Development for Embedded Solutions Framework

Over the past academic year, a team of students from Olin College of Engineering has worked on a set of projects aimed at improving the functionality of Lexmark’s multifunction products (MFP). For the last several months, we have been working on two major projects: a Graphical User Interface (GUI) builder application designed to make it easier to design interfaces for the X646e MFP, and a revamped USB thumb drive interface. We selected these projects after discussion with Lexmark and our first semester of work building and developing applications for the Embedded Solutions Framework (eSF).

Creating Custom Interfaces with VLML

During the first semester, the team built applications for the MFP and learned how to use VLML to create interfaces for embedded solutions. This experience taught us that VLML is a powerful tool offering a high degree of control over the design of interfaces for the MFP.

Unfortunately, like many other XML-based markup languages, VLML can be unwieldy at times. For simple tasks, it is easy to use the Lexmark-provided standard prompts, but for more complicated interfaces, hand-coding in VLML proved to be more difficult, tedious and time consuming.

LEXMARK

VLML GUI Builder

Users begin creating their custom MFP layout by dragging archetypal representations of VLML widgets onto the 640x480 pixel canvas. Users can set attributes of these widgets, and their changes are reflected in the widgets on the canvas. After perfecting their layout, users can generate an XML file containing the layout's VLML code as well as code stubs that will allow users to easily handle events generated by the layout's widgets.

About the Team

This project was completed by (from right to left) Brian Shih (project coordinator), Adam College (technical lead), Ben Hill (safety and ethics officer) and Nathan Karst (budget coordinator). The team was advised by Professor Allen Downey (far left). Their colleague was Software Research manager Dr. Shaun Love.

Many thanks to the others that were involved with this project: angel adviser Ben Artin and Lexmark employees Chuck Grieshaber, Nathan Cook, Randy Sparks and Joel DiGirolamo.
Improving the Thumb Drive Interface

"Held jobs" matches no concept in the real world that users would associate with the USB drive.

Files not recognized by the machine (e.g., program files) don’t appear clickable like other files, even though they actually are.

Icons in the folder navigator and the individual file inspector are different sizes. Similar buttons (e.g., both "Delete..." buttons) are also in different locations.

With no print preview present, it’s impossible for the user to determine which file is the one she would like to print, especially if many of them are similarly named.

Defining and Understanding Users

To narrow the users we considered in designing new applications, we focused specifically on MFP users in higher education. We conducted interviews with librarians, registrars and faculty assistants.

We distilled these interviews into three "average" users. These personas helped us to design embedded solutions for a specific person while at the same time taking into account the entire subset of users this persona represents.

Ideas

Highlight black area (gutter) on book scans for removal with touch screen
Print directions and map right from MFP
Instructions on demand (context-sensitive video demonstrations)
MFP doubles as punch clock
Any emails on scanned document get added to the contact list
Use coin, credit cards and/or cell phones to purchase printing
Sign documents on touch screen
Takeout ordering from MFP
USB personal ID with debit account
User enters item name and MFP searches online stores to produce a summary of quotes
Divide separate print jobs with plastic sheets from the MFP