Interaction and Presentation Laboratory, IPLab
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Presentation of the group

IPLab (The Interaction and Presentation Laboratory) conducts interdisciplinary research in human-computer interaction since 1985. At present, the group consists of about 30 people, 20 of whom are graduate students. IPLab is responsible for Nada’s education in human-computer interaction at both undergraduate and graduate levels.

The funding for IPLab’s research during 1998-1999 has come from SSF (The Foundation for Strategic Research), KFB (The Swedish Transport and Communications Research Board), AMS (The Swedish Labour Market Board), Nutek, HSFR and industry. Today, a significant part comes from SSF through the Graduate School for Human-Machine Interaction, a collaboration between KTH and the University of Linköping. IPLab’s involvement in the HMI programme has led to the recruitment of several new graduate students during this period as well as the establishment of new graduate courses in HMI at Nada.

IPLab has close collaboration with CID (The Centre for User-Oriented System Design), an industrial competence centre hosted by Nada, and involving interdisciplinary design and development projects. About 5 of IPLab’s graduate students are engaged in Cid’s research.

IPLab’s research falls into three main areas: (1) computer-supported cooperative work, (2) computer-supported writing and language technology, and (3) human-robot interaction. The first two areas were established during the 80’s, whereas the last one was initiated in 1997, as a part of IPLab’s engagement in the HMI Graduate School.

There is also a long tradition at IPLab of research in object-oriented programming and design. In recent years this has been focused on “design patterns”, where IPLab research students have worked on development and description of programming mechanisms and frameworks for distributed interactive applications for cooperative work.
Computer-supported cooperative work

IPLab’s research in computer-supported cooperative work started around 1990 with the project ”Communication patterns in CSCW applications”, funded by Nutek and AMFO, later followed by engagement in the European project COMIC. This work focused on the design of groupware tools, especially a ”collaborative desktop”. An important issue throughout this work has been how to support group awareness of others’ activities in computer-mediated collaborative work. More recently, these efforts have been continued to include an elaborated model of awareness and construction of a multi-purpose ”awareness engine” [Sandor, Bogdan, & Bowers, 1997].

Currently, a major part of IPLab’s research in CSCW is performed within the group ”KnowHow” (Knowledge exchange, communication and context in electronic networks”), a research theme funded by KFB and HMI. It includes several projects with the common focus on network-based collaboration in knowledge-intensive professions.

Studies of collaborative environments are also conducted by the graduate students at Cid, within the project areas ”Digital worlds” and ”Smart things and environments”, with projects based on video communication and on collaborative virtual environments.

Below, IPLab’s recent work in the CSCW area is summarized.

Knowledge exchange and competence development in local and global networks

Within this KnowHow project, studies are made of the use of local and global computer networks for knowledge development in the daily practices of knowledge-oriented professions. In particular, it focuses on collaboration patterns among geographically distributed groups of professionals (a pre-study is reported in [Lantz & Severinson-Eklundh, 1999]).

Media professions are of special interest with respect to the use of computer networks for the exchange of knowledge and information. A case study of journalists’ use of the Internet has been performed through in-depth interviews [Balsvik, 1999]. Results indicate that the access to fast electronic communication and the possibility for distributed work, together with immediate access to updated knowledge, will change cooperation and work patterns within these professions. This makes further empirical studies important with respect to more detailed effects of different digital media.

A recent Master’s project at IPLab studied the use of Internet-based video connection in a geographically dispersed expert group, and also addressed a set of theoretical issues about the exchange of knowledge mediated by technology [Bonde, 1999]. An experiment made in a natural setting has compared different media for meetings in a distributed group of experts [Lantz, 2000]. Currently, a field study is being carried out to examine...
the use of the Web and e-mail in a large international working group.

Coordination is a ubiquitous element in cooperative work, and a central area of concern for CSCW research. We have begun to study the role of artefacts in work coordination, departing from a study of air traffic control made in the context of the European project COTCOS [Berntsson & Normark, 1999]. A Master’s project at IPIlab addressed the role of documents for coordination in three organisations (Boquist, 1999). The results showed that even in technologically advanced contexts, quite traditional and lightweight solutions were preferred, based on paper and ordinary word processing. This could be related partly to subtle communication processes in connection with coordination decisions.

An area of growing concern is how technology can support knowledge development within organisations. As an alternative to solutions where attempts are made to store knowledge in an organisational memory, it is of interest to explore support for people to reach others who possess relevant knowledge. A licentiate thesis presented by [Kristina Groth 1999] has studied this approach, called "Knowledge net". The study consisted of three parts: the use of home pages on the World Wide Web as part of a knowledge net, an experiment exploring how people can describe their knowledge on different topics, and an ethnographically-inspired workplace study, looking at how professionals in a technical company interact and share knowledge on a day-to-day basis. The work continues with more elaborated field studies.

**Managing the information flow in network communication**

Electronic mail (email) is one of the most widespread computer applications today. The use of email within workplaces may involve problems of different kinds: an increasing amount of messages that overwhelm users, systems that are too complex for naive users and at the same time do not support the needs of experienced users. These problems were treated in a Ph.D. thesis by Olle Bälter [1998].

The thesis focused on email usage, organization of email messages, novice versus experienced users’ needs, managers’ email usage, and information and communication overflow. User data was gathered from one academic research laboratory, one technical company, and one primary medical service organization.

The results indicate that the different strategies used to handle email are a matter of a balance between advantages and disadvantages. The choice between strategies depend on the users’ total work situation and cannot be understood by investigating the email communication alone.

Users develop their handling of email with experience and work position. The media that managers use to handle the increased communication that follows with a higher position are email and meetings. One habit that
Virtual environments for collaboration

Computer environments are increasingly based on the use of multiple modalities, such as sound, pictures, video and even haptic feedback. This has actualized issues about the role of various modalities in collaborative tasks.

In an experiment, the effect of haptic feedback on performance in a collaborative virtual environment was tested (Saltnäs et al., 1999). The haptic force feedback device, PHANToM, was used to convey to the user a sense of touch and feel of virtual objects. An interface was developed that enabled participants to feel and manipulate virtual objects together in a collaborative virtual environment. Results showed that haptic force feedback significantly improved task performance and perceived task performance. Furthermore, haptic force feedback enhanced the sense of virtual presence in the environment (“being there”) while there were no significant effects on social presence (“being together”).

In an ongoing study, the need for subjective displays of data in collaborative virtual environments is investigated. The concept of artifact-centred coordinates, a method of mapping positions in one subjective space into semantically meaningful positions and orientations in another user’s
subjective view, has been implemented and is being tested in user studies [Jää-Aro & Snowdon, 1998].

**Writing and language technology**

Computer-supported writing has been a research topic at IPLab since the 80’s. Recently, this work has included studies of overview problems, writing research tools, collaborative writing, and language tools for writers.

**Overview and global perspective**

A special interest has been devoted to writers’ need for a global perspective of the text. Recently, this has been the focus of a licentiate thesis by Staffan Romberger, who studied the need for overview in different tasks [Romberger, 1998]. Many of the problems involved are related to general difficulties in reading on screens, and not restricted to writing situations. A popular summary of issues about writing and reading on computer screens included a discussion of these overview problems [Romberger & Severinson Eklundh, 1999].

The "paper model" of computer-based writing has been developed previously at IPLab as an alternative to the usual scroll-window text presentation. This model is designed to provide overview as well as support the writer’s spatial memory of the text. In his licentiate thesis, Ulf Berggren investigated the potential of the paper model to support collaborative writing [Berggren, 1999].

A new and updated version of the "Paper" environment has been designed for the MSWindows platform, and subjected to formative evaluation [Hansén-Eriksson, 1998]. The resulting, improved prototype is currently being used in longitudinal case studies of writers [Fatton, 2000]. The results so far have indicated that the need for a global perspective is an integrated part of writing processes, situated in the moment-to-moment text creation and reviewing contexts, and cannot be confined to a special stage or an isolated function of a writing tool.

**Tools for research about writing**

Since the 80’s, there has been an interest at IPLab in computer tools for the observation and study of writing processes. This has resulted in the development of keystroke-registration tools, and in an editor-independent notation for revisions performed during a writing session (S-notation). The notation is automatically derived from a keystroke record, and represents the order, range and internal structure of revisions as they appear in the text. Py Kollberg’s licentiate thesis [Kollberg, 1998] provided the theoretical and empirical foundation for the S-notation as well as its applications. The design of an interactive environment incorporating the S-notation, Trace-it,
has enabled a series of empirical studies, and has led to collaboration with several European research groups. Recently the tool has been applied to the identification of revision episodes, for the purpose of studying discourse-level revision strategies [Severinson Eklundh & Kollberg, 1999].

### Collaborative writing

Collaborative writing is a central research topic within CSCW, and also continues the traditions of computer-supported writing at IPLab. A preliminary study of work practices among collaborating writers has been performed, focusing on the reviewing stages of collaborative tasks in an academic setting [Kim & Severinson Eklundh, 1998]. The results showed that participants did not tend to use any dedicated co-writing tools. Mostly, they used e-mail and paper for communication and to coordinate their activities. In all, the results indicated that co-authors needed a more easily accessible infrastructure for collaboration.

Against this background, we are exploring the potential of the WWW as a basis for cooperation between writers. As a continuation of work previously performed in collaboration with Cid (the Domain Help project), an environment has been designed that allows users to share documents and to carry on an asynchronous dialogue of comments during the reviewing process [Rodriguez, 1999]. This generic tool has been further developed into a prototype for collaborative writing, called “Collaboracio”. In this environment, writers can share, comment on and modify a set of HTML documents, constituting a joint writing task. The set of comments evolve into a dialogue, visible in its entirety to the user. The participants’ awareness of each others’ activities and the current state of the document is supported through e-mail messages. User evaluation of this tool is ongoing, and has started with the use of the tool for various tasks within the research group.

A central problem in collaborative writing is awareness of changes to the text in a co-writing group. Certain word processors allow for the representation of changes, but experiences are lacking with respect to the function of such mechanisms in the collaborative writing process. An ongoing experimental study by Hee-Cheol Kim addresses this problem by comparing two forms of representation (“indication” and “display” of changes) in two different collaboration models.

### Language tools for writers

The design and use of language tools for writers has been a focus of study for IPLab since about 1992. During 1998–99 this work has been included in a project within the Language Technology programme, performed together with the TCS group at Nada (“Integrated language tools for writing and document handling”). The project has also included collaboration with the...
Swedish Language Council and the Department of Linguistics at Göteborg university.

The grammar-checking tool "Granska" focused on in the project was originally designed within a previous Nutek project. A prototype user interface was developed and tested, including links to a help system of Swedish language rules [Larsson, 1998; Domeij et al, 1998]. The entire environment has been re-designed within the new project. It now includes a new grammar-checking engine with a fast part-of-speech tagger, based on probabilistic methods, as well as a new rule language and a set of rules covering major Swedish language problems such as noun phrase agreement errors and erroneously split compounds [Domeij et al, 1999a, b]. A Web interface has been designed to link the Granska environment to a new version of the "Swedish writing rules" developed by the Swedish Language Council.

Automatic text summarization

IPLab’s research in language technology has recently been extended to problems in text summarization and extraction, with a wide range of applications within information retrieval and Web tools. The SweSum project is an effort to build the first automatic text summarizer for Swedish (SweSum).

A text summarizer is a tool which reads a text and creates a new shorter text with the same content. SweSum is built on statistical and linguistical state-of-the-art methods [Dalianis, 1999]. It extracts the most relevant sentences from the original text and creates the new text from these sentences.

To find the topic of the text to be summarized, one needs to perform keyword extraction. This is performed by using a dictionary of all open word classes, i.e. the meaning-carrying words. Since Swedish is an inflecting language it is very important that one finds the stem of each word. Both the stemming and the open word class finding is carried out with a Swedish root-table containing 700,000 words or entries [Carlberger & Kann, 1999].

We are currently working on pronoun resolution to make the summarized text more coherent. Incoherencies happen specifically when the summaries are below 30% of the original texts and e.g. when a pronoun reference hangs free with no reference in the text. Pronoun resolution will resolve the pronouns in the text and replace them with the original noun when necessary.

In the SeaSum project (which is sponsored by Nutek) we have disseminated the technique of automatic text summarization to the industry with the aim to obtain more interest and support to the research area.
Human-robot interaction

IPLab’s research on human-robot interaction started in 1997 as a part of the HMI Graduate School, and in collaboration with Cas. There is now a small group working in this area, including two graduate students. The main research issue is how to design user interaction with intelligent service robots moving around in people’s everyday environment. This research area is new, and is challenged both by the lack of previous HRI studies and the scarce user experience in the field of service robotics. The early work in the project focused on task analysis and simplified scenarios for human-robot dialogue [Oestreicher *et al.*, 1999, Isendorf, 1998].

A survey has been performed to examined how potential users perceive the notion of a service robot, and their acceptance of a robot in their own home [Khan, 1998]. Results showed that of those who needed help with a certain household task, assistance from a robot was acceptable for 30–50%, depending on the task. Generally, cleaning tasks were the ones for which the most help was requested both generally and from a robot. Although users were open to different ways of interacting with a robot, speech was the preferred modality. Mainly, users prefer a robot that only acts according to instructions, and does not take independent initiatives. A conclusion from the study was that humanoid robots encountered in film and other media were not perceived as models for a household robotic assistant, instead most users preferred the analogy of a smart appliance.

A current application project funded by AMS concerns the design and evaluation of a fetch-and-carry robot for disabled people in an office environment. A preliminary simulation study showed that users lack appropriate models for interacting with a robot, and that feedback about the robot’s state is crucial. At present different ways of providing feedback are examined, based on different metaphors for the robot as a partner in spoken dialogue.
References - IPLab


