EuroPLoP 2004 Focus Group on Human-Computer-Human Interaction Patterns

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1 Introduction

Successful human-computer interaction (HCI) design requires the involvement of many stakeholders, especially the end-users. But to participate in the design process, they have to be empowered to communicate about the approached solutions. Patterns in the field of HCI have served as a successful means for end-user involvement. End-user involvement is even more important for applications in which a human-computer-human interaction (HCHI) is required. These are applications which are used by more than one user, and which mediate and modify the interaction between users. A broad user involvement is crucial for the success of such human-computer-human interaction support because the users know best about the required interaction support expected from the HCHI application. HCHI-Patterns can support the participatory development of HCHI applications.

The goals of the focus group were to explore the field of human-computer-human interaction, seek for patterns or pattern languages, and discuss the appropriate pattern representation that can help end-users to participate best. The focus group was intended as a follow up to a CHI'04 workshop on human-computer-human interaction patterns. Relevant fields identified at the CHI workshop laid the basis for the discussion in the HCHI pattern focus group.

2 Human Computer Human Interaction Patterns

Patterns espouse an approach to design originating from the area of built architecture. The pattern approach focuses on the interactions between the physical form of buildings and the way in which that form inhibits or facilitates various personal and social behavior. An interconnected set of patterns is called a pattern language. Patterns of a pattern language are intended to be used together in a specific problem domain.

Software engineering adopted the format in the late eighties, leading to the general acceptance of software patterns as a very useful form of documenting successful software engineering solutions.

One of the central concepts behind Alexander's original pattern language in the area of built architecture is to empower any human being to design and build quite well at any scale. However, this idea of end users designing their own (software) architectures has not been taken over into software design. Looking at the closeness of HCI and architecture, it seems almost surprising that software engineering, not HCI, adopted the patterns concept so quickly and widely. On the other hand, early references in key HCI texts indicate that there has long been an interest in this link. Since then the topic has featured at numerous workshops at CHI and elsewhere in the HCI community.

An increasing number of applications are currently designed for the use by more than one user. Examples are multi-player games, web sites that foster interaction among visitors, applications for interaction between mobile users, systems that foster collaborative learning, interactive workspaces and smart environments, or peer-to-peer applications, to name only a few application areas. In these areas, we can see a shifting interest from human-computer interaction to computer-mediated human-human interaction. The role of patterns in this movement lies in the focus on the human user of the system.

There are many shared aspects between architecture in the physical world and human-computer-human interaction design in the virtual world. Both areas deal with supporting interaction between human beings and shaping environments where this interaction can take place. As Alexander argues, successful architecture should create places that "live" – the same is true for successful human-computer-human interaction design.

In architecture as well as in human-computer-human interaction design, one can find the same groups of stakeholders: researchers, who want to know more about successful technology design, architects and developers who have to create and design the technology, and users or customers who want to use the technology.

As with the original Alexandrian patterns, it is important to provide not only software engineering patterns, but also patterns that allow the end user to participate in the design of the applications they work with. And as with the Alexandrian patterns, the user group of patterns shifts from developers to end users of the system as the patterns begin to focus on system usage and interaction rather than on technical internals of a computer system.

3 Patterns for Human-Computer-Human-Interaction in computer supported collaborative learning

In the EuroPLoP 2004 focus group we wanted to concentrate on a particular topic to foster interactive discussion among the participants. Because most of the participants came from an academic context, it was appropriate to focus the discussion on human-computer-human interaction in the context of computer-supported collaborative learning (CSCL). In a first step, the participants compared their experiences from teaching (and studying) at different European universities to find commonalities in the process of traditional co-located learning.

One result of this first phase was a potential life-cycle of a learning group. The idea behind this was to capture long-term interaction in use case scenarios, which we use to find intersections with existing HCI/HCHI patterns and also to mine HCHI patterns not yet discovered. Here is a summary of the use case scenarios we discussed:

- The student sees other students during an orientation phase at the beginning of his university education. He learns to remember the faces met in the orientation phase and connects other students to specific behaviors or properties.
- Each student registers for courses (lectures) and visits the course individually.
- Students meet by accident in lectures or single-student assignments conducted in a class-style. All students become aware of other students around them and again connect students to specific strengths.
- Students start a "trial interaction" with other students around them. They socialize (exchange personal information) during this trial interaction and try to reveal common interests.
- If the interests and personal preferences overlap the students "sign up" to a learning group. The student in this case moves from a community of circumstances to a community of interests.
- From that time on, students perform collaborative learning interaction in small groups. Among others, the following issues need to be addressed for successful long-term interaction:
  - Group members need to be able to exchange information (e.g. by means of shared workspaces).
  - Lecturers who observe the group interaction as well as group members need to reflect on the group interaction (e.g. using transcripts of interaction such as chat logs).
  - Group members solve prescribed or self-defined assignments.
  - Each group member has to commit to a role at each time in the group process. He also has to be aware of the role he is currently playing in the group process. For instance, one group member should always take the role of the "pusher" (who is raising the group's pace).
  - Social interaction as well as learning-centered interaction should be well-balanced because a lack of social interaction will weaken the bonds between group members.
  - Student mobility can break a group apart. If students, for instance, decide to move abroad for one term, they will have difficulties to re-integrate in the learning group after they returned.
  - Group members need to be prepared for social loafing and agree on rules that define how to address this problem (e.g. by having special tasks for social loafers).
  - Interaction between different learning groups can be desirable. Especially the transfer between advanced and novice learners can help to establish a learner community.

During the discussion, the participants agreed on the fact that most issues in collaborative learning settings are social issues and thus address the problem space of human-human interaction. In a distributed setting, groupware technology in the context of CSCL systems can help to structure the interaction (by imposing a specific interaction structure) and bridge the distance (by providing means for communication, group awareness, or data exchange). A well-designed process is thus as crucial as a technology infrastructure to support the group process. For both aspects, patterns can support the designers (software developers and educators) and the users (educators and students) of CSCL environments.

In the limited time frame of a focus group, the members decided to work on one specific part in the life-cycle of a learning group and report possible solutions found in existing CSCL contexts. The choice was made for the problem of *role assignment*. Except one, all participants had experience in teaching courses via the internet or supporting traditional courses with internet-based interaction means. We used these experiences of the workshop participants to conduct an informed analysis of the problems teachers and students often face while assigning roles.

The discussion concluded with a set of forces and solutions for role assignment, which were later on related in the role assignment pattern family.

3.1 The Role Assignment Pattern Family

Context: Learners have already been assigned to a learning group (or enrolled themselves in the group). The group has also agreed on a group task (either prescribed by the educator or self-selected by the group members). The group has identified (or was told of) roles required for solving the group task. Each group member has specific strengths and weaknesses that qualify or disqualify him for a specific role.

Problem: For a given role, there are often no volunteers to take the role or more group members are interested in taking the role. Interest is not always in line with the user's qualifications. To reach the group goal, all roles have to be filled. Furthermore, the group members should agree on taking the assigned role. Otherwise, motivation will be low and the process of role assignment will lead to conflicts between group members.

Solution: The problem of role assignment has probably more than one solution. All solutions emphasize on different forces for role assignment. The following section will thus discuss the different solutions and list the forces that are addressed by the solution.

Solution 1: Roles are assigned randomly. The problem that roles may be assigned to the wrong persons is initially ignored. After a specific period of time, the role assignment is reviewed and roles are re-assigned if a specific group member has problems in filling the role.

Forces addressed by solution 1:

- The goals of individual group members and the group as a whole often diverge.
- Educators can have "preferred" and "discriminated" students.
- Students should not feel "preferred" or "discriminated".
- Group members may have problems with the available roles, especially with the role assigned to them.
- A group member may fail in a role.
- Each role has a specific intrinsic risk for the whole group process.

Solution 2: The person in charge of assigning the roles first collects information on the students (e.g. by assessment or form entry) and creates a profile for each student. The roles are assigned so that the profiles best match the different requirements for the roles. A best match is defined as the minimum sum in the differences between each profile and the connected role.

Forces addressed by solution 2:

- Group members have specific qualifications (and sometimes no matching qualification).
- Roles require qualifications.
- Role requirement and qualification need to be matched.
- Group members have a history of roles taken before.
- A role requires a commitment for a specific work load and time investment.
- Each role has a specific intrinsic risk for the whole group process.
- Students may have no collaboration experience.

Solution 3: Students select a role according to their own preferences. The student who first signs up for a role gets it.

Forces addressed by solution 3:

- Group members have certain preferences.
- Group members volunteer to take a specific role.
- A role requires a commitment for a specific work load and time investment.
- Group members may have problems with the available roles, especially with the role assigned to them.
- Group members need to be motivated to take up a role.

Solution 4: The group establishes a group-specific role assignment process. This process includes rules for re-assigning roles and for an initial assignment. In both cases, the role distribution is done as a group process. For instance, role assignment can be performed using an election (including a user's campaign to receive a specific role). The rules for role assignment are respected throughout the whole group life-cycle so that roles can for instance be re-assigned.

Forces addressed by solution 4:

- Group members volunteer to take a specific role.
- The goals of individual group members and the group as a whole often diverge.
- A role requires a commitment for a specific work load and time investment.
- Group members may have problems with the role assigned to them.
- A group member may fail in a role.
- Students may have no collaboration experience.
- Group members need to be motivated to take up a role.

4 Conclusions

It became clear that the area of human-computer-human interaction always involves social and technical problems. The social problems need to be solved up-front, which often makes the solution of the technical problems trivial. The focus group followed an approach where concrete problem-solution pairs for these social problems were identified in the context of domain-specific use cases (such as the learning group life-cycle).

During the focus group, it was possible to identify solutions and forces of one small area (namely role assignment) in the large context of human-computer-human interaction. These pattern-like descriptions provided an impression on the level of detail on which social issues can be addressed. Future work should head in two directions: First, a broader coverage of social problems is needed (in the educational and in other group contexts). Second, the technology support for the identified problem-solution pairs needs to be examined to provide socio-technical solutions.

Focus Group Participants The following participants attended the focus group: Paris Avgeriou, Karl Flieder, Stephan Lukosch, Symeon Retalis, Till Schümmer, Aimilia Tzanavari, Dimitrios Vogiatzis, and Uwe Zdun.