Project Ideas for the DLC Course 2005

Capturing and Presenting Relevant Information

In Envisionment and Discovery Collaboratory (EDC) problem-solving situations, construction activities and information relevant to the current problem are tightly coupled. One kind of information that would be useful in many domains would be resources from information providers, such as news feeds. Currently, there is no direct or automatic connection between information resources and the EDCs information space. People who find interesting articles must add them to the EDC by hand. In this project, you would explore how news feed or other similar streaming information sources could be used within the EDC. You would explore issues such as the capture, organization, and delivery of information. Relevant resources may include sites such as the Boulder Daily Camera. One example design problem would be deciding how automated the capture and delivery can / should be and what tools would be necessary to facilitate the information gathering process.

In addition, participants in the process may wish to contribute, extend, annotate, and organize the information relevant to their particular problem-solving process.

More Information:

http://l3d.cs.colorado.edu/systems/EDC/demo/demo10.html

Reading:

Arias, E. G., Eden, H., Fischer, G., Gorman, A., & Scharff, E. (2000) "Transcending the Individual Human Mind—Creating Shared Understanding through Collaborative Design," *ACM Transactions on Computer Human-Interaction*, 7(1), pp. 84-113.

Using Information from Geographic Information Systems in the EDC

EDC problems typically involve some geographic or spatial component. Both the EDC domains (transportation, wildfires, flooding) and the representations (maps, diagrams) are well suited for geographic information. There is a wealth of existing data in Geographic Information Systems (GIS) that professionals often use as part of their decision making process. Capturing and using this information could help improve the authenticity of some of the situations discussed in the EDC. Information such as census information, maps, expert models, and other GIS data could be tapped for use in an EDC planning task. In this project, you would look at what information exists in GIS systems and how this information could be used within the EDC. You would explore information such as finding the information that exists and the challenges of extracting and interfacing with existing tools. Relevant resources may include US census data and Boulders GIS resources. One example design challenge would be determining tradeoffs between importing data and having multiple tools used in a query process.

More Information: http://www.esri.com/, http://www.opengeospatial.org/, http://www.communityviz.com

Reading: study the above websites carefully!

Capturing Feedback from Remote Participants

The EDC relies on a physical construction space. Unfortunately, only a limited number of people can interact with this construction space at the same time. Is it possible to increase the number of participants in the construction process? For large group meetings, technologies such as wireless computers or PDAs may help give a voice to people who are not around the table. In this project, you would explore how new technologies (such as wireless systems) may be used to involve a larger group of face-to-face participants. You would explore different strategies for getting people to participate, and technologies that may support that participation. Relevant resources

may include existing work on voting and chat technologies. One example design challenge would be determining what kind of information would be contributed by individuals, and what social situations might be necessary to support large-scale interactions.

More Information:

Reading:
Abowd, G. D. & Mynatt, E. D. (2001) "Charting Past, Present, and Future Research in Ubiquitous Computing." In J. M. Carroll (Ed.) *Human-Computer Interaction in the New Millennium,* ACM Press, New York, pp. 513-535.

Context-Aware Computational Environments—Integrating Artifacts with the Decisions Surrounding Them

Our past work centered on domain-oriented design environments has been based on the following simplifying assumption: all design activities happened *inside* the computational environment rather than some of them happening in the external world. With the EDC, we need to extend our approach by creating environments that integrate computational environments and (computationally enriched) external physical worlds with mechanisms capturing the larger (often unarticulated) context of what users are doing.

For example: a fundamental shortcoming of the current prototype of the EDC is that there is no capture of the discussions in which stakeholders engage during design sessions. In this project, you would explore and investigate a variety of critical and important research problems, including the capture of design rationale, as it is articulated in the discussions and design sessions by integrating the artifact under construction with the discussions around it. This will address the failure of design rationale systems of the past that required extra efforts of scribes to document in the computational environment things that are happening in the surroundings.

Some of the following research issues can be explored in this project:

1. are context-aware environments most successful if constructed for specific domains because the domain-orientation will restricts the context and provides us with better mechanism to interpret the context?
2. because context-aware environments need to know more about other agents participating in collaborative decision making, will adequately designed "boundary objects" between users and systems be able to provide this additional context and thereby provide richer and easier interaction?
3. which context elements can be captured *automatically* by devices, usage data, recommender systems, social navigation, read wear and edit wear and which context needs to be *explicitly* provided by humans?
4. how can the efforts and necessary skills be based on the interests and background knowledge of specific communities of practice?
5. Complex collaborative decision making processes are ill-defined problems in which context do not exists but emerge gradually. How do we capture the emergent context?
6. Assuming a substantial amount of context has been captured, how will the context be used to personalize information, and how can push technologies exploit the context to contextualize information to the task at hand?

More Information:

Reading:
1. Fischer, G. (2001) "Articulating the Task at Hand and Making Information Relevant to It," *Human-Computer Interaction Journal, Special Issue on "Context-Aware Computing"*, 16, pp. 243-256. — available at: http://www.cs.colorado.edu/~gerhard/papers/hci2001.pdf
2. Gerhard Fischer, Ernesto Arias, Stefan Carmien, Hal Eden, Andrew Gorman, Shin'ichi Konomi, James Sullivan (2004): "Supporting Collaboration and Distributed Cognition in Context-Aware Pervasive Computing Environments", Paper Presented at the 2004 Meeting of the Human Computer Interaction Consortium "Computing Off The Desktop" — available at: http://www.cs.colorado.edu/~gerhard/papers/hcic2004.pdf

Capturing Feedback Between Meetings

The EDC emphasizes bringing people together to discuss problems face to face. However, not all problems can be solved in a single setting, and not every relevant stakeholder can be present at all meetings. Currently, the EDC only uses a simple Web annotation system to support this asynchronous discussion. How can we complement synchronous meetings with other asynchronous information sources? In this project, you would explore what features would be necessary for asynchronous interaction. More specifically, you could look at how Web tools (like discussions, annotation tools, outliners) can capture the results of meetings and how people who are not present can present their opinions. Relevant resources would include some of the sharing and annotation features provided by the Swiki. One example design challenge would be understanding what form user comments should take (such as voting, discussion, and so on) and how to summarize parts of a face-to-face meeting for people not present.

More Information:

Reading:
1. Moran, T. P. & Carroll, J. M. (Eds.) (1996) *Design Rationale: Concepts, Techniques, and Use,* Lawrence Erlbaum Associates, Inc., Hillsdale, NJ
2. Fischer, G., Lemke, A. C., McCall, R., & Morch, A. (1996) "Making Argumentation Serve Design." In T. Moran & J. Carrol (Eds.), *Design Rationale: Concepts, Techniques, and Use,* Lawrence Erlbaum and Associates, Mahwah, NJ, pp. 267-293.

"Virtual Stakeholders" (Critics) and Making Users Feedback Active

In most specific domains, some generally accepted rules emerge. For example in the transportation domain, one such rule might be: *"Two bus stops should not be further apart than 500 yards"*. These rules can be embedded in systems and "critique" (representing the design knowledge of virtual stakeholders) design activities as they take place. Critics are computational entities that can analyze a computer model of a problem and give feedback based on a certain perspective.

People participating in the EDC come to the table with a specific agenda and a set of personal constraints — and these constraints may be different from the critics existing in the system. Capturing people's own specific and additional constraints, helping them make the constraints explicit, and evaluating a design based on user constraints are all very important tasks. In this

project, you would explore how a user may express their perspective in an active manner, perhaps in the design of critics. Relevant resources include existing critiquing systems and other active feedback systems (such as spelling correctors.) One example design challenge would be determining the kinds of constraints a user might want to specify in an active way, and whether it is feasible to represent those constraints in an automatic or semi-automatic fashion.

More Information:

Reading:
Nardi, B. A., Miller, J. R., & Wright, D. J. (1998) "Collaborative, Programmable Intelligent Agents," *Communications of the ACM,* 41(3), pp. 96-104.

Fischer, G., Nakakoji, K., Ostwald, J., Stahl, G., & Sumner, T. (1998) "Embedding Critics in Design Environments." In M. T. Maybury & W. Wahlster (Eds.), *Readings in Intelligent User Interfaces,* Morgan Kaufmann, San Francisco, pp. 537-559.

Meta-Design: How Can Domain Designers and End-Users Create Content

Users often find a mismatch between what the system allows them to do and what they would need or would like to be able to do. This translates also in the incapability from possible users to see the potential of the system. How can users add functionalities to the EDC? Can the EDC functionalities be arranged in high-level categories (i.e. relevant information, real time data, active critics etc.)? Can this contribute to improve the meta-design of the system and to enable a rapid EDC prototyping?
The EDC provides users with a large amount of information and tools. How can the visualization and integration of relevant information, real time data and active critics be improved? How can the interface both reduce the effort for the amount of information to "read" and sustain more fluently the cognitive and social processes that take place around the table (or beyond)?
If we want to create environments that allow, support, and encourage users to be designers rather than simply consumers, perspectives of meta-design need to be brought to bear on the development of systems. For example, one of the challenges in the EDC is to go beyond having programming experts as the only avenue for creating new design situations and participatory scenarios.

This effort could be extended in two directions:

1. An initial version of a web-based (java) version of the "Project Builder" to allow content experts such as city planners to provide new context and create new scenarios based on existing PitA-Board functionality was created by a team from last year's DLC course. It has been extended by the PitA team and an initial version will be available for testing soon. A project team could perform some assessment of the current version, determine where there are needs for changes/extensions and design and implement these modifications.
2. The PitA system is implemented in Squeak. One of the reasons for this choice was the availability of the E-toys system within Squeak to support end-user programming (this is what the children in the "gravity" video used for their efforts). A potential project is to explore, design, and implement ways that the PitA simulations could be modified, extended, and created using the E-toys system.

More Information:
A demonstration of some initial ideas from Hal.

Reading:

Fischer, G., & Giaccardi, E. (2004) "Meta-Design: A Framework for the Future of End User Development." In H. Lieberman, F. Paternò, & V. Wulf (Eds.), End User Development — Empowering people to flexibly employ advanced information and communication technology, Kluwer Academic Publishers, Dordrecht, The Netherlands, p. (in press). http://l3d.cs.colorado.edu/~gerhard/papers/EUD-meta-design-online.pdf

Silence of the Lands—a collaborative environment

"The Silence of the Lands" is a project that we are developing that applies principles of metadesign to create socio-technical infrastructures in which new forms of design and creativity can take place. This project brings together artists, musicians, interaction designers, system developers, and community experts in order to develop an interactive system that enables to map, explore, and virtually modify the soundscape s of Colorado Natural Parks, while enhancing people's imagination and sensitivity to ambient sounds. The system will support the collection, exploration and direct manipulation of natural sounds, in a way that will engage local communities in the production and nomination of "audio objects", and will allow them to negotiate in a tangible manner the understanding and preservation of "natural quiet" in Colorado National Parks, declared as a cultural resource. The system will be composed of an online server receiving geographically located sonic data, and an interactive table which will expand the capabilities of the existing PitA-Board.

More Information:

Contact Elisa, Gianluca, or Hal

Reading:

Giaccardi, E., Sabena, G, and Eden, H (2005) " The Silence of the Lands: Interactive Soundscape for the Continuous Rebirth of Cultural Heritage " Draft of a paper to be submitted to CUMULUS Lisbon 2005 "Pride and Pre-Design: The Cultural Heritage and the Science of Design" (send e-mail for a copy)

Searching for Images and sounds, more than just semantics and NLP searches

Individuals with cognitive disabilities are often unable to live independently due to inability to perform daily tasks. Computationally enhanced dynamic prompting systems can mitigate this. High levels of assistive technology abandonment are driven by poor user interfaces. MAPS provides an effective prompting system with an intuitive interface for configuration. The MAPS script editor uses images and sounds to construct scripts. Each step in a MAPS script is comprised of a pair of image and wave file. Also the MAPS server has 150+ scripts in template form, which means there are no actual images or sounds but labels of images and sounds. The MPAS caregiver editor is designed to enable computer novices to sucessfuly program the MAPS handheld prompter with scripts.

One of the problems that the editor has not yet completely solved is the issue of storing, searching and retrieving the sound and images for script creation. Currently MAPS is using a simple visual search for directories of images and relying on filenames for searching and inserting sounds. Neither of these systems are as user friendly as the rest of the MAPS script editor components.

This project could consist of devising and implementing an interface for storing, searching and retrieval of the images and sounds. I have some ideas about how of go about this, so if you are interested I would be happy to provide guidance and support.

More Information:

Come by L3D and look at the MAPS system (Stefan Carmien). Look at google's web based image search (http://www.google.com/imghp?hl=en&tab=wi&q=) and their Picaba image organizer (http://www.picasa.com/index.php)

Reading

Image Retrieval from the World Wide Web: Issues, Techniques, and Systems
M. L. Kherfi, D. Ziou, A. Bernardi March 2004
ACM Computing Surveys (CSUR),! Volume 36 Issue 1

Handheld interface for sensor simulator to be used in Wizard of OZ studies of MAPS/LifeLine

The MAPS/LifeLine system tat was demoed to you during class has much potential for providing real independence and inclusion for persons with cognitive disabilities. Parts of the system require a sensor-enriched environment of trigger LifeLine to provide the right sort of help to the user with cognitive disabilities and to provide peace of mind for the caregiver. Unfortunately there are not currently the sorts of sensor rich environments that the system needs, and we are working on developing these. However the testing of the system does not need to wait for the development and installation of networks of sensors; we can use a technique called "Wizard of Oz" to simulate the triggering of sensors in the system. By providing a second Wi-Fi/GRPS enabled PDA/Cell phone to a person 'shadowing' the user with cognitive disability who is test the system in the real world, we can accurately simulate a complete system.

The project consists of developing an application for this second handheld computer that displays the same prompting cues as are seen on the MAPS handheld prompter, but additionally allows the user to signal to the LifeLine server a simulated sensor triggering event. We will provide the device and help with the requirements. We expect the project to be written in C#, but if you have any experience in C++ or Java, our MAPS/Lifeline team will provide enough support so that lack of experience will not be an obstacle.

More Information:

Come by L3D and look at the MAPS and LifeLine system, we (Andy Gorman & Stefan Carmien) can demo it for you at length.

Reading

Carmien, S., DePaula, R., Gorman, A., & Kintsch, A. (2004) "Increasing Workplace Independence for People with Cognitive Disabilities by Leveraging Distributed Cognition among Caregivers and Clients". A Special Issue of the Journal of Computer Supported Cooperative Work (CSCW) The Journal of Collaborative Computing
http://l3d.cs.colorado.edu/~carmien/cscw-journal-revised-submitted.pdf