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A Cross-Disciplinary Bibliography on Visual Languages for Information Sharing and Archiving

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Abstract: This bibliography offers citations for people who are interested in learning more about visual language, new types of communicating and archiving information with emphases on novel technologies and theoretical works in these multidisciplinary areas. This bibliography is considered in its broadest sense and covers references of research in humanities and social sciences as well as computer technology. Far from being exhaustive, it nevertheless covers essential resources in a selective way, so that the material can provide starting points for many different directions. What is *not* included here are references to visual *programming* languages.

Keywords: visual languages, visual communication, constructed languages, sign languages, interactive maps, computer-supported communication, information archiving, information retrieval, language independent communication
Categories: A.2, H.3.7, H.4.3, H.5.1, J.4, J.5

A Introduction

In [MSC03] we gave an introduction in the scientific backgrounds and the historic development and significance of various aspects of visual communication. We also investigated current and future computer technologies with respect to their potential to support visual person-to-person communication and archiving of visual information. In the course of this work we found that very little cross-disciplinary research has been done so far on these issues and also, that in our own work we had just "scratched the surface". However, vast resources exist in numerous fields that are worth to be considered when acting in this area.

The purpose of this bibliography is to make available a first list of what we think is the most important literature on the relevant topics. We cover wide ranges in a number of "thematic dimensions", from foundations to history to applications, to technical development and its implications. In general, we attached great importance to a well-balanced presentation of resources from the main fields of humanities and technology.

Because the materials listed here can very often be assigned to more than one field, categorization (not to mention restriction to the essential) was not an easy task. In our approximation we followed pragmatic considerations and always kept in mind the focus and context of this work: the purpose of this bibliography is to support the

investigation of the computer as a means for new (visual) way of working with and sharing of information.

Naturally we focussed on English literature but – with German being the mother tongue of both authors - we nevertheless included a number German references as well as a few French ones.

B Structure and Categories of the Bibliography

1 Humanities and Social Sciences 369
1.1 Philosophy and Psychology 370
1.1.1 Philosophy of Language 370
1.1.2 Mind, Cognition and Perception, with Focus on Visual Aspects 371
1.2 Visual Thinking, Visual Literacy, Media Science 373
1.3 Semiotics 373
1.3.1 General Aspects and Basics 374
1.3.2 Pictorial Semiotics and Visual Rhetoric 375
1.4 Linguistics 376
1.4.1 General Aspects and Basics 377
1.4.2 Sign Languages of the Deaf 378
1.4.3 Interlinguistics: Basics, Introductions and Overviews 379
1.4.4 Interlinguistics: Specific Artificial Written/Spoken Languages 381
1.4.5 Simplified Languages: Baby Talk, Linguae Francae, Pidgin, Creole 382
1.5 Fine Arts and Design 383
2 Visual Languages of Pre-Electronic Media 383
2.1 Basics and Overviews 384
2.1.1 References and Picture Dictionaries 384
2.2 Maps, Information Graphics and Graphic Recording 385
2.3 Cartoons, Comics and Animation 385
2.4 Specific Pre-Electronic Visual Communication Systems 386
3 Computer Technology 387
3.1 Computer-Mediated Visual Interaction and Communication 387
3.2 Sign Language Translation and Gesture Interaction 393
3.3 Language and Knowledge Technology 393
3.4 Visual Applications of New Media 395
3.5 Future of Computers: Augmented Reality and Ubiquitous Computers 396
References 396

1 Humanities and Social Sciences

Visual information and communication plays an important part in our lives. In the last years we have been more and more introduced to a multi-media world. We have been exposed to TV, video and computer, to pictures, maps, charts, matrices and diagrams and many other visual models. Research in humanities and social sciences show that new communication technologies will have far-reaching consequences. So the issue of visual language is not just one of technology. The growing number of publications

in this fields show an increasing interest in the theoretical investigation of visual languages as well as the applicability of these theories. Research on visual languages is widespread among different disciplines like philosophy, linguistics, psychology, semiotics, neurophysiology, and cognitive science.

1.1 Philosophy and Psychology

This section covers philosophical issues as well as basic aspects related to the perception of visual information and how it is organized by the human mind. Naturally, there are numerous cross-relations between these aspects.

1.1.1 Philosophy of Language

This is a very brief selection of philosophical works, dealing with philosophy of language, a field that has expanded extraordinarily in the last century. Not only foundational and conceptual questions arise but philosophical problems concerned with meaning, communication, truth, representation, the connections between mind, language and issues about philosophical methodology – it is a rich and fascinating field. This section includes mainly classical works on philosophy of language. Under the assumption that any visual communication has some relation to language, these fields are relevant in our specific context.

Austin, J.L.: *How to do Things with Words*. 2nd Edition. Oxford University Press, Oxford 1976.

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Ryle, Gilbert: *The Concept of Mind*. The University of Chicago Press, Chicago 1949.

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Wittgenstein, Ludwig: *Philosophical Grammar*. (ed. by Rush Rhees).Translated by Anthony Kenny. Blackwell, Oxford 1974.

1.1.2 Mind, Cognition and Perception, with Focus on Visual Aspects

This section covers literature on the subject of mind, cognition, perception, mental representation, image and brain. The exponentially growing interest in these fields includes research in many disciplines and is opening new fascinating horizons. Books and articles therefore span disciplines like philosophy, psychology, neuroscience, linguistics and cognitive science.

Allott, Robin: *The Motor Theory of Language Origin*. Book Guild, 1989.

Allott, Robin: *The Natural Origin of Language: The Structural Inter-relation of Language, Visual Perception and Action*. Able Publishing, 2001.

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Russell, Bertrand: *On Propositions - What They Are and How They Mean*. London 1919.

Smith, E.E.: Theories of Semantic Memory. In: Estes, W.K. (ed.): *Handbook of Learning and Cognitive Processes* . Vol. 5. Erlbaum, Hillsdale, New York 1978.

Solso, Robert L: *Cognition and Vision*. London, England and Cambridge, Mass. 1994.

Vygotsky, Lev S.: Thought and Language, 1934. In: Kozulin, Alex (ed.): *Research in Humanities Computing*,Vol. 1. Clarendon Press, Oxford 1986.

1.2 Visual Thinking, Visual Literacy, Media Science

Can visual tools help to make thinking visible? Can visual language change the ways we understand the world? There are some books and articles that deal with visual thinking and global communication in the 21st century. Some of them are practical guides; others include research on history and practice of visual language. In some cases these aspects are put into wider contexts.

Arnheim, Rudolf: *Visual Thinking*. Faber and Faber, London 1970.

Berger, Arthur Asa: *Seeing Is Believing: An Introduction to Visual Communication*. Mayfield, Mountain View, CA 1989, 2. kiad. 1998.

Buzan Tony, Buzan Barry: *The Mind Map Book*. Plume, reprint 1996.

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Rheingold, Howard: *The Virtual Community - Homesteading on the Electronic Frontier*. MIT Press, revised edition 2000;
see also http://www.rheingold.com/vc/book

Sellen, Abigail J.; Harper, Richard: *The Myth of the Paperless Office*. MIT Press

1.3 Semiotics

Semiotics, a philosophical theory of the functions of signs and symbols, is one of the basic disciplines in the humanities - it is connected with all kinds of communications. The theory and study of signs and symbols is essential, especially regarding elements of language but also for other systems of communication.

1.3.1 General Aspects and Basics

The following is a summary of books and articles which give a good introduction to semiotics.

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Burks, Arthur: Icon, Index, Symbol. *Philosophy and Phenomenological Research*. IX:4, 1949. pp. 673-689.

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Martinus, Njhoff; Mitchell, J.T. (eds.): *The Language of Images*. University of Chicago Press, Chicago 1974.

Marty, Robert: *Definitions of the Sign by C. S. Peirce*. 1976. available at http://www.door.net/arisbe/menu/library/rsources/76defs/76defs.htm

Merrel, Floyd: *Semiosis in the Postmodern Age*. West Lafayette Purdue UP 1995.

Merrel, Floyd: *Signs Grow: Semiosis and Life Processes*. Toronto UP 1996 a.

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Mitchell William J.T.: *Picture Theory - Essays on Verbal and Visual Representation*. The University of Chicago Press, Chicago 1995.

McKim, Robert H.: *Experiences in Visual Thinking*. Brooks/Cole, Monterey, CA 1972.

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Sebeok, Thomas A.: Signs, Bridges, Origins. In: *Global Semiotics*. Bloomington Indiana Press, Bloomington 2001. pp. 9-73.

1.3.2 Pictorial Semiotics and Visual Rhetoric

Pictorial semiotics is a quite new field. It concentrates on the semiotic character of pictures and is concerned with understanding the nature and specification of such meanings which are identified with the term "picture".

Bertin, Jacques: *Semiology of Graphics: Diagrams, Networks and Maps*. University of Wisconsin Press, Madison 1983.

Bierman, Arthur K.: That there are no Iconic Signs. *Philosophy and Phenomenological Research*, XXIII, 2, 1963. pp. 243-249.

Boehm, Gottfried (ed.): *Was ist ein Bild?* Wilhelm Fink Verlag, München 1994.

Bonsiepe, Gui: *Visual/Verbal Rhetoric*. Dot Zero 2. Ulm 14/15/16 1966. pp. 23-40.

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Carani, Marie: Sémiotique de l'abstraction picturale. *Semiotica*, 67:12, pp. 1-38.

Espe, Hartmut: Realism and some Semiotic Functions of Photographs. In: *Semiotics unfolding. Proceedings of the second congress of the International Association for Semiotic Studies*. Vienna 1979. Borbé, Tasso (ed.). Volume III. Mouton, Berlin, New York, & Amsterdam 1983. pp.1435-1442.

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Groupe μ, *Traité du signe visuel. Pour une rhétorique de l'image*. Seuil, Paris 1992.

Lindekens, René: *Eléments pour une sémiotique de la photographie*. Didier/Aimav, Paris & Bruxelles 1971.

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Stafford, Barbara Maria: *Good Looking: Essays on the Virtue of Images*. MIT Press, Cambridge 1996.

1.4 Linguistics

Linguistics is a vast field. It is the scientific study of language in general and specific languages in particular. It is concerned with the study of phonetics, phonology, morphology, syntax, semantics, pragmatics, language acquisition and disorders, historical linguistics and many other important issues, like psycholinguistics and computer linguistics. A number of these sub-fields are relevant in our context of visual communication.

1.4.1 General Aspects and Basics

This section covers introductions to contemporary linguistic theories and methods of linguistic analysis. Some books draw the attention on language, cognition and mind.

Bodmer, Frederick: *The Loom of Language*. George Allen & Unwin, London 1944; current issue W.W. Norton & Company 1985.

Bybee, Joan; Perkins, Revere; Pagliuca, William: *The Evolution of Grammar: Tense, Aspect and Modality in the Languages of the World*. University of Chicago Press, Chicago 1994.

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Seipel, Wilfried (ed.): *Der Turmbau zu Babel - Ursprung und Vielfalt von Sprache und Schrift*. Exhibition catalog. 4 Volumes. Kunsthistorishes Museum Wien, Vienna 2003. p. 1340.

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Wierzbicka, Anna: *Semantics, Culture, and Cognition*. Oxford University Press, Oxford 1992.

1.4.2 Sign Languages of the Deaf

Sign languages are the natural language of deaf people. This form of non-verbal communication has been developed by deaf people throughout the world. It started with simple hand gestures to express words, to the many complex sign languages throughout the world today. Latin Bibles from the 10th century already show drawings of finger spellings. As purely visual, dynamic languages that do not require any specific artificial medium they represent an intersection of linguistic and pictorial issues (including movement) that is particularly relevant in our context.

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Armstrong, David F.: *Original Signs - Gesture, Sign, and the Sources of Language*; Gallaudet University Press, Washington DC 1999.

Armstrong, David F.; Stokoe, William C.; Wilcox, Sherman E.: *Gesture and the Nature of Language*. Cambridge University Press, Cambridge 1995.

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1.4.3 Interlinguistics: Basics, Introductions and Overviews

Interlinguistics is the study of international linguistic communication from all its aspects including planned languages as international means of communication. Planned languages also known as "international artificial languages", "auxiliary languages" or "universal languages" are language systems created for the purpose of making international communication easier. This section lists materials that give a good overview and an interesting introduction to this field and we hope that this may give some inspiration regarding the specification of computer-supported visual languages.

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Becker, Ulrich: Interlinguistik im Internet. *Beihefte zu Interlinguistischen Informationen*, Beiheft 2, Terminologiewissenschaftliche Aspekte der Interlinguistik. 1997. p. 44-46.

Blanke, Detlev: *Internationale Plansprachen. Eine Einführung*. Akademie-Verlag, Berlin 1985. p.408.

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Pankhurst, E.; Delphos, Sylvia: *The Future of International Language*. Trubner, London 1927. p. 95

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1.4.4 Interlinguistics: Specific Artificial Written/Spoken Languages

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1.4.5 Simplified Languages: Baby Talk, Linguae Francae, Pidgin, Creole

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1.5 Fine Arts and Design

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Tonfoni, Graziella; Richardson, James: *Writing as a Visual Art.* Scarecrow Press, 2000.

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2 Visual Languages of Pre-Electronic Media

The inventing of visual languages has a long history. The creation of visual language emerges from people around the world inventing components out of necessity to communicate about the complexity of live. Visual languages have grown out of hieroglyphs, religious iconography and visual representations of political power, to book illustrations, scientific and business process diagrams, cartoons and animation, to modern computer-generated graphics. They have grown and spread organically and globally in ways that artificially created international spoken and written languages (like Esperanto, which was invented by a single person) have never done. Will visual languages create new possibilities for human communication and human creativity?

2.1 Basics and Overviews

This section should help to give information on history and evolution of signs and symbols as well as an overview on universally used graphics, illustrations and design.

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2.1.1 References and Picture Dictionaries

Here we include collections of icons and symbols as well as general–purpose picture-based dictionaries.

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Liungman, Carl G.: *Dictionary of Symbols*. (1974, in Swedish). Norton & Co., New York 1991.

Oxford-Duden *Pictorial English Dictionary*. Oxford University Press and Duden Verlag, 1995. A series of other variants based on various languages (uni- and bilingual) is available.

Thompson, Philip; Davenport, Peter: *The Dictionary of Graphic Images*. St. Martins Press, New York 1980.

Tresidder, Jack: *Dictionary of Symbols: An Illustrated Guide to Traditional Images, Icons, and Emblems*. Chronicle Books, San Francisco 1998. - Robert Dorling Kindersley, "Visual Encyclopedia," 1995.

2.2 Maps, Information Graphics and Graphic Recording

Maps and information graphics can be powerful tools for visualization that store, organize and communicate concepts. There are many types of visual explanations and practical applications to be represented in form of maps or graphics, like historic maps and cartography of Geographic Information System, but also statistical graphics, charts and diagrams.

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2.3 Cartoons, Comics and Animation

Picture stories, cartoons, comics and animations have established an undeniable position in the popular culture. Often comics and cartoons employ series of repetitive images and symbols and communicate through a "language" that relies on an easy understanding of the meaning and emotional impact of the image.

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2.4 Specific Pre-Electronic Visual Communication Systems

One main idea in visual communication is to replace words by graphic symbols and to invent a universal symbolism. It is very useful to look at some attempts where visual languages were created for use in different contexts, like the practical system of iconic communication called Isotypes and Blisssymbolics, nowadays used as a communication aid for persons whose speech function is severely impaired. These are probably the most widely known of all temporary visual communication systems.

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Twyman, Michael: The Significance of Isotype. In: *Graphic Communication through Isotype*. 1976.

3 Computer Technology

This section covers the core of this bibliography: all computer related issues necessary to understand, develop and apply computer technology with the aim of supporting with visual tools the communication between humans and the creation and archiving of visual materials. This includes visual digital media (with a focus on visual computer interaction) but also touches computer related language issues.

What we did not include here (or at any other place in this bibliography) are references to visual *programming* languages. This is a large field in itself, often hiding all other aspects of visual languages which are numerous.

3.1 Computer-Mediated Visual Interaction and Communication

This comprehensive category includes a few general references on visual aspects of human-computer interaction (HCI) and visual information systems (how can visual information be retrieved from computer systems). The focus, however, is on particular issues of graphic, iconic – in general visual – information related to computer technology. Note the two different motivations behind visual human-computer interaction. Users might need to interact with computers in order to use particular software or they might want to use a computer as a medium to communicate with fellow humans. The latter is the case we focus on but naturally the two fields often intersect heavily.

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3.3 Language and Knowledge Technology

Investigation of visual communication cannot be restricted to visual phenomena. In order to understand the world and to communicate with fellows humans, the human mind relies on internal concepts that in many respects have some relation to language, even if no natural spoken language seems to be involved in the thinking process at first. Therefore language and knowledge technologies are important fields in our context. In this section we cover computer models of thought and knowledge, computer linguistics, language engineering, and related topics such as ontologies and semantic nets.

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3.4 Visual Applications of New Media

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3.5 Future of Computers: Augmented Reality and Ubiquitous Computers

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