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


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.

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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,

Carnap, Rudolf: Logische Syntax der Sprache. Julius Springer-Verlag; English
translation: The Logical Syntax of Language, Humanities Press, New York
1937.


Dennett, Daniel C.: The Role of Language in Intelligence. In: Khalfa, Jean (ed.):
What is Intelligence? The Darwin College Lectures. Cambridge Univ. Press,

Fodor, Jerry Alan; Katz, Jerrold J. (eds.): The Structure of Language - Readings in the
612.


Wittgenstein, Ludwig: Tractatus logico-philosophicus. Routledge & Kegan Paul,


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.


### 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.


Cavigliolo, Oliver; Harris, Ian; Tindall, Bill: *Thinking Skills & Eye Q*. Network Educational Press Ltd, 2002.


### 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.


Sebeok, Thomas A.: *Semiotics as a Bridge Between Humanities and Sciences*. In: Perron, Paul; Sbrocchi, Leonard G.; Colilli, Paul; Danesi, Marcel (eds.): *Semiotica and Information Sciences*. Legas Press, Ottawa 2000. pp. 76-100.


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".


### 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.


### 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.


Sutton, Valerie: *Lessons in Sign Writing* 2002. publ. by the DAC (The Deaf Action Committee for Sign Writing); see also http://signwriting.org/lessons/lessonsw2002


### 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.


**1.4.4 Interlinguistics: Specific Artificial Written/Spoken Languages**

During the past centuries hundreds of planned languages have been published. This section only provides an overview of some of the best known cases that might be relevant in our context. Defining languages is also an amateur activity of quite a large community which is documented by hundreds related resources on the Internet.


Glosa Homepage: http://www.glosa.org


Moskowitz, Denis: Rikchik homepage: http://suberic.net/~dmm/rikchik/intro.html. (Rikchik is a hypothetical alien visual language based on gestures)


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

This section concentrates on languages that emerge from special situations where the communicational need demands a simplification of the language used. The moment when Pidgin becomes the mother tongue of a speech community it develops more elaborated grammatical features to cover the whole spectrum of human communication. Such languages are called Creole.


1.5 Fine Arts and Design

Visual thinking can be encouraged through art, design and creative learning techniques. These works are introductions to media of design and fine arts, ways are shown to design concepts and languages of art.


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 life. 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.


2.1.1 References and Picture Dictionaries

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


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.


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.


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.


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 Blissymbolics, 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.


Bohne, Steve; Bunar, Matt; Gardella, Steve; Hynes, Pam: *Cross-Cultural Icon Test*. An Interactive Qualifying Project Report, WPI. May 1996.


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.


Chang, Shi-Kuo; Costagliola, Gennaro; Pacini, Giuliano; Tucci, Maurizio; Tortora, Genoveffa; Yu, Bing; Yu, Jing-Sheng: Visual Language System for User Interfaces. IEEE Software, March 1995. pp. 33-44.


Sanderson, David (ed.): Smiley’s; O’Reilly 1993.


3.2 Sign Language Translation and Gesture Interaction

Computer technology offers translation between particular sign languages of the deaf and spoken languages (in both directions). Some of the results in this field might be relevant for the development of visual communication platforms.


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.


### 3.4 Visual Applications of New Media

Here we touch a number of areas related to issues of new, digital media (again focussing in visual aspects), far from trying to achieve completeness. This includes digital photography and movies, and applications such as interactive maps, computer games and iconic or graphic chats involving avatars.


3.5 Future of Computers: Augmented Reality and Ubiquitous Computers

This section is based on our belief that in the future, computer usage will be much more visual and intuitive than today. The materials referenced support this view.


References

With the exponential increase in non-English user population on the Internet over the last two decades, Cross-Language Information Retrieval (CLIR) has gained importance both as a research discipline and as an end-user technology. As query terms (or their statistics) must be translated in CLIR before the retrieval of documents, translation lexicon plays a large role in determining the retrieval performance no matter what retrieval algorithm is ultimately employed by the CLIR system. A bibliography usually just includes the bibliographic information (i.e., the author, title, publisher, etc.). An annotation is a summary and/or evaluation. Therefore, an annotated bibliography includes a summary and/or evaluation of each of the sources. Depending on your project or the assignment, your annotations may do one or more of the following. Summarize: Some annotations merely summarize the source. The aligned visual and language representations also set new state-of-the-art results on Flickr30K and MSCOCO benchmarks, even when compared with more sophisticated cross-attention models. The representations also enable cross-modality search with complex text and text + image queries. Subjects: Computer Vision and Pattern Recognition (cs.CV); Computation and Language (cs.CL); Machine Learning (cs.LG). Cite as: arXiv:2102.05918 [cs.CV]. A Cross-Disciplinary Bibliography on Visual Languages for Information Sharing and Archiving. Article. Jan 2003. Robert Stubenrauch. Daniela G. Camhy. 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 humanitie Cite. Request full-text. +4. Foundations of MIRACLE: Multimedia Information Repository, A Comput