Collaborative Pattern Design System Model

based on Web Technology

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Abstract - Effective collaboration between pattern design teams requires a collaborative platform that is both executable and efficient. With the advent of Web 2.0 technologies, including Ajax and RIA, it is now possible to enable collaborative designing that requires editing of images over the Web. In this paper, a system infrastructure is designed so that it enables collaborative design of textile patterns. Furthermore, a web-based pattern library is implemented to allow the participants to collaborate for intelligent designs. A website designed with the infrastructure will enable designers to make pattern designs faster and more efficient.

Keywords: pattern design, textile, web 2.0, collaborative, model

1 Overview

Pattern design, due to the complexity of work and the variety of requirements, necessitates collaboration among project team members, comprised of designers and those from textile-printing and weaving industries. In most cases, a short-run project is usual, with participants ranging from textile-printing customers, designers, project managers, and technology experts. Most participants are distributed geographically and they need to exchange collaborative information in an effective manner. With the evolution of the web and Computer Supported Cooperative Work (CSCW) technologies, it is now possible to put in place such a collaborative design environment.

The advantages of designing in a collaborative environment are recognized more widely in recent years, and many researches have been made in such sectors as collaborative building engineering [1][2], and parts design. The textile industry, though it needs a lot of collaborative efforts for pattern design, hasn’t seen much researches on this subjects.

Globalization of economy has made the industry more competitive, and the textile industry is required to develop new products and produce high quality goods in a shorter cycle than before. As the pattern design becomes one of the most important steps in production process, the creative pattern designing executed in a shorter timeframe ensures a company’s future survival. Therefore, a pattern design system that offers a collaborative awareness feature will be a great tool for a textiles company, because it facilitates collaborative designing over the web with its intelligent design tools.

To design such a system, you need a system that allows you to collaborate and share design files. The user interface of this system needs to provide a function that enables to transfer both text and image files over the web. Textile images should be editable and the editing needs to be made in real time, so you must have a system that enables client-side editing capability. In this research, we designed a system that it incorporates the latest web technologies to meet the requirements of a collaborative design system and a design library is implemented to help designers more productive.

This paper introduces a workspace model in section 2, proposes a prototype structure for collaborative designs and introduces a systems design and a pattern library in section 3, and in section 4, it presents conclusion and discussion of additional steps that need to be taken to expand the research.
2 System Model

2.1 Workspace Model

You need a workspace to offer users with a collaborative design environment over computer networks. Key components of a workspace include: roles, actions, artifacts, and cooperation messages.

- Roles are an entity of an organization that participates in a workspace and they represent the roles of the participants in a workspace. Multiple roles, including project manager, action manager, designer, and design user, can be assigned to a participant, along with the necessary permission and authorization.

- Actions encompass activities and processes that are performed according to the roles of the project participants. A participant’s action can be individual or cooperative.

- Artifacts denote the entities that are produced and consumed by actions. The artifacts defined in a system can be represented hierarchically as in Figure 1, where P is project; D, design action; and O, an image object. An image object comprises an image and descriptions.

![Figure 1: The hierarchical structure of artifacts](image)

2.2 Collaborative Structure Design

Figure 2 shows a systems configuration. An agent is a software component that performs a function that the system requires. Each component has a system function, service, data and knowledge.

- User Interface Manager (UIM): Located in a server and each client, UIM interacts directly with an end user, gets user’s input and triggers the necessary functions from Cooperation Control Module (CCM) to complete a design. In addition to responding to the inputs from a mouse and a keyboard, the UIM detects a pattern by gaining a certain level of learning capabilities (such as remembering a co-worker that the user who contacts frequently).

- Cooperation Control Module (CCM): This module manages a user’s joining and leaving a cooperative action, cooperative actions (discussion, work allocation, pattern design, and output assessment), and the roles of participants (host of a collaboration/discussion room, or a participant). Hierarchy control allows collaborative application users to share and utilize resources without any access conflicts.

1. Cooperation Message Stream Handler: Communicating with a User Interface Manager (UIM) in synchronous collaborative designing, it supports multi-user interface in a WYSIWIS (What You See Is What I See) mode. Created in a pre-defined template, a message is optimized before a UI agent notifies that a screen is refreshed.

2. Collaboration Awareness Management: In a cooperative action, the awareness management offers a range of methods to recognize collaboration. Examples of such methods include action management, pattern navigation, and a remote pointer.

3. Task Manager: It determines the starting point of a task, showing whether it is the start of a workflow status or a previous action point. Task Manager alerts users that it is time to start a task.

- Global Information Manager (GIM): As shown in Figure 2, Global Information Manager encompasses a global information access service. The proposed system delivers the information access service, combining it with external database management information. Global information database stores information on users, permissions, artifacts, projects, application tools, and pattern knowledge. Content of each database can be described as follows:

1. User Interface: User interface stores a user’s personal information, roles in a project, and authorizations.

2. Artifact Database: The database stores information on pattern documents, layers, image groups, image objects, and access requirements, including access control and synchronous control

3. Project Database: The database stores collaborative project models and their status.

![Figure 2: System Architecture](image)
4. Pattern Knowledge Database: The database stores the elements, samples, layouts, and constraint knowledge pertaining to intelligent pattern designs.

The data stored in a local database is a subset of the global database and it belongs to a specific user.

- Design Library Manager: The library manager plays a critical role in developing an intelligent design.

3 System Design

3.1 User Interface Implementation Technologies

In order to implement the user interface for proposed system, we need a technology that allows editing of images over the web. People call this type of technological capability as Web 2.0, but it’s difficult to come to a clear definition of what it truly is. You may be able to define Web 2.0 era as the time period after the point when the term was originated, but Web 2.0-like services have been available even in the Web 1.0 era. The so-called Web 2.0 technologies include: X/HTML and CSS, Ajax (Asynchronous JavaScript and XML), RSS/Atom, open API’s and Mashups, Microformat, Adobe Flash and Flex, XUL (XML User Interface Language), SVG (Scalable Vector Graphics), tags and tag cloud.

Among these Web 2.0 technologies, Ajax is a relatively new technology that enables an interactive and responsive user interface. Ajax leverages other technologies, like XHTML, HTML, CSS, JavaScript, and XML. Using XML to exchange small bits of data between a server and a client, Ajax makes a user interface more interactive. Ajax engines create a user interface while communicating with a server on behalf of a user.

Known as a Rich Internet Application (RIA), a Web client is an application that has implemented a user interface that offers a rich user experience that matches a desktop application. Leveraging Ajax, a RIA offers an opportunity to deliver rich user interfaces for more users. Using a lightweight web-based technology called JavaScript, it can easily integrate with existing web systems and offer easy-to-use services to most users. Built on the advantage that many users find it easy to use them, Ajax and Flash technologies contribute significantly to the evolution of user interfaces in the Web 2.0 era.

Ajax is seeing wide adoption because the technology is one of the easiest to implement in combination with other Web technologies. However, you can make it even more bullet-proof with the following two techniques: Flex applications that run on Adobe’s Flash player; and Microsoft’s XAML-based applications. You can use Adobe Flex Builder and Adobe Flex Enterprise Service products for this purpose.

Running in a Flash player, Flex engine comprises: (a) Flex Builder, an integrated development environment (IDE) built on the Eclipse platform; and (b) a software development kit (SDK) that includes Flex Compiler. To use this engine, you need to install Flex Builder on the Eclipse platform.

3.2 Pattern Library (PL)

PL describes the resource library that helps users with creative pattern design.

A resource library encompasses an element library and a sample library. The former contains pattern elements that can be used as an object in a pattern, while the latter includes samples that can be used as a model for a new pattern. Therefore, it is most convenient way when you make simple modifications of these samples to find a new pattern. The patterns library is implemented in a way that it allows a search, leveraging the meta-data on the image’s style, and years in vogue. The patterns library’s image search screenshot is shown in Figure 3.

![Figure 3: Pattern Library Screenshot](image)

3.3 Design Project Interface

A design project is created from a project management screen as shown in Figure 4. A new project can be created by a user with the necessary permission. When a new project is created, it is displayed on the project management screen, indicating its creator and status. Other users can join the project by clicking on a participation button, while its owner can allow or disallow participation.

Project participants now can work together in a cyberspace on a same design, by sharing and editing images, and adding text comments. Figure 5 shows a design project screen where users can add images and opinions on them to increase the versions of the design.
The image that is being worked on is displayed on the image action screen, where you can download the image, make necessary changes with a desktop image editor, and add comments on editing. When it’s not possible to use a desktop editor, you can call and use an online image editor. For an online editor, we can build an image editor but instead use open software developed with Flex technology in our development. In this research, Adobe’s FotoFlexer is used as an online image editor. Leveraging the Flex technology, FotoFlexer is a program that enables image editing over the Web. The web interface that can call the image editor is shown in Figure 6.

**4 Conclusions**

With the advent of Web 2.0 technologies, including Ajax and RIA, it is now possible to enable collaborative designing that requires editing of images over the Web. In this research, a web-based software platform is proposed to support collaborative pattern designing. The system proposed offers a platform to produce fast pattern designs, by allowing the geographically-distributed project team members, like designers, textile-printers and weavers, to exchange images and editing information online. Furthermore, the design library allows faster development of intelligent designs, based on shared design knowledge. The focus of future research from here on will be to develop and adopt the system.

**5 References**


*This study is supported by the "Seoul R&B &D " in 2007. (Study No.10851)*