

SDG Toolkit in Action

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ABSTRACT

SDGToolkit, presented in a video in ACM CSCW 2004, is a toolkit for building single display groupware (SDG) applications. It automatically manages multiple mice and keyboards, draws multiple cursors, and supplies an infrastructure for building SDG widgets. In the 2004 video we claimed that this toolkit would make it easy for others to build SDG. This video demonstrates that claim. Seventeen students were asked to independently design and implement an SDG system of their choosing for a class assignment. They had minimal instruction and very little time to do it. Yet they managed to build a considerable variety of applications – some quite complex – across various genres. This video illustrated eight of these projects.

Categories and Subject Descriptors

H.5.3 [Group and Organization Interfaces]: Computer supported cooperative work

General Terms

Design, Human Factors.

Keywords

Single display groupware, toolkits, evaluation.

1. INTRODUCTION

SDGToolkit is a toolkit for building single display groupware (SDG) applications [5,6]. During runtime, it automatically recognizes and manages multiple mice and keyboards, and draws multiple cursors on the display. During development, it provides the programmer with easy ability to capture and differentiate events from multiple mice and keyboards, and the ability to control various properties of these mice. It also provides specialized user control objects that programmers can extend to develop their own SDG widgets.

The driving goal behind this toolkit is that it

“...should be simple enough for average programmers to quickly learn and use, where they can concentrate on SDG application design rather than low level SDG plumbing.” [6]

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In a previous paper and video publication [5,6] Tse and Greenberg provided several examples that clearly show that very simple SDG applications could be written in a few lines of code. They also provided several more sophisticated examples of SDG widgets and applications. However, all these examples were either done by the authors, or were done by people working in direct collaboration with the authors.

The next step was to test the claim that SDGToolkit was actually simple to learn and use by average programmers. We gave the following assignment to computer science students in two small undergraduate and graduate classes on Human Computer Interaction.

You have been hired to create a demonstration of a single-display groupware (SDG) system that allows 2 to 4 people to interact over a single display using multiple mice and (optionally) multiple keyboards. Your demonstration should illustrate at least one object that gracefully reacts to multiple people using it simultaneously, which in turn is embedded in an application that exploits it. You have complete freedom of your design, as long as you can show that the SDG object and its containing application are useful for its intended audience, and that its design is somewhat impressive.

Their instruction consisted of a single background lecture on SDG given by Greenberg, (see <http://www.cpsc.ucalgary.ca/~saul/581/>), and a tutorial on how to program the SDGToolkit given by Tse. Students then had about two weeks to design and implement their system.

2. WHAT THEY BUILT

All succeeded in producing impressive SDG applications, which validates the claims made by the SDGToolkit designers. This video shows, by demonstration, what this mix of student programmers was able to design and build in a short time. While only eight projects are featured in the video (due to limits of video length), the others were of similar quality. A summary of these videos, divided into three genres, are listed below.

Fun Activities. Various students designed their SDG application around a fun collaborative activity. The three below illustrates some of them: photo sorting, children fashion dress-up, and music composition.

- *SDG PhotoRiver* lets two people work together to select and organize photographs. The central motif is the photo river: a constantly flowing storage area for photographs that streams past the viewers (replicating ideas found in [3]). People select photos from their rivers, which are then displayed in personal viewing areas. Photos in common appear in a 3rd river. The design is based upon the traditional motifs of photography

where one moves through a strip of negatives to select photos of interest.

- *SDG DreamPaperDoll*, by Sandra Khorina, is designed for young girls interested in fashion. Girls can simultaneously drag, drop and layer clothing atop a graphical doll. Children change the color of their clothing by working together: one moves a color palette (a magic lens [2]) across the cloths, while the other selects through it.
- *SDG MusicalBands*, by Jim Young, is a collaborative music composition system. It realizes the metaphor of plucking a stretched elastic band to create sounds. The screen displays several rubber bands. Players simultaneously pluck and/or collaboratively stretch one or more elastic bands to create and manipulate a variety of sounds and tones. Bimanual input is also possible, where each player can stretch and pluck at the same time.

Games. Many students opted to design an SDG game. This is perhaps unsurprising, because games are naturally multiplayer, and most people have experience with console games that have multiple controllers. Each game, however, was quite different not only in content but in how it exploited SDG capabilities.

- *Oh Nuts!* by Jordan Schaan, requires two players to work together to toss red nuts in a red hole, and blue nuts in a blue hole. Players not only control two mechanical arms to grab and pass nuts to each other, but each player also controls two joints of the arm. Thus this project is a combination of bimanual input and single display groupware (two people, each with two mice).
- *TypoBlaster*, by John McDonald, is an educational game designed for two learning typists. Words float towards a spaceship in the center of the screen. For each word, both players must cooperate to type the same word; when they both finish that word, that word will be shot out of existence by the spaceship. As the game progresses, more and more words attack the players' spaceship at faster and faster speeds. The game ends when a word hits the spaceship. Unlike all other projects, this one exploits multiple keyboards instead of multiple mice.
- *SDG MindBender*, by Petra Neumann, is a competitive speed and hand/eye coordination game. Each player is assigned a different color, and play begins after both players select a rectangle showing their color. Each person then needs to color as many round targets as possible by mousing over them. The first person to touch all the targets as well as the other person's rectangle wins the round. The game quickly becomes difficult, as each successive round alters the direction the cursor moves in relation to a mouse move, i.e., moving the mouse 'up' causes the cursor to move 'left'.

Drawing. Several students built SDG drawing systems, perhaps because collaborative drawing over a canvas is an obvious application. However, each of their applications had unusual characteristics.

- *Kidpad 2*, by Alexandra Braginsky, replicates features of the Kidpad SDG drawing system, particularly the idea of *local tools* [1]. People can pick up graphical tools (e.g., colored crayons) which then becomes the cursor. The tool takes on a new behaviour when used collaboratively (e.g., drawing by

moving two ends of a line). What is important is that the original Kidpad features [1] were replicated and varied in a short amount of time.

- *SmoothDraw*, by Toni Quach, focuses on smooth drawing transitions of pen strokes (mainly its size and colour). Two people work collaboratively (or one person works bimanually). One mouse is used for drawing with the pen, while the other is used to alter dynamically the pen stroke attribute via spatially moving around a 2d grid. What is unusual about this system is that one person works in tandem with another to control a single drawing implement.

3. CONCLUSION

While some consider toolkits as just 'good engineering', our own belief is that a good toolkit promotes creativity [4]. When conceptually simple things become simple to do in practice, everyday programmers will begin to think in those terms. Simple things are built, and hard things become possible. As the video shows, our minimally trained programmers were able to *design* SDG systems because the SDGToolkit afforded the way they *thought* in terms of SDG building blocks.

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Software Availability

The SDGToolkit, documentation, and source code examples (including all the ones shown in the video) are available at <http://grouplab.cpsc.ucalgary.ca/cookbook/>. Select the SDGToolkit link in the sidebar. Examples are shown in C#.

4. REFERENCES

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