

The Social Web Research Program

Linking people through virtual environments

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Today we can observe that computers and networks are beginning to form social spaces where people present themselves, meet with other people, exchange news, play games together, do business, or jointly look for information. A new kind of space for action and interaction is emerging. Computers and networks are developing into a social medium and forming a new kind of habitat.

Companies, universities, and governments are already using new interaction forms like virtual teams, virtual universities, and virtual cities for several years now. Yet experience shows that current technology like shared workspaces, chat windows, bulletin boards, video-conferencing, or shared 3D worlds are not fully satisfactory for virtual interaction. A central point is that current systems fail to supply rich sources of *social* information that enable people to work in virtual partnerships.

Based on these observations and trends, we have specified a research program called *The Social Web*. The goal of our research is to explore the possibilities for turning the net into a social space: From document links to people links. *Providing content* via the World Wide Web has been the killer application of the Internet in the last few years. *Linking people* will be the next killer application.

In order to support linking people, we need to understand the challenge: How can we turn information environments into rich communication and interaction environments? Virtual partners should be able to engage in sophisticated interaction such as team-building, trust formation, and meaningful expression. Information technology may never replace face-to-face communication, but it can shrink the distance by expanding the windows of communication to enable more social information to pass through.

With the Social Web program we aim at:

- A thorough understanding of the principles and techniques for linking people in virtual environments.
- A suite of systems which provide new social media and
 - offer a persistent shared environment,
 - can be inhabited by people,
 - allow people a wide range of expression,
 - portray history, presence, and activities,
 - support "populated" knowledge,
 - extend into the real world by smart appliances.
- An assessment of the principles and systems in a number of real-world applications.

Applications

We expect that a broad range of people will benefit from the results of the Social Web program. It can support groups in industry, schools, universities, cities, hospitals, government, and professional and political organizations. The following scenarios illustrate some applications:

Virtual Teams in the Oil Industry are formed to explore potential oil fields, or to monitor producing fields. Members come from several remote, often solitary locations and from different professional backgrounds. Such teams are supported in staying in touch with each other, in becoming aware of other teams working on similar tasks, and in the common evaluation and assessment of the large amount of data necessary to process.

Patient-Support Networks (virtual hospital lobby) support long-term patients within and particularly outside the hospital through provision of an integrated set of communication facilities, dedicated discussion forums, and therapy-related information environments. Participants include the patients themselves, their families and friends, hospital staff and social workers.

School Networks provide a shared environment for pupils and teachers, both within a school and across different schools, on a local as well as a global level. Such an inhabited environment can be used for serious purposes, e.g., by teachers for joint preparation of course material, or by pupils to just hang around and meet old and new friends.

Corporate Education Environments are meant for people taking part in the on-going education and training process within an enterprise as trainers or trainees. Essential features include orientation lobbies and virtual classrooms, that support cooperative distance learning through on-line and off-line communication, shared workspaces, or shared simulation models.

Research scene

The problem of conveying social information to remote partners is already being worked on world-wide by industry research labs and universities alike, such as Microsoft Research (Virtual Worlds and Collaborative Frameworks groups), FX Palo Alto Laboratory (Communication and Collaboration group), MIT Media Lab (Sociable Media and Tangible Interface groups), British Telecom (Telepresence Laboratory), the University of Nottingham (Communication Research group), Kyoto University (Social information network group), and NTT (Cooperative Communication Systems Research group).

The forthcoming Information Society Technologies Programme under the EU's 5th Framework also has a considerable number of so-called key-actions on its research agenda which are closely related to research issues of the Social Web program.

Research challenges

The research challenges posed by the Social Web program include technical as well as socio-psychological problems. The main research questions we want to address are:

Personal representation for virtual interaction

What representations should be used for people in shared environments, and how can people use them to communicate a wide range of expression, both verbal and nonverbal? How can representations be personalized and individualized? How can a representation be used to show a person's knowledge, expertise, and facilitate trust for team-building?

Technological approaches worldwide have created personalized and realistic avatars by integrating photos and streaming video into computer-generated scenes. Others have employed avatar animation using sensors (gesture tracking, facial expression mapping).

In contrast to realistic representations, we will concentrate on symbolic representations of action and presence, and have begun experimenting with tracking devices that can easily convey body movements of remote partners.

Mutual perception and social awareness

How can we provide and present sufficient cues about others and the environment so that groups can develop a sense of social awareness? What information about others and the environment should be visible even if we do not directly interact? How can we define and identify situations that trigger the presentation of awareness information? How can we describe and model the context of a cooperative setting or an inhabited environment that determines the distribution of activity information?

The awareness problem is a focal problem in CSCW research. Most approaches concentrate on task-oriented awareness, i.e. providing information about the status of shared objects that belong to a certain cooperative task. Less research concentrates on social awareness, i.e. the information we perceive peripherally while sharing the same room or floor with each other. All approaches have in common that they concentrate on application-specific solutions.

We believe that an application overlapping approach is necessary that integrates the provision of both social and task oriented awareness. The ultimate goal is the development of models for a situated and context-driven presentation of presence and activity information in inhabited shared environments.

Collaborative construction of community knowledge

How can people with similar interests or tasks profit from each other's knowledge? How can they become aware of potential collaborators and advice giving experts? How can they develop a knowledge sharing community where information can be correctly assessed because the background of the people behind the information is known?

There have been several approaches to support knowledge sharing in communities: shared workspaces, recommender systems, annotation and rating systems, or shared ontologies. They all suffer from an imbalance of effort and benefit from the individual's point of view.

Presently, we develop systems that support the collection, assessment and organization of knowledge in communities of users; we integrate these systems into shared working contexts, and keep the individual effort low by employing software agents, text mining, and collaborative filtering techniques.

With regard to the following two research topics we do not pursue technical solutions, but restrict ourselves to empirical analyses and evaluations.

Formation of norms and conventions

What are suitable conventions to establish relationships in virtual environments? How can relationships be preserved and maintained, and how can they be concluded? What norms, conventions, and mechanisms must be considered to insure privacy, trust, and security of relationships and information?

Self organization of groups and communities

What kind of rules and infrastructure must be provided to help community members self organize and manage their affairs? How can the building of identification, commitment, and responsibility in a virtual community be facilitated?

Current work in the Social Web program

In 1998, we have begun to work on the Social Web program. This section gives an overview of our current work.

BSCW meeting place (Project CESAR)

The BSCW system is an award winning cooperation support system developed by FIT which is conceptually based on the metaphor of shared workspaces and technically on Web technology. We will use the BSCW as one of the base systems for the Social Web program. BSCW has already a large user community and is therefore an ideal platform for the evaluation of results from the Social Web program in real world settings. For this purpose, the BSCW has to be extended with services for presenting both real-time and historical information on the presence of users and their activities in shared workspaces. Through these services the current "shared space" metaphor of the BSCW, offering persistent storage of shared information, will be extended to a rich "meeting place" with real-time updates on user presence, activities and availability of means for synchronous collaboration. Users will be able to tailor their degree of "presence" and awareness. The concepts and models for distributing awareness information will be the same as in the NESSIE system.

Awareness environment (Project NESSIE)

The goal of this research is to find out which information about others and the environment is necessary to develop a sense of social awareness and to provide this information in an application independent way. As a general solution, we will develop an open and application independent infrastructure for the creation, distribution and presentation of events that indicate the presence, actions and movements of people, agents, or objects that populate a Social Web as well as real world spaces. Basic components are: computer based and real world sensors for the production of events; a NESSIE server that stores, transforms, and distributes events based on context models; graphical 2D/3D, animated, and avatar like indicators that provide a context based notification about the activities. The NESSIE system is not integrated into another application but serves as a stand-alone awareness service. Actually, the NESSIE system can provide even more than social awareness: the system extends the human senses into the electronic world.

Collaborative knowledge building (Project Coins)

For a community of people with similar interests and tasks it is beneficial to contribute and share their knowledge. The social process of capturing and constructing shared knowledge in a virtual environment is not yet well understood and an intriguing research issue. Our approach takes the documents which the community collects and produces as the main carrier of knowledge. Members contribute annotations and references, opinions and recommendations. We are exploring the idea of a concept index that, starting from highlighted keywords in a collection of documents, generates conceptual relations that are implicit otherwise. A concept index allows to enrich a document with visual cues that stress a particular perspective, to cross-reference the documents via a conceptual hyperspace, and to establish a shared vocabulary. In this context, we will also use text mining tools to support the discovery and management of knowledge in the documents of a group. All these tools will be integrated into a shared workspace system.

Collecting information with agents (Project Coins)

The LiveMarks system uses agents as mediators to help people in finding useful information on the World Wide Web. LiveMarks agents exploit the existing search engines in looking for information. Additionally, they exchange URLs that have already been retrieved by other agents and have been approved of by their users for a similar information task—a technique known as collaborative filtering. The status of LiveMarks is that of an experimental system which has been integrated into BSCW in order to let LiveMarks users easily share the material collected by the agents. Extensions for the near future concern additional agents that improve the precision of the information gathering process by analyzing and organizing the bookmarks found on the Web according to the interests and the vocabulary of a particular user group, and agents that can recommend individuals and groups which exhibit similar information interests.

Personalized representations (Project Movy)

As a first step toward providing people with a range of communicative expressions for virtual interaction, the development of personalized representations will provide the capability of translating a selected range of gestures of a human into a symbolic virtual representation. We are investigating the adequacy of various sensors which enable a direct mapping of body movement from real to virtual space, preserving spontaneity and subtlety in movement. We are currently developing and experimenting with a lightweight, cableless tracking device ("inertial tracker") that enables autonomous movement in one's own environment and that can easily convey movements: hand gestures, head movements, and body positions.

Multi-user virtual reality toolkit (SmallView)

In the Social Web program we will experiment with 3D interfaces. Therefore, we are developing the toolkit SmallView which enables multiple users distributed world wide to share a 3D environment over the Internet. Since VRML (Virtual Reality Modeling Language) is the standard for transmitting 3D data on the Internet, SmallView uses VRML as scene description language. In addition to mechanisms required to keep distributed copies of shared virtual worlds consistent, SmallView provides support for collaboration between multiple users. This includes the representation of users by avatars, access control mechanisms, and support for communication between participants (text based chatting and audio).