GABBEH – A Tool to Support Collaboration in Electronic Paper Prototyping

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ABSTRACT

This demonstration presents Gabbeh, a prototype that we have developed to integrate pen-based electronic prototyping media within a framework of participatory design practice. The main purpose of this tool is to discover to what extent an electronic paper prototyping tool could facilitate computer supported collaboration in the early stages of development process of interactive systems.

Paper-prototyping is an established approach to the creation of early prototypes in the participatory design of interactive systems. Recent years have seen the rapid development of new interaction devices in which a display screen is combined with pen-based input to allow users to create sketches or hand-written notes in an interaction that is similar to writing with a pen on paper. Research with such devices has shown how this capability can be used to rapidly create simple prototypes of interactive systems, such as websites. Such devices developed to date are designed in a way that facilitates only one of the stakeholder groups' work (e.g. designers) and they don't usually support equal opportunity in designing interactive systems for members of different stakeholder groups (i.e. users, analysts, designers, developers, project managers).

Keywords

Interactive system design, paper prototyping, collaborative design, Gabbeh, Denim and CSCW.

1. INTRODUCTION

It is generally accepted that user participation is central to the successful design of an interactive system. Enabling users to envisage or make sense of design proposals (whether those proposals originate with 'professional designers' or from the users themselves) is an essential element of all participatory approaches to design. Users can only make informed choices when the proposals being discussed are meaningful to them. Prototyping is one popular method of helping users (and designers) to

understand possible alternatives.

To encourage user participation in the design process, the use of pencil and paper as an established participatory approach for designing interactive systems has been suggested [2], [7]. Whilst paper-prototyping has many advantages in promoting user participation, it also has some limitations. In particular:

- lack of an explicit representation of the navigational structure could make it difficult for users to understand and revise the dynamic behaviour of paper prototypes [8];

- it is difficult to review a paper-prototype when users and designers are not able to arrange a face-to-face meeting; and

- paper-prototypes may be difficult to relate to other representations being used within design, such as detailed specifications of behaviour and functionality.

As pen-based interaction devices have become more widely available, some software systems provide support for penbased interaction in interactive systems design. Examples include SILK and DENIM [4], [5] and Freeform [6]. These systems might be described as supporting a form of 'electronic-paper prototyping'. Such approaches overcome some of the limitations of paper-prototyping. In particular, these systems can make the dynamic behaviour of the proposed system easier for users to perceive and can permit the prototype to be distributed electronically.

In next section we review the DENIM environment, which provides some facilities that may be useful in attempts towards electronic paper prototyping. We then introduce Gabbeh which we are using to explore how users and other stakeholders could participate more actively in 'electronic paper prototyping'.

2. DENIM

DENIM [5] is a sketching tool for designing web-sites. DENIM is usually run on a graphics tablet such as a TabletPC or a Wacom Cintiq. In DENIM users can sketch out the overall structure of a site (a collection of pages); sketch the contents of the pages as a set of 'scribbles'; define hyperlinks from scribbles in one page to another page; and then execute the resulting hypertext in a reduced functionality browser.

Figure 1 presents a screenshot from DENIM. The slider bar to the left of the screen allows the site to be viewed at different levels of detail – varying from a site overview that simply identifies the pages included, through a navigation view where the overall navigation can be examined; down to a detailed view where fine

details of individual pages can be manipulated. At the bottom of the screen is a toolbar that includes: a pencil - for sketching new pages, new content within pages, or adding links; an eraser; a hand – for moving the working surface to bring different areas
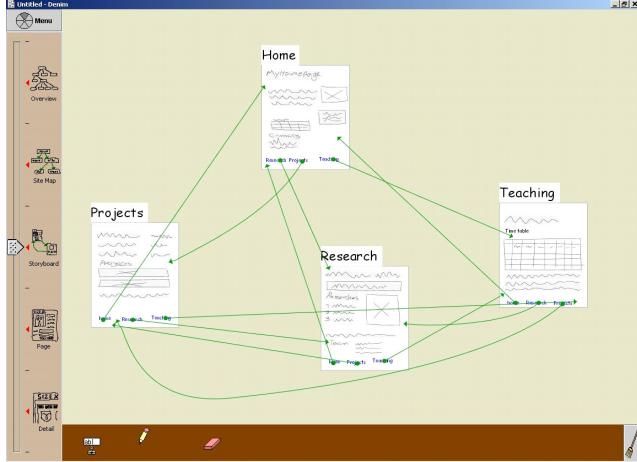
Figure 1: The DENIM sketching environment [5].

into view; and a stamp for adding typed text fields. To add links, the user selects the pencil and draws a line from a scribble in one page to the destination page. At the top left of the screen is a menu that can be selected whichever tool is currently active. The brush at the bottom right is a button that tidies up the tool pallet.

3. STUDYING DESIGN

To investigate the practice of using paper prototyping and DENIM a number of informal design sessions and a case-study were conducted. The case-study was conducted on designing a simple Student Marks program. The program was designed to allow users to assign students to a course module and allocate a mark to each student.

The results of our studies showed that for changing the content or layout of individual pages, DENIM is similar to using paper and pencil. DENIM does also permit the kinds of provisional marks that can be made with paper and pencil. Hence, DENIM may represent a design direction that is well suited to the initial exploration of possible designs. The developers of DENIM have discussed enhancements that would make it easier to copy and paste parts of a design.

Being able to execute DENIM in its limited functionality browser offers a major advantage for evaluation in comparison to paper prototyping, since it is no longer necessary for the designer to 'play the computer' during evaluation sessions, which allows the designer to focus more on the users' responses. The execution of the model provides a closer layout to the interaction that users may experience in the completed system, than is possible using pencil and paper.

The emphasis on using DENIM using a tablet suggests a model of a single designer creating the design for consideration by others. There is no particular reason why DENIM should not be used on a shared electronic whiteboard, or by two users, each of whom uses a 'pen' to make modifications. Such an approach would allow DENIM to be used to support collaboration in this exploratory phase of design.

A major difference between DENIM and using a paper prototype is the limited support for communication of findings. In paper prototyping, post-it notes and hand written comments in form of scribbles can be used to indicate reasons for particular design choices, critiques of particular elements, or indications that further work is required or planned. DENIM does not provide for any form of commentary notation either within the design view or during execution of the model. The only marks that can be made are scribbles, which cannot be distinguished from the intended content of the design itself. This approach does not allow users and other stakeholders to add their own comments to the design.

4. ENHANCING PARTICIPATION

As explained in previews section a striking feature of Denim is that all of the marks or notes made in this environment are treated as part of the design and it is not possible to add any additional notes as commentary on the design.

This contrasts with the authors' experience of paper-prototyping where post-it notes and hand written comments are common means for recording the design issues (e.g. a comment that certain screens form a related group), indicating the status of parts of a design (e.g. to be developed further), or for noting user feedback. Green & Blackwell [3] suggest that 'Secondary notation' which includes such annotation, is important in exploration or modification of a design. Annotation is also a common feature in modern document editing software.

The lack of the ability to annotate the design may severely limit the ability of Denim to support communication between different stakeholders in the design process. Denim does not permit users or other stakeholders to give feedback directly through the medium of the prototype. Instead, any comment or feedback must be held separately (for example in an audio recording or minutes of the meeting), resulting in a difficulty in identifying the items to which any comments refers. This problem will be particularly acute if some stakeholders are not co-located with designers. By limiting the opportunity for users and other stakeholders to communicate with the designers by reference to the prototype, electronic prototyping systems such as Denim appear to have overlooked one of the primary benefits of paper-prototype.

5. GABBEH

Gabbeh is a prototype tool that extends the capabilities of existing tools by supporting dialogues between different designers, or between designers and other stakeholders. The core innovation in Gabbeh is in allowing users to add arbitrary comments either when the system is being designed, or when the prototype is been executed. Gabbeh is developed as an extension of Denim environment.

Figure 2 shows an example of comments in Gabbeh. The current version of Gabbeh allows different stakeholder to add comments in the 'design view' from initial exploration phase of design. To promote user participation in using secondary notations, Gabbeh allows users to add arbitrary scribbles (free-hand notes) to a comment using a similar free-hand writing tool as is used to create elements in a web page.

A comment in Gabbeh can be associated with any arbitrary number of design components. It is important as it will allow

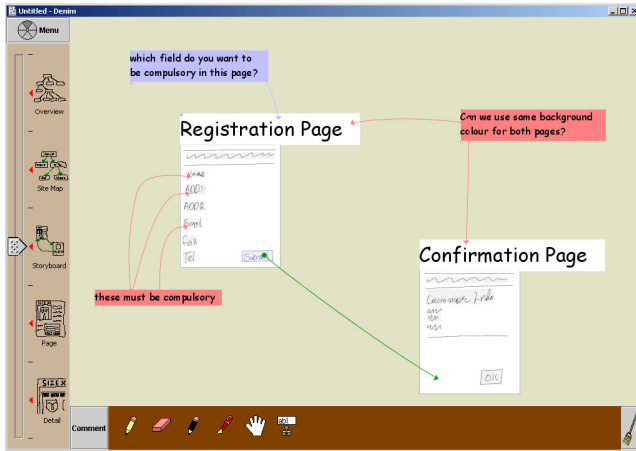different stakeholders in evaluation to give feedback at any component of a design.

Figure 2: Comments in the Gabbeh design view

Comments are given a background colour. This is intended to allow development teams to distinguish between different types of comments, or perhaps between comments from different speakers. The usage is left open deliberately to provide flexibility.

In the evaluation phase different stakeholders may execute Gabbeh using a limited functionality browser to review the design. Gabbeh allows users to view and add comments while they are reviewing the design in 'run mode'. This functionality is intended to allow stakeholders to give feedback through the prototyping media. Viewing and recording such dialogues among different stakeholders during the execution of the model promote user participation in evaluating the prototype. Also, it would support the communication when stakeholders are not located in the same site.
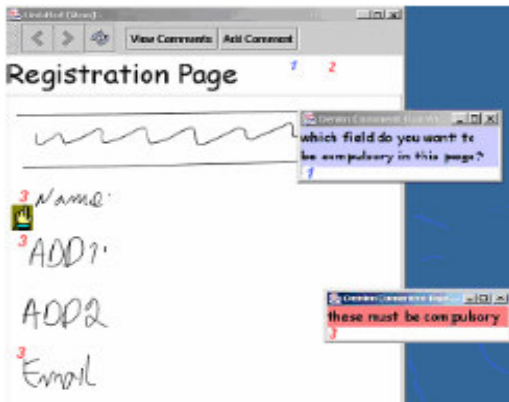

Figure 3: Viewing comment when Gabbeh is executed

Figure 3 shows how a user reviewing a design can view existing comments related to a page. When the user selects to view existing comments, the points within the page that comments refer to will be marked by numbers. When user select a number on the page the related comment will be displayed in a separate window.

Figure 4 shows how users reviewing the design can also add their own comments, which are then available in the design view. In the current version comments created in 'run mode' are associated with a page but cannot be linked at a more detailed level of granularity.
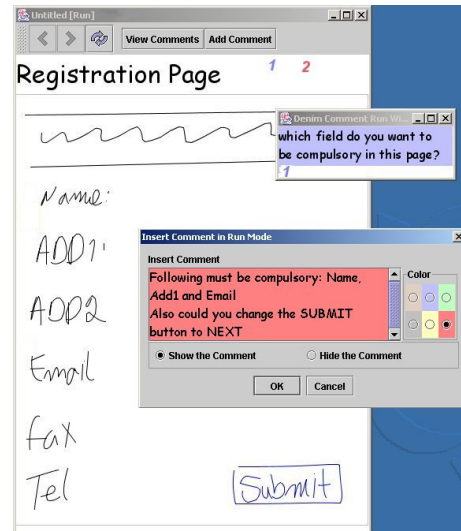

Figure 4: Adding comment when Gabbeh is executed

6. NEXT STEP
Gabbeh is at an early stage of prototyping. The design concepts have been developed from discussions with designers of websites, desktop applications and video games. Further enhancement will include being able to add comments in 'run mode' in more detailed level than a page level. This will expand the scope of user's feedback in design evaluation. Also being able to introduce comments on transitions, as well as being able to import images of existing applications so that the tool can be used to support design evolution and redesign.

At the time of writing, the basic functionality has been completed, and we are conducting an empirical study to evaluate Gabbeh. We are interested to discover to what extent Gabbeh facilitates the communication and collaboration among different stakeholders during the design process.

7. DEMONSTRATION
Demonstration of Gabbeh will begin with a brief presentation of its structural design and functionality. The presentation will continue with a brief comparison of Gabbeh to other 'electronic paper prototyping' systems (for example Denim, FreeForm and InDesign) which is reported in detail in our earlier paper [1]. We will then demonstrate one of the case studies from previews evaluation sessions to illustrate the use of commenting facilities. Furthermore, we will invite members of the audience to interact with Gabbeh in several tasks (for example designing a personal webpage or commenting on one of our unfinished design models). We will encourage audience to participate in a simple deign process as a team of stakeholders. And experience the use of Gabbeh in facilitating communication and collaboration among them.

8. PRESENTERS
The authors will present the demonstration and they are primary resources who are working on this project (for more information on presenters visit [9]).

9. EQUIPMENT SUPPORT

To run this demonstration we need a minimum of one GraphicTablet and two PCs which are connected through network. Also extra network connections are required (for portable computers and TabletPC). 20 square meters space would be enough for setting up this demonstration.

10. ACKNOWLEDGMENTS

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