Act it! How to design interaction patterns “beyond the desktop”.

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Abstract
The design of interactive systems based on the physical manipulation of objects for accessing digital contents should take into account the complex interplay of mind, body and the environment. The interaction patterns have to be natural and intuitive for the user, as well as integrated in their daily physical lives. The design process has to be dedicated to investigating the forms and the meaning of the interaction patterns: the definition of the input form and the output form is essential for understanding the impact on user’s activity. Prototyping is the key for a successful design process, and, in particular, scenario dramatization can be very effective in exploring these design issues. In the paper, this technique is explained by illustrating a project in which the resulting interaction patterns have been designed by an active engagement of the team in acting the scenario and envisioning the possible solutions.

Keywords
Interaction design, social behavior, scenario-based design, design methodology.

ACM Classification Keywords
D.2.2 [Design tool and techniques]: Evolutionary prototyping and User interfaces D2.10 [Design]: Methodologies

General Terms

Design, Human Factors

Introduction

In the design approaches based on the direct involvement of the end user in the process (e.g. UCD, cooperatives design, participatory design) the investigation of the physical and cognitive characteristics of the users as well as the physical and social qualities of the context in which the activity is performed are essential in order to develop technological solutions that could have a positive impact on people. This design perspective is put into practice by applying methods and techniques most adequate to specific project contexts and the type of technologies used. Indeed, the evolution of the technology affects the methodology and its implementation.

The recent evolution of technology is driven by a vision based on the concept of pervasive computing and direct interaction with contents. Computers, phones and game consoles are no longer the only devices in our environment deemed worthy to embody computation and be connected. This vision substantially modifies the way in which the user interacts with technology as well as the activity supported: the use of augmented everyday objects removes the barriers commonly associated with the use of regular electronic devices but at the same time sets some limits. In these contexts, the interaction patterns have to include the use of traditional input devices (i.e. mouse and keyboard) as well as augmented objects and spaces. Thus, the design process requires a careful study of the forms of interaction (including the motor-physical aspects) offered to the user.

Understanding how the interaction with these systems can affect human activity means to orient the design process in the direction of defining the form of input and output in order to foresee the possible actions including those that are unintentional. The techniques used for the design of GUI and WIMP (Windows, Icons, Menus and Pointing device) interfaces are not suitable for this, post-WIMP, interaction: design methods have to consider the involvement of the whole body in the interaction as well as looking at the multimodality, and taking into account different stimuli. Prototyping becomes fundamental for exploring the form and the meaning of interaction patterns. Among the prototyping techniques the Scenario dramatization allows to develop patterns for technological solutions "beyond the desktop". The Scenario dramatization offers the opportunity to explore design ideas through the active engagement of participants in the scenario enactment, allowing the definition of specific physical movements and interaction patterns as well as interface elements.

Scenario Dramatization Technique

In Participatory design [9] and Cooperative design [5] approaches prototyping is a mean for exploring both role and aesthetic qualities of the artifact with real users in real contexts of use and for investigating materials and patterns of interaction. Along these approaches several techniques emerge. At IDEO [8] the body-storming has been conceived for allowing the team to investigate the functional and aesthetic aspects of the product, while the Experience Prototyping [2] is based on the exploitation of real contexts of use. Scenarios [3, 7] can also drive the creation of prototypes by envisioning system roles, functionalities, and aesthetics. Scenarios present the user perspective and give an initial idea of the impact of the system on human activity. They are particularly helpful for

exploring and discussing design solutions among the team.
In our case, the scenario is the starting point for prototyping. Scenario Dramatization is based on acting out a certain circumstance of use involving potential users (or team members) in playing a real part in the drama. This technique engages participants and focuses discussion on the functioning of fairly complex technology in an enjoyable context. The situated and participative enactment of a scenario allows participants "to exercise reflection-in-action" [5] and this offers the opportunity to have an immediate feedback on the design solutions and to explore other possible solutions. In addition, Scenario dramatization techniques support the active engagement of the design team and users in the design process and decisions. Scenario dramatization plays an important role in the design of complex systems based on the physical manipulation of objects where the set of interaction patterns, as well as the form and the meaning of input and output, have to be designed from scratch (since nothing similar exists). In the case of tangible interfaces, in which augmented objects are used as input/output devices, the physical property of the object (and the affordance) can be used in defining the interaction patterns, while the meaning of the action associated to it can be replicated. In other cases, this association could not be possible or meaningful for the user. Considering the purpose for these systems of "being fluid" in the life of people, by providing natural and intuitive interaction modalities, the definition of these properties needs to be designed and assessed using a design approach that allows to physically experiment the interactions in situated contexts. In this perspective, scenario dramatization allows to define intuitive movements and potential activities emerged from the usage in a real situation. This technique can be employed with users for co-producing the prototype or by the design team members without the users. The dramatization plays an important role since it allows the design team to think over the potential of human activity in transforming and evolving the interactive system itself, as well as in understanding the future user's thinking and behavior. This technique has been used along years by the author in several [1].
Following, one project exemplifies how this technique c1an be used and its advantages.

USIAlumni Faces

USIAlumni Faces is an interactive installation that projected a digital "yearbook" (i.e., photos of the alumni organized by year and faculty) onto a large public screen. The installation was built in the occasion of the Alumni event that aims at establishing and consolidating a contact network among Università della Svizzera italiana (USI) graduates, faculty and students. One of the main goals of the organizers was to stimulate the sense of community among the participants. In this perspective, we envisioned an interactive application that has the purpose of engaging people in getting in touch and socializing. In the design process, the technology development and the concept generation occurred in parallel and informed each other during the project. The dramatization, focused on defining the interaction patterns, was essential also for the technology assessment. We conducted two dramatization sessions during which the technology, the concept and the interaction patterns have been assessed.
In the first session, we built a prototype made of a real size projection of the interface and an application for gesture recognition. For the sensor-based gesture

recognition we employed the Wii controller (Wiimote) as input device. The Wiimote separated from the console has been used often as instruments for prototyping thanks to the accelerometer technology that can detect motion and rotation in three dimensions. The mock-up was installed in the spaces where the event would happen.

This first session aimed at assessing:

- the definition of *gesture patterns*,
- the understanding of *perturbing environmental factors* (i.e. elements that can affect the interaction, such as light),
- and the *technology setting* (e.g. the correct positioning of the sensor recognizer).

Starting from the scenarios we conducted the enactment that at this first stage was done by the team members without involving the end users. As results of the dramatization we decided to change the concept metaphor from the "Picture wall" to the "Yearbook": this metaphor was much closer to the content provided and it was more inspiring in terms of possible gestures patterns: the gesture of flipping the page for browsing the contents promised to be very effective and bound to have an imaginative value for the users.

Figure 1 The two interfaces designed for the mockup on the left the one inspired by the "Picture wall" metaphor on the right the one based on the "Yearbook" metaphor.

Trough the Wiimote we explored some possible gestures (e.g. flipping) and we established the setting of technology: the position of the gesture patterns recognition, the location of the beamer and of the screen for projection, the minimum and maximum distance of the user from the screen. These aspects have been assessed also considering the perturbing environmental factors that could affect the signal transmission as well as the clear visualization of the images projected on the screen. Starting from these findings we refined the prototype and we conducted another dramatization session with the real users. From a technical point of view we decided to change the input device: the Wiimote controller acting as receiver and an infrared pen hidden inside a toy torch casing as the input device. The interface changed accordingly to fit the Yearbook metaphor as well as the interaction patterns. In the second session we aimed to assess the final technological setting and application, and to look at the participants social and collaborative behaviors. We tested the group interaction by involving a group of users (6 USI students): two groups of three (in separated sections) enacted the scenario. We tried also individual usage involving other 5 users. We observed:

- the *ease of understanding the interaction model behind*,
- the *intuitivity of the input device,*
- and the *emergence of social behavior*.

The group sessions concerned all the three aspects while the individual one just the first two. We refined the gestures patterns and some details of the technology settings, however the dramatization showed that the users were highly engaged in the interaction that stimulated discussions among them. Overall, the interaction model was quite comprehensible and easy to imitate, while the input device was easy to use. The

individual session showed some limitation in the interaction model comprehension: the time for understanding the pattern was longer than in the group session. However, this issue reinforces the merit of the installation of being a social artifact. These results fed the design and allowed to implement the final solution. During the event many other interesting data, about the usage of the system, have been gathered and suggested the development of additional features.

Conclusion

The scenario dramatization methodology has been used in this project for designing a gesture-based interaction grounded on the assessment of patterns through the physical enactment of the scenario of use. Scenario dramatization allowed to consider the effect of the interactive system on the user's behavior in the real context of use and to foresee the unexpected actions. In many other projects, not mentioned in the paper, this technique has been applied (e.g. the Tangible museum project). Along years, it has been refined and customized according with the designer needs and the type of project in which it was applied. From our experience, we learned that the enactment of the scenario has a great value for defining the gesture patterns and assessing the technological settings especially in those systems "beyond the desktop" that required interaction patterns with an imaginative value.

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