreterInnen aus der Welt der Netzwerkforschung erstmalig nach Österreich zu bringen. Erstmals werden sich Forschungs- und TechnologiepolitikerInnen, KünstlerInnen, SozialwissenschaftlerInnen, DidaktikerInnen, PsychologInnen, MathematikerInnen und InformatikerInnen sowie AnwenderInnen zusammenfinden, um den Wissensstand zu Netzwerken auszutauschen.

Der Dank für das Zustandekommen von Symposium und Ausstellung gilt den Sponsoren und den KollegInnen vom AEC sowie allen ReferentInnen und den Personen, die Beiträge für die Ausstellung zur Verfügung gestellt haben. Besonders danken möchte ich Wolfgang Neurath vom Rat für Forschung und Technologieentwicklung. Er war es, der den Anstoß zu dieser Veranstaltung gab und die Finanzierung sicherstellte.

Ich wünsche Ihnen ein spannendes, inspirierendes Symposium und beim Besuch der Ausstellung interessante Einblicke in die Welt der Netzwerke!

Ihr

Harald Katzmaier



LANGUAGE OF NETWORKS

Workshops

HARALD KATZMAIR (AT), Director of FAS.research, Vienna

ELKE ZIEGLER (AT), Science and Technology Journalist, Vienna

Workshop I Science Communication

Visualizing and communicating complex knowledge is „daily business“ not only for journalists and PR-experts, but also for educators.

By participating in the workshop „Science Communication“, they will have the opportunity to learn about the method of „Social Network Analysis“. On the basis of concrete examples, the lecturers will provide participants with a „tool box“ for analysis and visualizations.

GERHARD FUNK (AT), University of Art and Industrial Design, Linz

JOACHIM SMETSCHKA (AT), Media Designer and Video Artist, Linz

Presentation DMA – Digital Media for Artists

The aim of the project is to collect and share the widespread knowledge of many people and to develop a web-based system by means of which users can pick up in a flexible and demand-oriented way the necessary technical and formative skills within the range of the digital media. The crucial point is that every lecturer, student or interested user can produce and upload modules, which are supervised by an editorial board.

The project was initiated and implemented by the University of Art and Industrial Design, Linz in co-operation with FH Hagenberg and is granted by the Federal Ministry for Education, Science and Culture.

<http://e-learn.internet.ufg.ac.at/digimapp/digimapp>

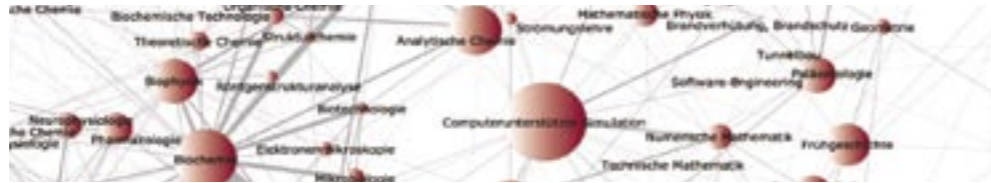
VLADIMIR BATAGELJ (SI), University of Ljubljana, Department of Mathematics

ANDREJ MRVAR (SI) – University of Ljubljana, Faculty of Social Sciences

Workshop II Pajek – Analysis and Visualization of Large Networks

We will present an introduction to the use of Pajek followed by some efficient approaches (islands, cores, triangular weights, citation weights, pattern search, etc.) to the analysis and visualization of real-life large networks (genealogies, collaboration networks, citation networks, Internet networks, dictionary networks, etc.).

Program Pajek is available at:
<http://vlado.fmf.uni-lj.si/pub/networks/pajek/>



Komplexe Zusammenhänge und Wissen anschaulich zu vermitteln, gehört zum „daily business“ nicht nur von JournalistInnen und PR-Fachleuten, sondern auch von DidaktikerInnen und PädagogInnen.

Der Workshop „Science Communication“ bietet die Möglichkeit, die Methode der Sozialen Netzwerkanalyse anhand konkreter Beispiele zu erlernen. Die TeilnehmerInnen bekommen ein „Praxispaket“ präsentiert, mit dem sie Analysen und Visualisierungen durchführen können.



Ziel des Projektes ist es, verstreutes Wissen von vielen Personen zu sammeln und als Beitrag allen zur Verfügung zu stellen sowie ein web-basiertes System zu entwickeln, mit dem BenutzerInnen sich die notwendigen technischen und gestalterischen Fähigkeiten im Bereich der digitalen Medien sehr flexibel und bedarfsorientiert aneignen können. Entscheidend dabei ist, dass Lehrende, StudentInnen und interessierte BenutzerInnen eigenständig, unter der Aufsicht eines redaktionellen Gremiums, Module produzieren und in das System integrieren können.

Das Projekt wurde initiiert und implementiert von der Universität für Kunst und Industrielles Design, Linz in Kooperation mit der Fachhochschule Hagenberg und wird vom Bundesministerium für Bildung, Wissenschaft und Kultur gefördert.

<http://e-learn.internet.ufg.ac.at/digimapp/digimapp>



Das Programm Pajek ist erhältlich unter:
<http://vlado.fmf.uni-lj.si/pub/networks/pajek/>

LANGUAGE OF NETWORKS

Round Table / Press Conference, Introductory Lecture, Evening Lecture & CAVE Presentations

JEFF JOHNSON (USA)

East Carolina University, Institute for Coastal and Marine Resources

Evening Lecture

Visualizing Group Dynamics at the Amundsen-Scott South Pole Station



This is a correspondence analysis of the network of relations during one winter month for the crew at the Amundsen-Scott South Pole Station. Rings depict individual crew members and colors represent the degree to which each member was nominated as the instrumental leader in the group using the Black Body radiation scale (also known as „Temperature Factor“). Here the hottest (whitest) colors emphasize the highest values (higher nominations). Blue links represent linkages between science personnel. Yellow links represent linkages between trades (e.g. carpenters, plumbers) personnel, and red links represent linkages between science and trade personnel.

Präsentiert wird eine Korrespondenzanalyse des Beziehungsnetzwerkes eines Teams, das einen Wintermonat in der Amundsen-Scott Station am Südpol verbrachte. Ringe stehen für die einzelnen Teammitglieder und Farben zeigen für jedes Gruppenmitglied den Grad der ihm zugewiesenen Leitungsfunktion, wobei der Black Body Radiation Scale (auch als „Temperaturfaktor“ bekannt) verwendet wurde. Hier betonen die heißesten (weißesten) Farben die höchsten Werte (mehr Nennungen). Blaue Links stellen die Verbindungen unter dem wissenschaftlichen Personal dar. Gelbe Links markieren die Verbindungen zwischen Angestellten in verschiedenen Branchen (z.B. unter Tischlern, Installateuren) und rote Links repräsentieren die Verbindungen zwischen Wissenschaftlern und Geschäftsleuten.

VLADIMIR BATAGELJ (SI) University of Ljubljana, Department of Mathematics

JEFF JOHNSON (USA) East Carolina University, Institute for Coastal and Marine Resources

LOTHAR KREMPEL (DE) MPI-Max Planck Institute for the Study of Societies

ANDREJ MRVAR (SI) University of Ljubljana, Faculty of Social Science

GERHARD WÜHRER (AT) Johannes Kepler University, Linz, Department of Marketing

CAVE VISUALIZATION

Salzburg Sommer Joker 2003

Various 3D-visualization approaches based on the same data set developed for the virtual reality of the CAVE.

The Salzburg Sommer Joker is a chip card for an all inclusive vacation. It offers free or reduced admission to about 150 tourist sights and leisure attractions throughout the entire province of Salzburg in Austria. The movements from one event to another within the province of Salzburg may be interpreted as a large-scale network where the tourist events are linked by the visits of about 28,000 people.

Der Salzburg Sommer Joker ist eine Chipkarte für einen Urlaub, bei dem alles inbegriffen ist. Sie bietet kostenlosen bzw. ermäßigten Eintritt in etwa 150 Sehenswürdigkeiten und Freizeiteinrichtungen im gesamten Bundesland von Salzburg. Die Bewegungen von einem Ereignis zum anderen innerhalb des Bundeslandes können als ein ausgedehntes Netzwerk interpretiert werden, in dem touristische Ereignisse durch die Besuche von etwa 28.000 Menschen verbunden sind.

GÜNTHER BONN (AT) University of Innsbruck

– Austrian Council for Research and Technology Development

HARALD KATZMAIR (AT) FAS.research, Vienna

ANDREAS PENK (AT) Pfizer Austria, Vienna

CHRISTA SOMMERER (AT) University of Art and Industrial Design, Linz

GERFRIED STOCKER (AT) Ars Electronica Center, Linz

Round Table / Press Conference

How Innovations Happen

Representatives of research, art, administration and industry will discuss their assessment and expert knowledge on networks and innovations.

Repräsentanten aus Forschung, Kunst, Verwaltung und Industrie werden ihre Bewertung und ihr Expertenwissen zu Netzwerken und Innovation diskutieren.

LOTHAR KREMPEL (DE)

Max Planck Institute for the Study of Societies, Cologne



Introductory Lecture Networks: Science – Art

The world trade among the OECD countries in 1992. Different trade blocks are identified with color schemes.

Seit Menschengedenken entstehen Bilder. Bilder können hoch realistische Eindrücke der Welt geben. Sie dienen als Speicher,

um Informationen aufzubewahren. Die visuelle Kommunikation ist im höchsten Maße aussagekräftig. Dies könnte erklären, warum die Wissenschaft lange zögerte, das Potential von Bildern einzusetzen. Die Netzwerkforschung von heute ortet virtuelle Netzwerke, Informationslandschaften, die von automatischen Routineverfahren hervorgebracht werden. Wie ein geographischer Atlas identifiziert sie Positionen, die sich aber im statistischen Raum befinden. Die Wissenschaft ist in die Domäne der Kunst getreten. Wir haben erst begonnen, das riesige Potential dieser neuen Formen der Kommunikation zu erforschen. Wie man dies am besten tun soll, ist nun die Frage, die sich stellt.

Humans have created images since ancient times. Images can give highly realistic impressions of the world. They are storage devices which preserve information. Visual communication is extremely powerful. This may explain why science was very hesitant to use the potential of images. Today network studies identify information landscapes that are produced by automatic routines. Like geographical atlases they identify positions, but in statistical space. Science has entered the domain of arts. We have just begun to explore the vast potential of these new forms of communication. How to best do it is the question.

ULRIK BRANDES (DE)

University of Konstanz, Department of Computer & Information Science

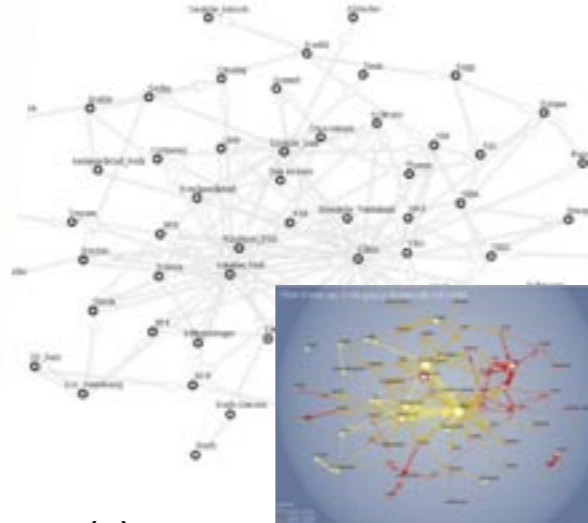
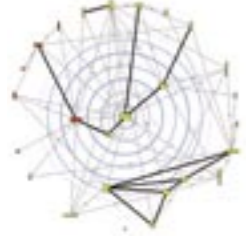
EURO2004

The football tournament visualized as walkable graph.

Die Fußballmeisterschaft als begehbare Diagramm visualisiert.

LANGUAGE OF NETWORKS

Information Visualization



ULRIK BRANDES (DE) *University of Konstanz*

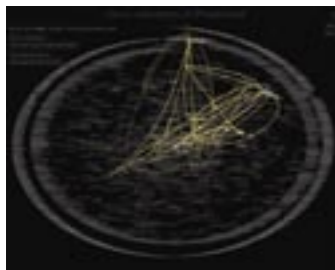
RENÉ WEISKIRCHER (AT) *Vienna University of Technology*

Network Visualization and Graph Drawing

Networks are ubiquitous. Just think of visible, everyday networks like those in public transportation, communications, or electrical engineering. However, there are other, invisible networks that come to existence when objects are viewed as being in relation to each other. It is their inherent nature of being relational structures that interests the algorithmicians. How can we utilize computers to assist the understanding of such networks, determining and classifying their properties, and creating visual representations?

Netzwerke sind allgegenwärtig. Denken Sie an sichtbare, alltägliche Netzwerke, wie Verkehrsnetze, Kommunikationsnetzwerke oder elektrische Leitungen. Aber es existieren auch andere, unsichtbare Netzwerke, die entstehen, wenn Objekte in ihrer Beziehung zueinander gesehen werden. Es sind deren inhärente Beziehungsstrukturen, die sie für Algorithmiker interessant machen. Wie können wir Computer einsetzen, um solche Netzwerke zu verstehen, ihre Eigenschaften zu bestimmen und zu klassifizieren und visuelle Repräsentationen zu erzeugen?

Information Visualization: Meaning, Evolution, and Design; How to Engage Cognition Using Early Vision



W. BRADFORD PALEY (USA)
Digital Image Design

Several demonstrations of his work will help develop the thesis that a designed object, when operating as a window on an inherently interesting and complex natural phenomenon, may be able to satisfy both the eye and the mind – not sacrificing information content for esthetics nor vice versa. True synergy may be achievable: easier understanding because the image engages, and richer images because the source/subject transcends the creator.

Einige Demonstrationen seiner Arbeit untermauern die Annahme, dass ein designtes Objekt, das als „Fenster“ in ein an sich interessantes und komplexes Phänomen fungiert, sowohl das Auge als auch den Geist zu befriedigen vermag – ohne dass deshalb die Information der Ästhetik geopfert würde oder umgekehrt. Echte Synergie ist durchaus möglich: Durch ansprechende Bilder wird das Verstehen erleichtert; und da die Quelle/das Subjekt den „Schöpfer“ transzendiert, gewinnen die Bilder an Reichtum.

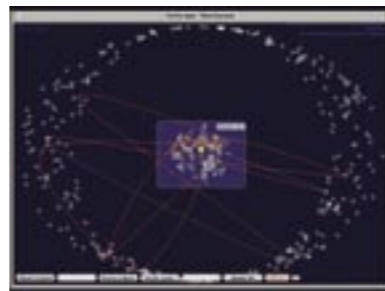
LOTHAR KREMPER (DE)

Max Planck Institute for the Study of Societies, Cologne

Communicating Empirical Information with Color

Following specific scientific principles color can be used to translate quantitative numerical information into the natural order of human vision. This allows to communicate complex multivariate information with ease and high precision.

Farben können nach bestimmten wissenschaftlichen Prinzipien verwendet werden, um quantitative numerische Informationen in die natürliche Ordnung der menschlichen Wahrnehmung zu übersetzen. So können komplexe, multivariate Informationen präzise und effizient kommuniziert werden.



ANNE NIGTEN (NL)
V2_Lab Rotterdam

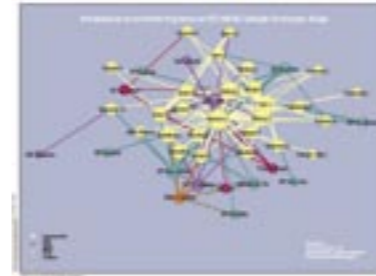
Mental Maps

Mapping as an overall term seems appropriate for indicating a significant cluster of art and design research dealing with information visualization in a broad sense. In the field of mappings several categories can be distinguished, from notation systems, the cartographic map to the associative or mental map. Mental maps or associative maps offer a personal, emotional or artistic view on abstract data or information without any equivalent in our physical reality or according a specific subjective interpretation of our life.

„Mapping“ als Überbegriff eignet sich gut, um einen wichtigen Cluster von Forschungsarbeiten im Bereich der Kunst und des Designs zu bezeichnen, die sich mit Informationsvisualisierung im Allgemeinen beschäftigen. Im Zusammenhang mit „Mappings“ lassen sich einige Kategorien unterscheiden – von Notationssystemen, über kartographische Darstellungen bis hin zur assoziativen bzw. mentalen Karte. Letztere bieten eine persönliche, emotionale oder künstlerische Sichtweise von abstrakten Daten oder Informationen, ohne dass es in der wirklichen Welt oder in einer gegebenen subjektiven Interpretation unseres Lebens eine Entsprechung gibt.

LANGUAGE OF NETWORKS

Mapping Research & Innovation



JÜRGEN GÜDLER (DE) *DFG, German Research Foundation*

2003 DFG Funding Ranking: Methods, Findings and Perspectives

The figure shows collaborative relations between universities and non-university research institutes in the field of biology based on informations about the common participation at coordinated programs of the Deutsche Forschungsgemeinschaft (DFG).

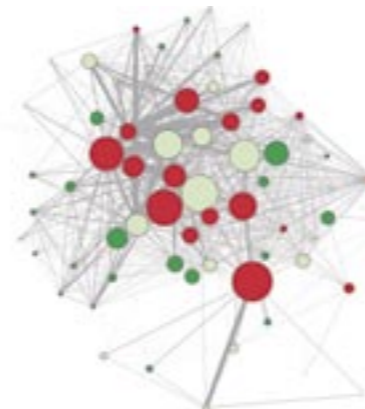
Die Abbildung illustriert Kooperationsbeziehungen zwischen Hochschulen und außeruniversitären Forschungseinrichtungen im Bereich der Biologie. Basis bilden Informationen über die gemeinsame Beteiligung an koordinierten Programmen der Deutschen Forschungsgemeinschaft (DFG).

For more information:

www.dfg.de/ranking/netzwerke

Weitere Informationen unter:

www.dfg.de/ranking/netzwerke



Network of cooperative research institutions in Austria. The connectedness of the innovation system is crucial for the exchange of knowledge. The map shows the embedding of the subnetworks and the different roles, actors and set of actors play within an innovation system.

WOLFGANG NEURATH (AT)

BMWA – Federal Ministry of Economics and Labor

RFTE – Austrian Council for Research and Technology Development

Social Network Analysis (SNA): A New Method for Exploring Patterns of Innovation

Research and innovation policy is undergoing a process of change, as can be seen in the social structure and exchange patterns of the innovation system and in social capital management. Innovation experts argue that not only the input in research, technology and development (RT&D) is crucial for innovation, but also – and perhaps even more so – the social structure of the network of innovators and the exchange of knowledge in terms of accessibility and speed; in other words the adoption and exchange structure of the innovation system. Social Network Analysis is a scholarly method to explore and visualize social structures and thus sustainable social patterns of innovation can be generated.

Forschung und Innovationspolitik unterliegen einem Wandlungsprozess, der in der Sozialstruktur und in Austauschbeziehungen des Innovationssystems deutlich wird. Innovationsexperten vertreten die Auffassung, dass nicht nur der finanzielle Input in Forschung, Technologie und Entwicklung maßgeblich für Innovationen ist, sondern – und vielleicht in viel stärkerem Ausmaß – das Netzwerk der Innovatoren und der Austausch von Wissen hinsichtlich Geschwindigkeit und Erreichbarkeit von Informationen entscheidend ist; in anderen Worten: die Adoptions- und Austauschstruktur des Innovationssystems. Social Network Analysis ist eine wissenschaftliche Methode, um soziale Strukturen zu erforschen und zu visualisieren und so dauerhafte soziale Muster von Innovation zu erzeugen.

NIKOLAOS KASTRINOS (EL)

European Commission, Directorate K – Social Sciences and Humanities, Unit 1: Strategy and Policy

Mapping the Social Sciences and Humanities in Europe: Needs, Challenges and Prospects

The talk will address the ways in which „mapping“ is potentially linked with policy development perspectives in the field of social sciences and humanities in the European Commission. The European Research Area initiative has created a policy environment in which there is a great deal of demand for easily understandable data, and which favours the use of mapping and visualizations. In the fields of the social sciences and the humanities a series of attempts have been made to generate relevant data and representations. The talk will reflect on the experience of those attempts and outline some future policy directions in the social sciences and humanities with implications for the use of mapping and visualizations.

Der Vortrag wird sich damit beschäftigen, inwieweit „Mapping“ neue Perspektiven für die Erarbeitung von Maßnahmen im Bereich der Sozial- und Geisteswissenschaften in der Europäischen Kommission bieten könnte. Die Initiative zum Europäischen Forschungsraum hat ein Maßnahmenumfeld geschaffen, in dem ein großer Bedarf nach leicht verständlichen Daten besteht und das den Einsatz von Mapping und Visualisierungen begünstigt. In den Sozial- und Geisteswissenschaften wurden eine Reihe von Versuchen zur Generierung relevanter Daten und Daten-Repräsentationen durchgeführt. Der Vortrag wird die bei diesen Versuchen gemachten Erfahrungen reflektieren und skizzieren, in welche Richtung sich Maßnahmen in den Sozial- und Geisteswissenschaften bewegen könnten und was das für den Einsatz von Mapping- und Visualisierungstechniken bedeutet.



Banking network of Austria. Nodes are the about 800 banks, links are inter-bank liabilities in a given period. Clusters are grouped (colored) according to sectorial and regional organization.

STEFAN THURNER (AT)

MUV (Medical University Vienna), Head of the Complex Systems Reserch Group

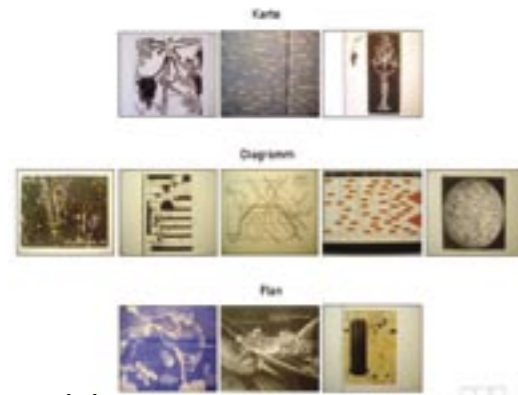
Complex Systems Theory, Evolution and Innovation

In the quest to make the concept of innovation a quantitatively understandable, we suggest the notion of selfish autonomous agents which are linked together on networks. We review how this view has provided some recent understanding of biological evolution and the emergence of the biosphere. We conclude with an outline of how these concepts can be borrowed for a description of (technological) innovation and where the potential handles for its management and control could lie.

In dem Bestreben, das Konzept der Innovation quantitativ verständlich zu machen, schlagen wir den Begriff der eigennützigen anonymen Agenten vor, die miteinander durch Netzwerke verbunden sind. Wir prüfen, wie diese Sichtweise manch neue Einsicht in die Evolution und die Entstehung der Biosphäre ermöglicht hat, und skizzieren abschließend, wie diese Konzepte für eine Beschreibung (technischer) Innovation dienen könnten und wo das Potenzial für deren Management und Kontrolle liegen könnte.

LANGUAGE OF NETWORKS

Networks and Art



GERHARD DIRMOSER (AT)
Systems Analyst und Art Theorist

Depictions of Networks in the Field of Art – A Contribution to Diagrammatics

Taking as his starting point a wide-ranging collection of diagrams having to do with various mapping issues, Dirmoser elaborates on the subgroup of network depictions. He presents an approach to ordering that was worked out for the entire field of mapping and is now being applied as a method for the analysis of network diagrams. On the basis of 11 fundamental schema types, he decodes a broad spectrum of network diagrams.

Ausgehend von einer umfangreichen Diagrammsammlung zu verschiedenen Mapping-Fragestellungen wird auf die Untergruppe der Netzdarstellungen eingegangen. Vorgestellt wird ein Ordnungsansatz, der für den gesamten Mappingbereich erarbeitet und nun als Methode auf die Netzdiagramm-Analyse übertragen wurde. Mit den zugrundeliegenden 11 Schematypen wird versucht, die Netzdiagramme in den unterschiedlichsten Erscheinungsformen aufzuschlüsseln.



Lipstick Traces, a Secret History of the 20th Century von Greil Marcus, europäische Theaterpremiere, Salzburg 2003 (© Wolfgang Kirchner)

ASTRIT SCHMIDT-BURGHARDT (DE)
Freie Universität Berlin, Historian of Graphic Imagery

Art's Family Trees. On the Genealogical Transformation of Information

Selected diagrams are to be used to illustrate some in part fundamentally contradictory concepts and strategies behind iconic historic symbolism or the semiotic model of explanation. The genealogical representation of art lends itself as an object of study since new genealogical orders of the past exemplify the changing self-understanding of modernism.

Anhand ausgewählter Diagramme soll gezeigt werden, welche zum Teil fundamental entgegengesetzten Konzepte und Strategien hinter der ikonischen Geschichtssymbolik bzw. hinter dem semiotischen Erklärungsmodell stehen können. Der Kunststammbaum bietet sich als Untersuchungsgegenstand insofern an, weil anhand der genealogischen Neuordnungen der Vergangenheit das wechselnde Selbstverständnis der Moderne exemplarisch zum Ausdruck kommt.



URS HIRSCHBERG (CH)
University of Technology, Graz

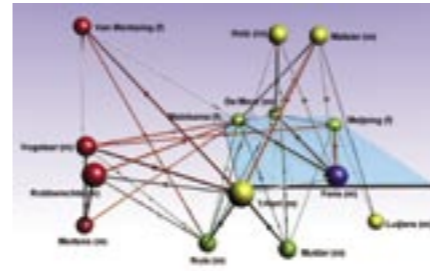
Networks of Collective Authorship

Collaboration via networks has opened up new possibilities of creative exchange. The visualizations make the social dynamics of these networked interactions transparent. They show how collective authorship doesn't have to be in contradiction with individual creativity as both can be traced and evaluated.

Kollektive Projekte, die mit Hilfe von Netzwerken entstehen, haben eine Reihe von neuen Möglichkeiten kreativen Austauschs eröffnet. Visualisierungen machen die soziale Dynamik dieser vernetzten Interaktionen transparent. Sie zeigen, wie die kollektive Urheberschaft nicht mit individueller Kreativität im Widerspruch stehen muss, zumal sich beide nachvollziehen und bewerten lassen.

LANGUAGE OF NETWORKS

Networks and Power



The image shows a snapshot of the evaluations among Dutch authors and critics in 1976.

WOUTER DE NOOY (NL)
Erasmus University, Rotterdam, Faculty of History and Arts

Who Shall Survive in the Literary Field?

Evaluations among literary authors and critics constitute the fundamental social relation in the literary field as they are part and parcel of the recognition process producing a ranking according to success. The image shows a snapshot of the evaluations among Dutch authors and critics in 1976. Positive evaluations are represented by light arrows, negative evaluations are red. This network reveals the ranks (vertical layers) and factions (horizontal clusters) in the literary field at that moment.

Beurteilungen von Schriftstellern und Kritikern konstituieren ihre fundamentale soziale Relation im literarischen Feld, da sie einen wesentlichen Bestandteil im Prozess der Anerkennung produzieren. Das Bild zeigt einen Schnappschuss der Evaluierungen unter holländischen Autoren und Kritikern im Jahr 1976. Positive Beurteilungen sind mit hellen Pfeilen dargestellt, negative sind rot. Dieses Netzwerk enthüllt die Rangordnung (vertikale Ebenen) und die Gruppierungen (horizontale Cluster) zum damaligen Zeitpunkt.



HARALD KATZMAIR (AT) Director of FAS.research, Vienna

The Structure of Rugged Power Landscapes – Complexity Theory, Social Network Analysis and the Mathematics of Power

The paper shows by the example of a large real data network (Austria's elite networks) how theoretic models from the field of Complexity Theory (CT) and Social Network Analysis (SNA) can be applied for visualizing and simulating power spaces. In the last 20 years these two sciences both dealing with states and dynamics of networks have developed a broad spectrum of highly sophisticated indicators for measuring the "power", "influence", and "prestige" of whole networks, groups or individuals. They discovered some very general structural principles which give power structures a robust and sustainable setting. The paper presents some of the most intriguing insights and demonstrates by the example of real data networks from the field of economy, science and culture some approaches how to measure, visualize and simulate power landscapes.

Der Vortrag veranschaulicht mit Hilfe von einem ausgedehnten Netzwerk von wirklichen Daten (die Elite-Netzwerke Österreichs), wie theoretische Modelle aus dem Bereich der Komplexitätstheorie (CT) und der sozialen Netzwerkanalyse (SNA) angewandt werden können, um Machträume zu visualisieren und zu simulieren. In den letzten zwanzig Jahren haben diese beiden wissenschaftlichen Disziplinen, die sich mit den Zuständen und Dynamiken von Netzwerken auseinandersetzen, ein breites Spektrum von hochentwickelten Indikatoren entwickelt, um die „Macht“, den „Einfluss“ und das „Prestige“ von ganzen Netzwerken, Gruppen oder Individuen zu messen. Sie haben einige ganz allgemeine strukturelle Prinzipien entdeckt, die Machtstrukturen mit einem robusten und nachhaltigen Hintergrund versehen. Der Vortrag stellt einige der faszinierendsten Erkenntnisse vor und zeigt anhand von Netzwerken mit realen Daten aus dem Bereich der Wirtschaft, der Wissenschaft und der Kultur einige Ansätze zur Messung, Visualisierung und Simulation von Machtlandschaften.



JOSH ON (USA) – Futurefarmers
Network vs. Class

Modern capitalism has been described as both a network society and a class society. What are the implications of these two descriptions? Are they compatible? Perhaps class is a useful metaphor at times while network can help us understand society better others. Could this be the particle duality of sociology? What implications does it have for activists, and those engaged in struggles against oppression? I will argue that the Marxist notion of class, brings more clarity to both understanding the world that we live in and changing it, than the metaphor of networks can.

Der moderne Kapitalismus wurde sowohl als eine vernetzte als auch als eine Klassengesellschaft beschrieben. Welche Implikationen haben diese beiden Beschreibungen? Sind sie kompatibel? Zuweilen scheint „Klasse“ eine gute Metapher zu sein, während ein anderer die Vorstellung des „Netzwerks“ besser geeignet scheint, um Gesellschaft zu begreifen. Könnte dies die spezifische Dualität der Soziologie sein? Welche Implikationen hätte dies für Aktivisten und jene, die gegen Unterdrückung kämpfen? Ich werde darlegen, dass der marxistische Begriff der Klasse sowohl für das Verständnis als auch für die Veränderung der Welt besser geeignet ist als die Metapher des Netzwerks.

BRIAN HOLMES (FR/USA) Art critic and activist

Control Networks, Productive Diagrams: The Limits of Representation

The „Skitter“ graph, assembled by the Cooperative Association for Internet Data Analysis, correlates the spatial location of some 12,500 ISPs with the volume of outgoing signals they generate. The results show a striking visual resemblance to a map of the hierarchical relations existing between and within each of the world's three major production blocs (NAFTA, European Union, Far East Asia). The development of the Internet mirrors both the geographical extension of contemporary capitalism, and the neoliberal principles of modular, flexible management. But its uses are irreducible to the neoliberal model. Indeed, they are partially unmappable. This paper draws on the Deleuzian notion of the „diagram of power“ to examine how new forms of grassroots political agency emerged from the tremendous bout of deterritorialization imposed by the globalization process, from the 1980s to the turn of the millennium.

Das von der „Cooperative Association for Internet Data Analysis“ zusammengestellte „Skitter“-Diagramm korreliert den räumlichen Ort von etwa 12.500 ISPs mit dem Volumen der von ihnen erzeugten Ausgangssignale. Die Ergebnisse zeigen eine auffallende visuelle Ähnlichkeit mit der kartographischen Darstellung der hierarchischen Relationen zwischen und innerhalb jeder der drei größten Produktionsblöcke der Welt (NAFTA, Europäische Union, Fernost). Die Entwicklung des Internets spiegelt sowohl die geographische Ausdehnung des zeitgenössischen Kapitalismus als auch die neoliberalen Prinzipien des modularen, flexiblen Managements wider. Die Anwendungen lassen sich jedoch nicht auf das neoliberale Modell reduzieren. Tatsächlich lassen sie sich teilweise gar nicht kartographisch darstellen. Dieser Vortrag beruft sich auf den deleuzeschen Begriff des „Machtdiagramms“, um zu untersuchen, wie neue Formen politischer Handlungsinstanz aus der starken Phase der Entterritorialisierung entstanden sind, die durch den Prozess der Globalisierung zwischen den achtziger Jahren und dem Millennium auferlegt wurden.

LANGUAGE OF NETWORKS

Sociometry

“We have first to visualize... A process of charting has been devised by the sociometrists, the sociogram, which is more than merely a method of presentation. It is first of all a method of exploration. It makes possible the exploration of sociometric facts. The proper placement of every individual and of all interrelations of individuals can be shown on a sociogram.”

Moreno, J. L. (1953). *Who Shall Survive?* Beacon, N.Y.: Beacon House Inc 8 (pp. 95–96)

„Zuerst müssen wir visualisieren ... Ein Prozess der schematischen Darstellung wurde von Soziometrikern entwickelt, das Soziogramm, das mehr ist, als nur eine Darstellungsform. Es ist vor allem eine Methode der Erkundung und Erforschung. Es ermöglicht die Exploration soziometrischer Fakten. In einem Soziogramm können die exakten Positionen aller Individuen und alle ihre wechselseitigen Beziehungen gezeigt werden.“



Positive and Negative Choices in a Football Team (Moreno, 1934, p. 213).

BRIGITTE MARSCHALL (AT)

University of Vienna, Institute for Theater, Film and Media Studies

Encounter as Life: Socio-theatrical Forms of Action in the Improvisational Theater of J. L. Moreno

The essence of Moreno's Theater of Spontaneity is actionism and interpersonal relationships: “the Invitation to an Encounter”. The Theater of Spontaneity is a place of exhibition, a place where life and reality itself is tested with respect to its realities. This theatrical concept involved tearing to pieces the safety curtain separating reality and the performing arts. One of Moreno's main projects was the construction of a circular stage. To portray the simultaneity and sequence of different levels of consciousness, experience and perception, he designed platforms of various heights arranged around a central stage area. The conflicts, hopes, dreams and emotions of the community were translated into a rhythmical language of images, a transformation of actions and reactions in space and time.

Die Essenz von Morenos Theater der Spontaneität ist Aktionismus und interpersonale Beziehungen: „Die Einladung zu einer Begegnung“. Das Theater der Spontaneität ist Ort der Zurschaustellung, ein Ort, an dem Leben und Wirklichkeit selbst auf ihre Realität getestet werden. Das theatrale Konzept bedingt die Zerstörung des schützenden (Theater-)Vorhangs zwischen Realität und darstellenden Künsten. Eines von Morenos Hauptwerken war die Konstruktion einer kreisförmigen Bühne. Um die Simultanität und Abfolge von verschiedenen Bewusstseinsstufen, Erfahrung und Wahrnehmung abzubilden, entwarf er Plattformen mit variabler Höhe, die rund um einen zentralen Bühnenbereich arrangiert waren. Die Konflikte, Hoffnungen, Träume und Gefühle der Gemeinschaft wurden in eine rhythmische Sprache der Bilder übersetzt, eine Transformation von Aktionen und Reaktionen in Raum und Zeit.

ANTON-RUPERT LAIREITER (AT)

University of Salzburg, Institute for Psychology

Psychological Network Research

Contrary to the sociological approach to SNA, psychology is mostly interested in the contents, dynamics, and functions of the personal relationships of an individual and much less in the structural characteristics of the connections of the members of one's network system. Thus the analysis of the contents, changes and the functions of „personal networks“ dominate research. The paper reviews the most important perspectives and methods of psychological network research, and discusses theoretical and methodological reasons for not taking into account the connectedness of the network members.

Psychologische Netzwerkforschung unterscheidet sich von der strukturellen durch die Fokussierung auf das Individuum und das Interesse an den Inhalten und Funktionen seiner sozialen Beziehungen. Also stehen deskriptive, inhaltliche und Ressourcen- und Belastungsanalysen im Vordergrund. Dies wird anhand des „Interviews zum Sozialen Netzwerk und zur Sozialen Unterstützung, SÖNET“ demonstriert. Für die seltene Berücksichtigung der Vernetzung der Netzwerkmitglieder sind vor allem theoretische und methodische Gründe maßgeblich.



MICHAEL SCHENK (DE)

University of Stuttgart-Hohenheim, Institute of Social Sciences

Network Analysis of Social Structures

The figure shows the communication pattern of a citizens' action committee consisting of 47 participants. The scope of influence of individual actors within the citizens' action committee varies with the centrality of the actor within the network. The more a person is integrated in the communication network, the greater the possibility of diffusing his or her own ideas and of gaining support. The figure shows the closeness centrality scores for the individual actors. Members #1 and #14 appear as the most central members of the core group. They have the shortest paths to all other members, which gives them the edge in communicating effectively.



Die Abbildung zeigt die Kommunikationsstrukturen einer Bürgerinitiative mit 47 Mitgliedern. Der Umfang der Gestaltungsmöglichkeiten einzelner Akteure in der Bürgerinitiative hängt von der Zentralität der Personen im Netzwerk ab. Je stärker die individuelle Einbindung in das Kommunikationsnetzwerk, um so höher ist die Wahrscheinlichkeit, eigene Ideen und Vorstellungen einbringen zu können. Die Abbildung zeigt die Akteurszentralität nach Nähe. Die Mitglieder #1 und #14 erscheinen als zentrale Akteure im Kern: sie verfügen über die kürzesten Pfade zu allen anderen Mitgliedern und damit über die effizientesten Kommunikationsbeziehungen.

LANGUAGE OF NETWORKS

Networks and Business

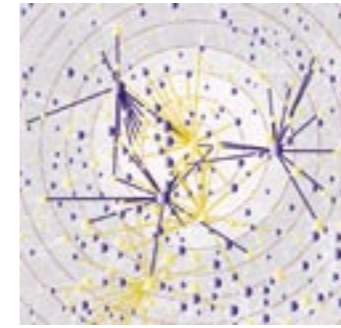
HARALD KATZMAIR (AT)

Director of FAS.research, Vienna

A New Science Goes Business: Key-Account Management, Sales and Marketing by Means of Social Network Analysis

As the saying goes there is nothing as practical as a good theory. The social science of analyzing networks called Social Network Analysis (SNA) is one of those rare „good theories“. It offers a wide range of practical applications in various fields of economy. Cases conducted by FAS.research in the following three fields: key-account marketing and sales, lobbying and communication and organizational analysis will be presented.

Wie es heißt, ist nichts so praktikabel wie eine gute Theorie. Die Sozialwissenschaft der Analyse von Netzwerken, Social Network Analysis (SNA) genannt, ist eine dieser seltenen „guten Theorien“. Sie bietet eine reiche Palette an praktischen Anwendungsmöglichkeiten in unterschiedlichen Bereichen der Wirtschaft. Geschäftsfälle der FAS.research aus den drei Gebieten: Key-Account Marketing und Vertrieb, Kommunikation und Lobbyismus und Organisationsanalyse werden vorgestellt.



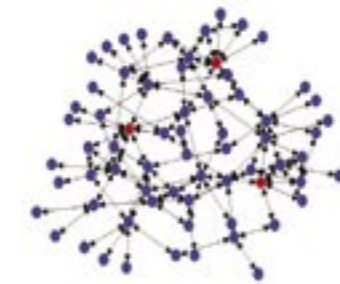
GERHARD WÜHRER (AT)

Johannes Kepler University, Linz, Department of Marketing

Marketing, Communication, and Project Networks in Technology Clusters – the Example of Upper Austria

For the development of a network the flow of communication is crucial. Three participants of the Upper Austrian Food Cluster play a key role in the exchange of information. If all of the three were to withdraw the communication flow would be reduced substantially.

Die Entwicklung eines Netzwerkes hängt entscheidend vom Kommunikationsaustausch ab. Drei Teilnehmer im Lebensmittelcluster Oberösterreich tragen durch ihre Position hauptsächlich zum Austausch bei. Wenn alle drei aus dem Cluster ausschieden, würde der Kommunikationsfluss entscheidend reduziert.



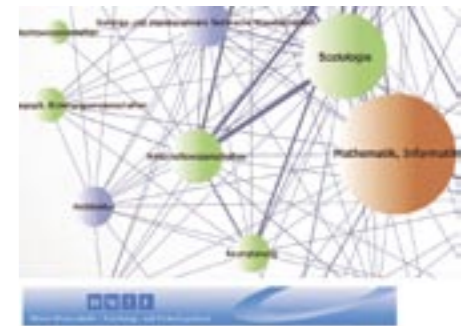
DON STEINY (USA)

INSNAE – Institute for Social Network Analysis of the Economy

Networks and Meaning

Social network analysis often talks of „ties“ that represent relationships between individuals. When humans communicate and have a relationship, part of what allows them to do this, is shared understanding of the situation. Networks of meaning are part of what not only supports our day-to-day interaction, but also what creates, stabilizes or destabilize our institutions. Many of the common issues of business, including leadership, tasks and goals, and productivity using networks of meaning as the descriptive and predictive perspective.

Soziale Netzwerkanalyse spricht oft von „Bändern/Bindungen“ als Darstellung von Beziehungen zwischen Individuen. Wenn Menschen miteinander kommunizieren und eine Beziehung zueinander haben, dann setzt dies u.a. ein Einverständnis der beiden hinsichtlich ihrer Situation voraus. Netzwerke von Sinngehalten/Bedeutungen sind nicht nur Teil dessen, was unsere täglichen Interaktionen unterstützt, sondern auch das, was unsere Institutionen hervorbringt, stabilisiert und destabilisiert. Viele der häufigen Themen im Unternehmen, wie Führungskraft, Aufgaben und Ziele und Produktivität nutzen Netzwerke von Sinngehalten/Bedeutungen als beschreibende und prognostizierende Perspektive.



MICHAEL STAMPFER (AT)

Vienna Science and Technology Fund (WWTF)

Funding (the) Sources in Innovation Systems

In innovation systems the interlinks and relations between the different actors and actor sets are as important as the actors themselves. Replacing linear models of innovation by more network-oriented approaches has implications not only on business behavior and public funding of business research & innovation activities. There are also far reaching consequences for science-industry co-operations and for the funding of scientific activities. It is necessary to fund networks and new combinations, which is one of the main missions of the Vienna Science and Technology Fund (WWTF).

In der Forschungs- und Innovationspolitik gehen wir zunehmend weg von linearen Modellen und hin zu Innovationssystemen. Damit wird den Beziehungen zwischen den Akteuren sehr hohe Bedeutung zugemessen. Diese Veränderung gilt für die ganze Breite der Innovationslandschaft, vom Unternehmenssektor und den darauf bezogenen Politikmaßnahmen bis hin zur Wissenschaft. Formen anwendungsorientierter Grundlagenforschung brauchen spezifische Förderungen und Programme, die etwa Netzwerken und neuen Kombinationen besondere Beachtung schenken. Der Wiener Wissenschafts-, Forschungs- und Technologiefonds (WWTF) ist mit seinen Programmen in diesem Feld tätig.

Mapping Science, Art and Society
LANGUAGE OF NETWORKS

Scientists and artists present diverse methods to visualize networks. Speakers at the conference "Language of Networks" and other scientists like **KIM SNEPPEN (DK)**, **LADA ADAMIC (USA)**, **JAMES MOODY (USA)**, **ALLEN KLOVDAHL (AUS)**, **PAUL MUTTON (UK)**, **PATRIK KENIS (NL)**, **NING YU (USA)**, **DOROTHEA WAGNER (DE)**, **JANE AND DAVID RICHARDSON (USA)**, **JASON OWEN SMITH (USA)**, etc. as well as artists like **DENNIS PAUL (DE)**, **MARCOS WESCAMP (ARG/USA)**, **MARTIN WATTENBERG (USA)** **ODER SCHOENERWISSEN (DE)** will show their network-visualizations.

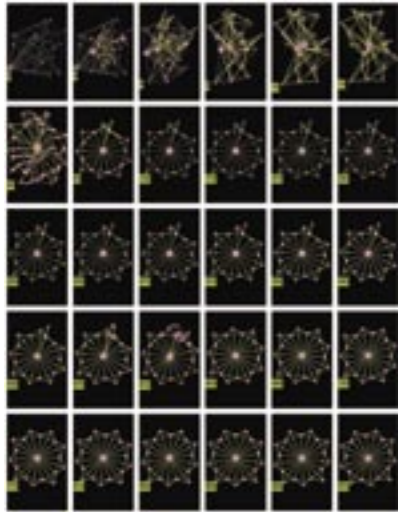
The networks vary in size from small groups to huge systems containing thousands of units. They also differ in the amount of information available, that allows to detect patterns in these structures. There is a large variation in the use of graphic elements (positions, sizes, colors, shapes, motion and interactivity) all of which can be helpful to explore and communicate important aspects of these systems. Examples of networks regarding sports and science, art and economy, biology and society show the wide range of applications of social network analysis.

WissenschaftlerInnen und KünstlerInnen präsentieren unterschiedliche Methoden, Netzwerke darzustellen. Neben den ReferentInnen der Konferenz „Language of Networks“ zeigen auch andere WissenschaftlerInnen wie **KIM SNEPPEN (DK)**, **LADA ADAMIC (USA)**, **JAMES MOODY (USA)**, **ALLEN KLOVDAHL (AUS)**, **PAUL MUTTON (UK)**, **PATRIK KENIS (NL)**, **NING YU (USA)**, **DOROTHEA WAGNER (DE)**, **JANE AND DAVID RICHARDSON (USA)**, **JASON OWEN SMITH (USA)**, etc. sowie KünstlerInnen wie **DENNIS PAUL (DE)**, **MARCOS WESCAMP (ARG/USA)**, **MARTIN WATTENBERG (USA)** **ODER SCHOENERWISSEN (DE)** ihre Netzwerkvisualisierungen.

Die Netzwerke variieren in der Größe von kleinen Gruppen bis hin zu riesigen Systemen, die aus mehreren tausend Einheiten bestehen. Sie unterscheiden sich ebenfalls durch die Menge der enthaltenen Informationen, die das Auffinden von Mustern in diesen Strukturen ermöglichen. Graphische Elemente (Positionen, Größen, Farben, Formen, Bewegung und Interaktivität), die bei der Erforschung und Kommunikation einzelner Aspekte eingesetzt werden können, werden unterschiedlich verwendet. Beispiele aus Sport und Wissenschaft, Kunst und Wirtschaft, Biologie und Gesellschaft zeigen die universelle Anwendbarkeit der Netzwerkanalyse.

How to Visualize Networks

by Lothar Krempel
<http://www.mpi-fg-koeln.mpg.de/~lk/etvis.html>
How to combine many links so that their representation allows to read important properties of a network, is the central problem.



Why Social Network Analysis?



by Harald Katzmaier www.fas.at
Our world is complex. Social Network Analysis provides overview and orientation.

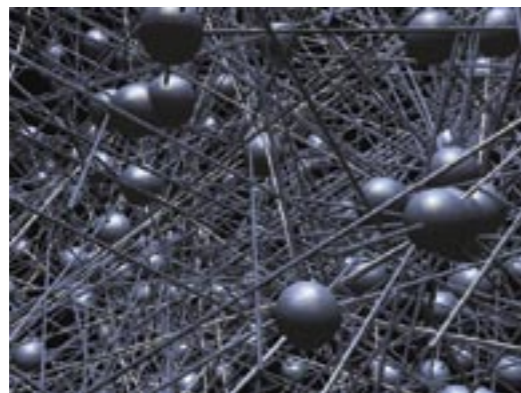
Early Beginnings

1950ies by Jacob L. Moreno
Lit.: Die Grundlagen der Soziometrie. Köln 1954.
Handdrawn graph, mapping the relations between members of two groups.



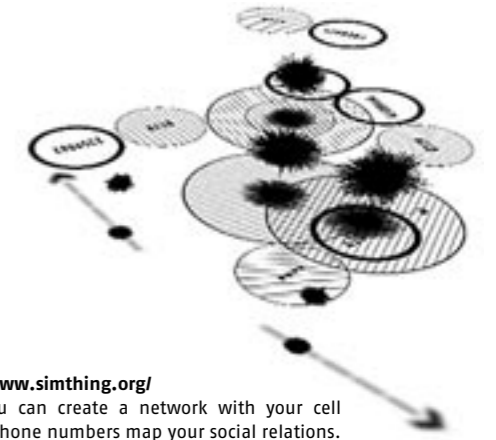
Early Computer Visualizations

by Alden S. Klovdahl, 1989, Australian National University
<http://arts.anu.edu.au/Arts/SSSchool/Sociology/klovdahl.htm>
Social interaction network in Canberra, Australia. One of the earliest computer visualizations of networks.



Network of Physical Interaction Between Nuclear Proteins in Yeast

by Sergei Maslov, Kim Sneppen and Uri Alon
Lit.: Handbook of Graphs and Networks, 2003.
Most neighbours of highly connected nodes have rather low connectivity. Nodes are color coded according to how essential they are for the survival of yeast cells (green nodes are viable and red ones are non-viable lacking the corresponding protein).

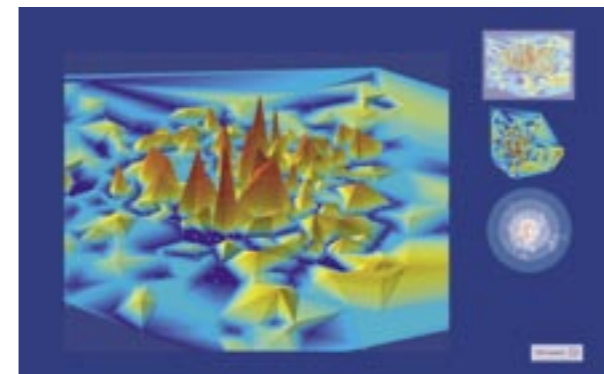


SIMTHING

by Dennis Paul <http://www.simthing.org/>
Do you know, that you can create a network with your cell phone? The stored telephone numbers map your social relations. Use SIMTHING to explore your communication network and compare it to those of friends and relatives!

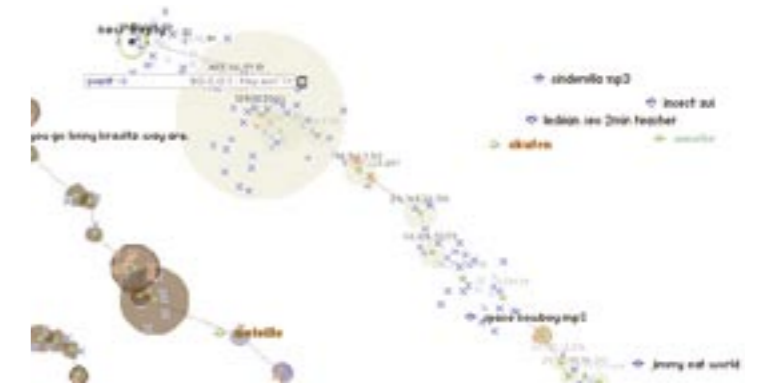
Austrian Shareholder Structure of the Largest Austrian Enterprises, 2004

2004 by FAS.research, www.fas.at
Each enterprise owns parts of other enterprises. Some enterprises are more important than others (on top of mountains).



Minitasking by Schoenerwissen

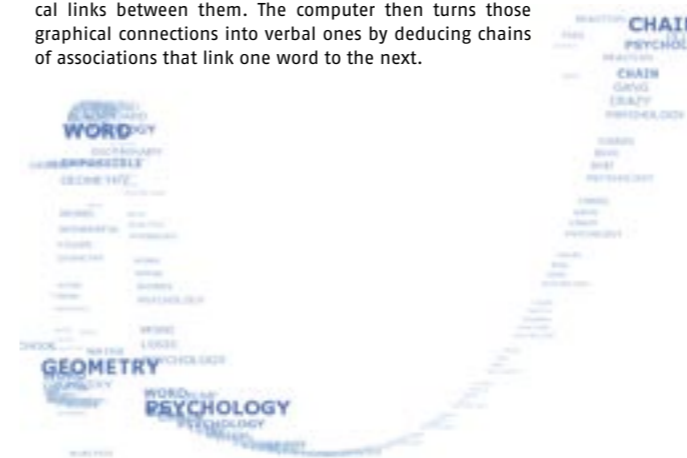
<http://www.minitasking.com/old/>



Minitasking is a graphical browser for surfing the Gnutella network. Relying on the peer-to-peer standard Gnutella, this application provides a visual manifestation of the properties of dynamic and temporarily created networks.

Associogram

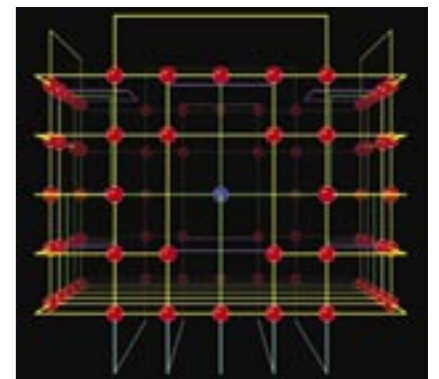
by Martin Wattenberg <http://www.bewitched.com/>
Associogram is a sketchpad for generating concrete poetry, using a vast dictionary of real-life word associations. A viewer places words on the screen, and then draws graphical links between them. The computer then turns those graphical connections into verbal ones by deducing chains of associations that link one word to the next.



1st Prize Graph Drawing Contest 1997

by Vladimir Batagelj and Andrej Mrvar / University of Ljubljana
<http://vlado.fmf.uni-lj.si/pub/gd/gd97.htm>

The mathematical graph drawing community studies how graphs with certain properties can be optimally represented in specific ways. Rectangular drawings (in which lines are only allowed to move along a grid) are severe limitations to arrange the nodes of a graph.



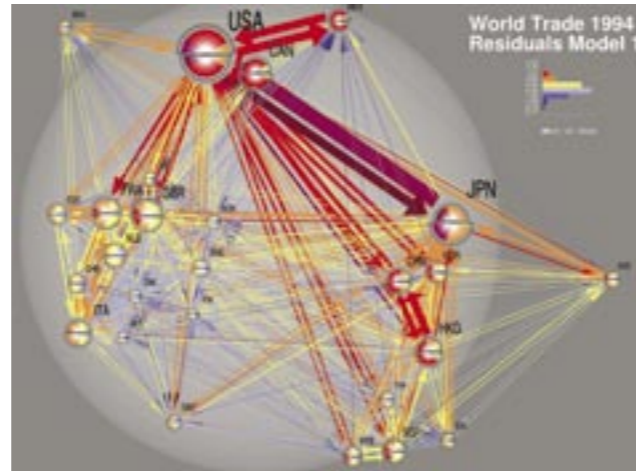
bertault-drawing

by René Weiskircher
 Vienna University of Technology
<http://www.ads.tuwien.ac.at/AGD>
 The layouts produced by a graph drawing algorithm should be "esthetically nice" and "easy-to-understand". Some important criteria for readable diagrams are a small number of edge crossings, evenly distributed vertices and edges, short edges, few edge bends, a small layout area or volume, and a good angular resolution.



World Trade 1994

by Lothar Krempel <http://www.mpi-fg-koeln.mpg.de/~lk/netvis.html>



Using network visualizations to improve statistical models estimating globalization tendencies in world trade. The mapping of estimation errors with colorschemes onto the volume of trade allows to locate systematic patterns, which help to improve the statistical modelling.

Brucknerhaus 3.9 - 7.9.2004 / 10:00-19:00

W. BRADFORD PALEY (USA)
JEFFERSON Y. HAN (USA)
 with **PETER K. KENNARD (USA)**

TraceEncounters



A thousand visitors to Ars Electronica are going to be part of a very special network visualization. A pin worn on an individual's clothing records the number of contacts the individual has had with others outfitted with such a pin, as well as the time the contact took place and its duration. The recorded data are then depicted as visualizations: each pin is represented as a node from which countless lines indicate contacts and linkages.

1000 Besucher der Ars Electronica werden zum Teil einer ganz besonderen Netzwerkvisualisierung. Ein Pin, an der Kleidung getragen, speichert Anzahl, Zeit und Dauer der Kontakte mit Personen, die ebenfalls mit einem Pin ausgestattet sind. Die gesammelten Informationen werden dann als Visualisierungen dargestellt: jeder Pin wird durch einen Knoten repräsentiert, von dem unzählige Linien Verknüpfungen und Verbindungen herstellen.

The Scientific Field of Basic Research in Austria

by Harald Katzmaier www.fas.at
 Network based on the co-occurrence of assigned scientific classification codes in 5217 projects funded by the Austrian Science Fund (FWF) from 1994 to April 2004.



VLADIMIR BATAGELJ

Department of Mathematics, FMF, University of Ljubljana and Department of Theoretical Computer Science, Institute for Mathematics, Physics and Mechanics, Ljubljana, Slovenia. Professor of Discrete and Computational Mathematics, Ph.D. in Mathematics 1986. Scientific interest: mathematics and computer science, combinatorics with emphasis on graph theory, algorithms on graphs and networks, combinatorial optimization, algorithms and data structures, cluster analysis, and applications of information technology in education. He is a chair of the Department of Theoretical Computer Science, IMPM. With Andrej Mrvar he is developing Pajek, a program for analysis and visualization of large networks. In 2004 two books "Generalized block-modeling" (Vladimir Batagelj, Patrick Doreian, Anuska Ferligoj) and "Exploratory Network Analysis with Pajek" (Vladimir Batagelj, Wouter de Nooy, Andrej Mrvar) will be published by the Cambridge University Press.
 URL: <http://vlado.fmf.uni-lj.si/>

JONAH BRUCKER-COHEN

works as a Research Fellow in the Human Connectedness Group at Media Lab Europe in Dublin, Ireland, and is a Ph.D. candidate in the Disruptive Design Team of the Networks and Telecommunications Research Group (NTRG) at Trinity College Dublin. His writing has appeared in numerous international publications including Wired Magazine and Rhizome.org, and he was chosen as a net.art judge for the 2003 Webby Awards. He is the co-founder of the Dublin Art and Technology Association (DATA Group) and won the 2001 International Browserday with his project "Crank the Web". His work has been shown both in the US and internationally at events and venues such as DEAF (2003), Transmediale ('02,'04), ISEA, Whitney Museum of American Art's ArtPort (2003), Ars Electronica ('02,'04), The Institute of Contemporary Art (ICA) in London and others.
 URL: www.coin-operated.com/

ULRIK BRANDES

is a full Professor of Computer Science at the University of Konstanz, Germany. He received his diploma from RWTH Aachen (1994), Ph.D. degree (1999) and habilitation (2002) from the University of Konstanz. After postdoctoral visits to Brown University (1999) and the University of Sydney (2001), he held an associate professor position at the University of Passau (2002-2003). His research interests are in algorithmics and focussed on the analysis and visualization of networks.

ISMAEL CELIS

is a media artist and computer scientist. He graduated in Visual Arts at the Pontificia Universidad Católica de Chile, studied Design and completed a post-graduate course in Interactive Multimedia Design and Production. 2002 he received a Master in Interactive Systems Creation and Design at MECAD in Barcelona. He received the FONDART, a Chilean Government Arts Grant for realising his project Modular Sky. Further projects in 2002/2003: "Newlexia", an online experimental project at MECAD, and "InterMaps" at ZKM in Karlsruhe, Germany, where he as well worked for the Medienkunstnetz. 2003 he received the Heinrich-Klotz grant of the ZKM for realising his project "InterSections". Currently, he is working as freelance developer and project manager for Aquacom and 016 at Santiago, Chile.
 URL: www.ismaelcelis.com

GERHARD DIRMOSER

works in Linz as a systems analyst (specializing in geographical information systems) and has also been dealing with semantic networks for over 15 years. He has produced studies in network form on cybernetic esthetics, structuralism, French philosophy, art in context, terms of thought, verbs, atmospheric concepts, design gestures, mapping issues, and the 25-year history of Ars Electronica. In collaboration with Josef Lehner, he conceived the SemaNet tool and, together with Grintec, developed the WiLa application module for the depiction of semantic networks.

GERHARD FUNK

Study of Mathematics and Education of Art at the Johannes Kepler University and at the University of Art in Linz. Ph.D. in Theoretical Computer Science. High school teacher for art, mathematics and computer science. Lecturer at RISC Linz (Research Institute for Symbolic Computation) and collaborator in research projects. Since 1993 Senior Lecturer at the University of Art in Linz within the range of digital media. Working as artist, e.g. interactive installations. Research projects in the field of e-learning and e-science. Head of the DMA project.
 Mail: gerhard.funk@ufg.ac.at

JÜRGEN GÜDLER

studied Sociology and History of Art at the Universities of Mannheim, Karlsruhe and Cologne („Magister of Arts" in 1989, Ph.D. in 2001, University of Jena). Since 1996 he is working at the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation). Since 2001 head of the Department for Information Management which is responsible for information services including statistics and evaluation, web-based information databases (e.g. www.gepris.de) and general internet- and intranet-services.

URS HIRSCHBERG

Professor for Representation of Architecture and New Media at Graz University of Technology. He received his diploma in architecture from ETH Zurich. Until 1997 he was involved in two major research projects: on computer support in urban planning and on digital photogrammetry in architectural design. Between 1997 and 2000 he was Lecturer for Computer Aided Architectural Design at ETH Zurich. He was an Academic Fellow at the Hong Kong Polytechnic University. From 2000 until 2002 he served as Assistant Professor in Design Computing at the Harvard Graduate School of Design. Since 2004 he heads the newly founded Institute of Architecture and Media and serves as dean of the Architecture Faculty of TU Graz.

BRIAN HOLMES

is an art critic and activist, living in Paris, concerned with the intersections of artistic and political practice. He holds a doctorate in Romance Languages and Literatures from the University of California at Berkeley. He was the English editor of publications for Documenta X, Kassel, Germany, 1997, was a member of the graphic arts group "Ne pas plier" from 1999 to 2001, and has recently collaborated on cartography projects with the French group Bureau d'études. He contributes regularly to the international mailinglist Nettime, on the subjects of activism, social theory and tactical media; is a member of the editorial committees of the journals Multitudes (Paris) and Brumaría (Barcelona); publishes frequently in Springerin (Vienna) and Parachute (Montréal). He lectures around Europe and the world, and is the author of an anthology of essays, "Hieroglyphs of the Future: Art and Politics in a Networked Era".

JEFFREY C. JOHNSON

is a Senior Scientist at the Institute for Coastal and Marine Resources, and Professor in the Departments of Sociology, Biology, Anthropology, and Biostatistics, East Carolina University, USA. He received his Ph.D. in Social Science from the University of California Irvine. He has recently completed a long-term research project comparing group dynamics of the winter-over crews at the American South Pole Station with those at the Polish, Russian, Chinese, and Indian Antarctic Stations. He is currently interested in network visualizations of complex social and biological systems.

NIKOLAOS KASTRINOS

has a degree in Political Science from the University of Athens and an M.Sc. and a Ph.D. from the University of Manchester. He has carried out research and published articles in matters related to European RTD policies and their evaluation. He joined the European Commission in 1997 as part of the ETAN (European Technology Assessment Network) initiative, and following a period in the Strategy Directorate of DG Research, he moved to the area of social sciences and humanities research, where he now works on policy development.

HARALD KATZMAIR

is director at FAS.research, a non-university institute for social science research. He holds a degree in Sociology and Philosophy (University of Vienna). Since 1992 he has been lecturer at various universities (Vienna University of Economics and Business Administration, University of Vienna, Danube University in Krems, university course for communication in science, Faculty for Interdisciplinary Research and Advanced Training, NBC-Defense-School Austria, etc.). His main interests are social network analysis, complexity theory and ornithology.
 URL: www.fas.at
 Mail: office@fas.at

LOTHAR KREMPEL

is a senior research fellow at the Max Planck Institute for the Study of Societies in Cologne and lecturer for Empirical Social Science Research at the University of Duisburg–Essen, Germany. He has written a habilitation (second thesis) on network visualization as a multivariate graphical technology: how complex empirical information can be inspected with graphical means in a scientific way. In his work he has applied network visualization technologies in various domains, to diverse topics such as patterns of scientific collaboration, inter- and intra-organisational processes, economic globalization and the world trade in cars, the economic transformation of transition societies, historical mobilization processes, symbolic exchanges in simple societies and the analysis of large text corpora.

ANTON-RUPERT LAIREITER

Dept. of Psychology, University of Salzburg; Position: Outpatient–Center for Clinical Psychology and Psychotherapy (Head). Doctoral study in Psychology, Psychiatry and Psychopathology; Dr.phil. 1990, Salzburg. Scientific activities/interests: Psychotherapy research (effectiveness, training); social support and social networks, e.g. stress and social support; social networks and attachment; social support and psychotherapy; empathy.

URL: www.sbg.ac.at/psychologie/lairer.htm

Mail: anton.laireiter@sbg.ac.at

BRIGITTE MARSCHALL

Brigitte Marschall is currently Professor at the Department of Theater, Film and Media at the University of Vienna, where she completed 1983 her doctorat with a dissertation on J.L. Moreno and Psychodrama. She has published numerous articles on Jakob Levy Moreno, Walter Benjamin, Georg Tabori, August Strindberg, ritual, drugs and theatricality, threshold phenomena, performance theory, subculture and actionism. Her book „Die Droge und ihr Double“ was published by Boehlau, Cologne 2000. She was guest lecturer at University of Berne, cooperator of the Quadriennale at Prague 2003, and supervises the databank THEADOK. She is currently preparing an edition of the early works of the performer J.L. Moreno.

KATHERINE MORIWAKI

artist and researcher investigating wearables, fashion, and the experiential resonance of technologically mediated urban public space. Currently a Ph.D. candidate at the University of Dublin, Trinity College. Her work has appeared in IEEE Spectrum Magazine, and she has exhibited and presented at numerous festivals and conferences including Siggraph (2000), numer.02 at Centre Georges Pompidou (2002), Break 2.2 (2003), Ubicomp (2003), e-culture fair (2003), Transmediale (2004), and CHI (2004). She is a 2004 recipient of the Araneum prize from the Spanish Ministry for Science and Technology and Fundación ARCO. URL: www.kakirine.com

ANDREJ MRVAR

is Assistant Professor at the Faculty of Social Sciences at the University of Ljubljana, Slovenia. His studies at the University of Ljubljana are: 1992, B. Sc. in Computer Science at Faculty of Electrical Engineering and Computer Science. 1995, M. Sc. in Computer Science, 1999, Ph. D. in Computer Science at Faculty of Computer and Information Science. Mrvar’s scientific and teaching activities are: 1992–1996 Assistant of Statistics. 1996–2000 Assistant of Computer Science and Statistics. Since 2000 Assistant Professor of Social Science Informatics. Research interests: Network analysis, graph drawing, electronic timing and data processing of sports competitions.

URL: <http://mrvar.fdv.uni-lj.si/>

Mail: andrej.mrvar@uni-lj.si

WOLFGANG NEURATH

holds a degree in History and Philosophy from the University of Vienna. He is lecturer at the Vienna University of Economics and Business Administration. He works for the Austrian Council for Research and Technology Development. Currently, Wolfgang Neurath manages a project, which deals with innovative models for research and technology policy. Within this project visualization of R&D and the measurements of innovation potential are central themes.

ANNE NIGTEN

is the manager of V2_Lab, the aRt&D department of V2_Organization. She is Ph.D. candidate at SMARTlab Centre / The University of the Arts, London (UK). Nigten is advisor for several art and science initiatives in Europe and international. Over the last years she published papers on art, engineering and science collaboration and software development from an artistic perspective.

URL: <http://lab.v2.nl/>; www.v2.nl

Mail: ANne@v2.nl

WOUTER DE NOOY

teaches Methodology and Sociology of the Arts at the Department of Arts and Culture Studies at the Erasmus University Rotterdam. His research focuses on the social production of belief within the literary field as well as the visual arts world, in which he combines Pierre Bourdieu’s field theory and social network analysis. He participated in visual arts projects at the Witte de With center for contemporary art in Rotterdam, where he designed, for instance, the exhibition of the art work Between the Frames by Muntadas.

DENNIS PAUL

was born in Bremen, Germany. He started studying Typography in 1998 at the Fachhochschule Hannover, Germany, went to Berlin in 2000 to study Visual Communication at the Universität der Künste in the “Digitale Klasse” with Professor Joachim Sauter and graduated in 2003. He is currently working at Art+Com, Berlin and teaching at the Universität der Künste. Selected exhibitions: 2004 at the National Museum of Art, Taichung, Taiwan, with Art+Com. 2004 at the Jüdische Museum Berlin, Germany, with Art+Com. 2003 at the Technik Museum Berlin, Germany, with Art+Com.

JOSH ON

is a web designer and activist living in San Francisco, USA. He works with Futurefarmers as well as pursuing solo projects and collaborating with his partner Amy Balkin. In 2000 he received a Masters degree in Computer Related Design at the Royal College of Art in London. Much of his time is spent participating in socialist activism. In 2001 (with some help from others) he made www.theyrule.net which he updated in 2004.

W. BRADFORD PALEY

creates visual displays with the goal of making readable, clear, and engaging expression of complex data. Brad did his first computer graphics in 1973, founded Digital Image Design Incorporated in 1982, and started doing financial & statistical data visualization in 1986. He has exhibited at the Museum of Modern Art; he created TextArc.org; he is in the Artport collection of the Whitney Museum of American Art; has received multiple grants and awards for both art and design. He is an adjunct Associate Professor at Columbia University, and is director of Information Esthetics: a fledgling interdisciplinary group exploring the creation and interpretation of data representations that are both readable and esthetically satisfying.

URL: <http://didi.com> , <http://didi.com/brad> , www.cs.columbia.edu/~paley

MICHAEL SCHENK

heads the Research Centre for Media Economics and Communication Research at the University of Hohenheim (Stuttgart) and, since 1986, is chair of Communication Science and Social Research, ibidem. With a Masters degree in economics (University of Regensburg, Dipl.–Kfm. 1974) and a Ph.D. (University of Augsburg, 1977) he worked as a project manager in market research at Infratest, Munich. In 1983 he was promoted to Professor (tenured) for Journalism and Media Economics at the University of Mainz. Prof. Schenk’s fields of interest include: Media- and communication research, media marketing, innovation research, and network analysis.

Mail: schenk@uni-hohenheim.de

ASTRIT SCHMIDT-BURKHARDT

is a historian of graphic imagery. As a lecturer at the Freie Universität Berlin, she teaches the history of graphic imagery and art since the Enlightenment. She is also active as an expert witness and consultant. She has done research and published on the subjects of diagramming, the eye and pseudonyms.

SCHOENERWISSEN/OFCD (ANNE PASCUAL & MARCUS HAUER)

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JOACHIM SMETSCHKA

Study of Experimental Visual Design at the University of Art in Linz. Working as a media designer, art director and video artist. Member of the Ars Electronica Futurelab from 1997 to 2000. Lecturer at the University of Art and Industrial Design Linz/Institute for Media within the range of video and postproduction. Supervisor and member of the editorial board of the DMA project.

URL: <http://e-learn.internet.ufg.ac.at/digimapp/digimapp/>

MICHAEL STAMPFER

is managing director of the Vienna Science and Technology Fund (WWTF; www.wwtf.at), a private non profit research funding institution for Vienna. It’s main aim is to fund scientific research with a medium term application potential. Before he was program manager for the Austrian K plus funding program (within TIG, www.kplus.at) from 1998–2002, building up the single largest RTD funding program in Austria. From 1992 to 1998 he worked as a strategist responsible for technology policy in federal ministries. Michael Stampfer is a founding member and co-ordinator of the Austrian Platform for Research and Technology Evaluation and author of a number of publications on RTD policy and legal issues.

DON STEINY

is part of Mark Granovetter’s Silicon Valley Network Analysis Project, is a Senior Fellow at the UC Santa Cruz Knowledge Society Center and is president and co-founder of the Institute for Social Network Analysis of the Economy. He graduated with a degree in Linguistics from UC Santa Cruz in 1981. He spent a number of years as a software engineer and founded several companies including one of the first Web companies. In the late 90’s Don began to work with angel investor groups and has heard pitches from hundreds of companies. He has acted as a business consultant in the USA and in Finland. Don is co-founder and president of Central Coast Angel Network. He is involved in a number of social network research projects.

STEFAN THURNER

Ph.D. in Theoretical Physics (TU Vienna 1995), Ph.D. in Financial Economics (Univ. Vienna 2001), habilitation in physics (2001). Postdoc positions at Boston Univ. and Humboldt Univ. Berlin. Since 2000 regular visits at the Santa Fe Institute. Since 2001 Associate Professor at the Medical University Vienna (MUV). Research interests: Complex systems theory, network theory, modeling biological and financial systems. Work published in about 70 papers. Head of the Complex Systems Reserch Group at the MUV. URL: www.complex-systems.meduniwien.ac.at/thurner/

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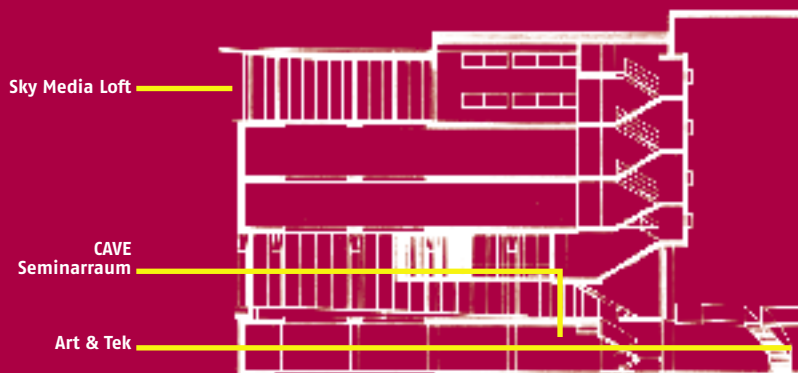
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Exhibition

Language of Networks: Mapping Science, Art and Society

September 1 – 7, 2004 / 10:00–21:00 / Art & Tek

Neo D. MARTINEZ | Gindo TAMPUBOLON | Sergei MASLOV | Ismael CELIS
 | Gerhard DIRMOSER | Daniel MCFARLAND | Alden KLOVDAHL | Bradford
 PALEY | Dorothea WAGNER | Josh ON | Ning YU | Doug MCCUNE | David
 KRACKHARDT | Jason OWEN-SMITH | Harald KATZMAIR | Chaomei CHEN
 | Marcos WESCAMP | Katherine MORIWAKI | Lothar KREMPPEL | Jane &
 David RICHARDSON | Martin HÖPNER | SCHOENERWISSEN | Jürgen PFEFFER
 | K. CLAFFY | Linton FREEMAN | Paul MUTTON | Vladimir BATAGELJ | Patrik
 KENIS | Jim MOODY | Lada ADAMIC | Jacob L. MORENO | Kim SNEPPEN |
 Doris SPIELTHENNER | Jeff JOHNSON | Thomas PLUEMPER | Miguel CENTENO
 | Max RUHRI | Ulrik BRANDES | Skye BENDER-DEMOLL | Andrej MRVAR |
 Brian HOLMES | Christian GULAS | Volker SCHNEIDER | Jürgen LERNER |
 Martin WATTENBERG | Wouter de NOOY | Marcos WESCAMP | Dennis PAUL |
 Peter BEARMAN | Gerhard FUNK | Volker RAAB | Uri ALON | Ka-PING YEE |
 Valdis KREBS | Wolfgang NEURATH | Urs HIRSCHBERG | René WEISKIRCHER |
 Joachim SMETSCHKA | Ronnie RAMLOGAN | Jonah BRUCKER-COHEN et al.



Ars Electronica Center
 Museumsgesellschaft mbH
 Hauptstrasse 2
 A – 4040 Linz
 tel: +43-732-7272-0
 email: info@aec.at

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Science and Culture; Au

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