End-User Tools

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How to get users to program a VCR?

Source: http://www.goofball.com/cartoons/INC20060118122426
How to get users to program a VCR?

Problem

Solution?
How to get users to program a VCR?

Solution!

Source: TiVo
VHS, 30, dies of loneliness

The home-entertainment format lived a fruitful life

By DIANE GARRETT

- After a long illness, the groundbreaking home-entertainment format VHS has died of natural causes in the United States. The format was 30 years old.
- No services are planned.

...
End User Tools make complex functionality accessible

Darkroom

Adobe Photoshop

End User Tools typically implemented as ...

- Direct manipulation (e.g. Photoshop)

End-user Programming

- When end-users, who have not necessarily been taught how to write code in conventional programming languages, write computer programs. Examples include spreadsheet users who write formulas and macros ...

End User Programming typically implemented as ...

- Scripting (e.g., AppleScript)

To designate which application is meant to be the target of such a message, AppleScript uses a “tell block” construct:

```
tell application "Microsoft Word"
  quit
end tell
```

Alternatively, the tell block may be expressed in one line by using an infinitive:

```
tell application "Microsoft Word" to quit
```

Example: scripting the entire web browsing experience
Sometimes it’s a combination of both visual and programming.
Key challenges in End User Programming

- What should the “syntax” (visual or text) look like?
- What should “debugging” look like?
Good architecture needed to make the programming visual

How Automator Works
- The Development Components of Automator
- Loadable Bundle Architecture
- Threading Architecture
- The Automator Classes
- Implement as MVC

Source: Apple
List of approaches to End User Programming

- Preferences
- Scripting languages
- Macro recorders
- Programming by Demonstration

Another Scripting Example: Web enabled mash-ups

Google Mash-up Editor
Example of Macros

Microsoft Excel Macro Editor

Source: Microsoft
Example of PBD: Stagecast Creator

Game created in Stagecast Creator by 12-year-old

Source: Stagecast
How do you design End User tools / programming?

- User centered approach!
- Iterate often
- Sometimes it boils down to giving access to a cleanly designed programming interface
Implementation Example: Facebook development platform

Facebook apps

Example app

Source: Facebook
Eye to the Future: PBD in the physical world

Source: http://hci.stanford.edu/exemplar/
The Long Tail of Interaction

Alpha Applications

Situational Applications
Rapidly Prototyping Interactive Systems
AKA Designing Things for Designing Things
Two Key Fieldwork Results

Comprehensive prototypes are being built, but only for presentation.

Video recording is pervasive, but revisiting video is too expensive.
Smart Hardware

I²C input/output components (ATtiny45)

- USB port
- Status LED
- ATmega128 master controller

open I²C connectors

IO hardware, e.g., slider

ATtiny45 I²C slave

+5V

GND

I²C SDA

I²C SCL

OSC msgs via USB

ATmega128 I²C master

PC running d.tools

other I²C device e.g., accelerometer

ATtiny45 I²C slave

IO hardware, e.g., button
### Designing Sensor-based Interactions

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prototype Application Logic</td>
<td>Specify relationship between sensor data and application logic</td>
</tr>
<tr>
<td>Specify Relationship Between Sensor Data and Application Logic</td>
<td>Provide software abstraction for hardware</td>
</tr>
</tbody>
</table>
How would you prototype...

...a workout monitoring system?
How would you explore...

...motion-based game controllers?
//detect accelerometer peaks

//read data sample
xVal[t++]=readA2DValue(xPin);

//look for changes in derivative
if(((xVal[t]-xVal[t-1]) >= 0
   && (xVal[t-1]-xVal[t-2]) < 0)
   && ((xVal[t]-xVal[t-1]) < 0
       && (xVal[t-1]-xVal[t-2]) >= 0)
   //peak detected
   //send message
   oscSendMessageInt("/x/peak",1);
} else {
   //no peak
}
Tacit Knowledge
Exemplar

Demonstrate

[CHI 2007]
Exemplar

Demonstrate

[CHI 2007]
Exemplar

Demonstrate

[Image of electronic device being held]

Review

[Image of software interface]

Edit

[CHI 2007]
Exemplar

Demonstrate

Export

Review

Edit

[CHI 2007]
Barriers

- Complexity of understanding, and using web services
- Complexity of deploying and managing web application environments

[cf. Ko, Myers, Aung, VL/HCC 2004]
Growth in Web Service APIs
Previous approaches

- Better search for finding code
- Visual authoring tools that lower thresholds (and ceilings)
Web sites and their APIs are related...

...let’s leverage that fact!
Corresponding API call:

```python
flickr.photos.getInfo(
    user_id='73866493@N00',
    photo_id='3208312'
)
```
Conventional wiki

Welcome to the mashup-tools wiki!

The goal of this wiki is to be a guide to the different tools and tips that ubicomp developers use in mash-ups. Our definition of a mashup may differ from yours, so take a look at MashupDefinition.

- **ScreenPoking** tools generate mouse and keyboard events to control PC applications through electronic, or through software. These are INPUT ONLY, see also GUI Automation
- **ScreenScraping** tools
- **Electronics**:
  - **Hardware to PC interfaces** reading sensors on your PC, controlling actuators from your PC
  - **Simple Microcontrollers** embedded control of sensors and actuators, mostly with roll-your-own examples
  - **Transducers** that change one type of input/output into another
Scenario
Welcome to the Climber’s Portal

About our group | When is the next climb? | Contact us

Scotts latest images:

Drews latest images:
To: Scott, drew

Subject: Check out our new group portal!

Attach a file

Rich formatting »

Our new portal is online - see for yourself at:
http://valparaiso:3704/tepee/climbersportal/ 

-Jane
Proxy Architecture

Original Page

Proxy Server

Rewritten page with API annotations

Site-to-Service Map (hosted on d.mix wiki)
A web site (Flickr)...

Colory Cover for Why's (Poignant) Guide to Ruby
Colory Cover for Why's (Poignant) Guide to Ruby

Photo title
Get Image URL
Tag search
... its services
The site-to-service correspondence

Corresponding Flickr API calls

- Flickr photos API
  - `flickr.photos.getInfo(photo_id = "298655528").title`
    - Return the current photo’s title.
  - `info = flickr.photos.getInfo(photo_id = "298655528")`
    - URL = “http://farm”
      + `info.farm-id`
      + “.static.flickr.com/”
      + `info.server-id`
      + “/”
      + `info.attributed["id"]`
      + “_”
      + `info.secret`
      + “.jpg”
    - Return the static URL for this image.
  - `flickr.tags.getListPhoto(photo_id = "298655528")`
    - Get the tag list for a given photo.
  - `flickr.photos.search(tags = "poignant ...")`
    - Return a list of photos for this user, matching the given tags.
Authoring the Site-to-Service Map

Need to write

1. Map from URL to Page Type (RegExp)
2. XPath/CSS Selectors (JQuery/Hpricot) to
   1. Identify element $E$ to be annotated
   2. Extract web service arguments
3. Bind arguments to web service method that returns $E$
Authoring the site-to-service map

Site owners or lead users define site-to-service map (once) in the d.mix wiki
Using the site-to-service map

- Multiple, independent web developers benefit from this mapping
Beyond the Desktop Browser
Tools for Design Thinking
Human-Centered Representations
Creation by Sampling and Analogy
Integrating Design, Test, and Analysis