Human-Computer Interaction

End-User Programming

Professor Bilge Mutlu

Questions

To ask questions during class:

» Go to slido.com and use code **#2938904** or direct link or scan QR code

» Anonymous

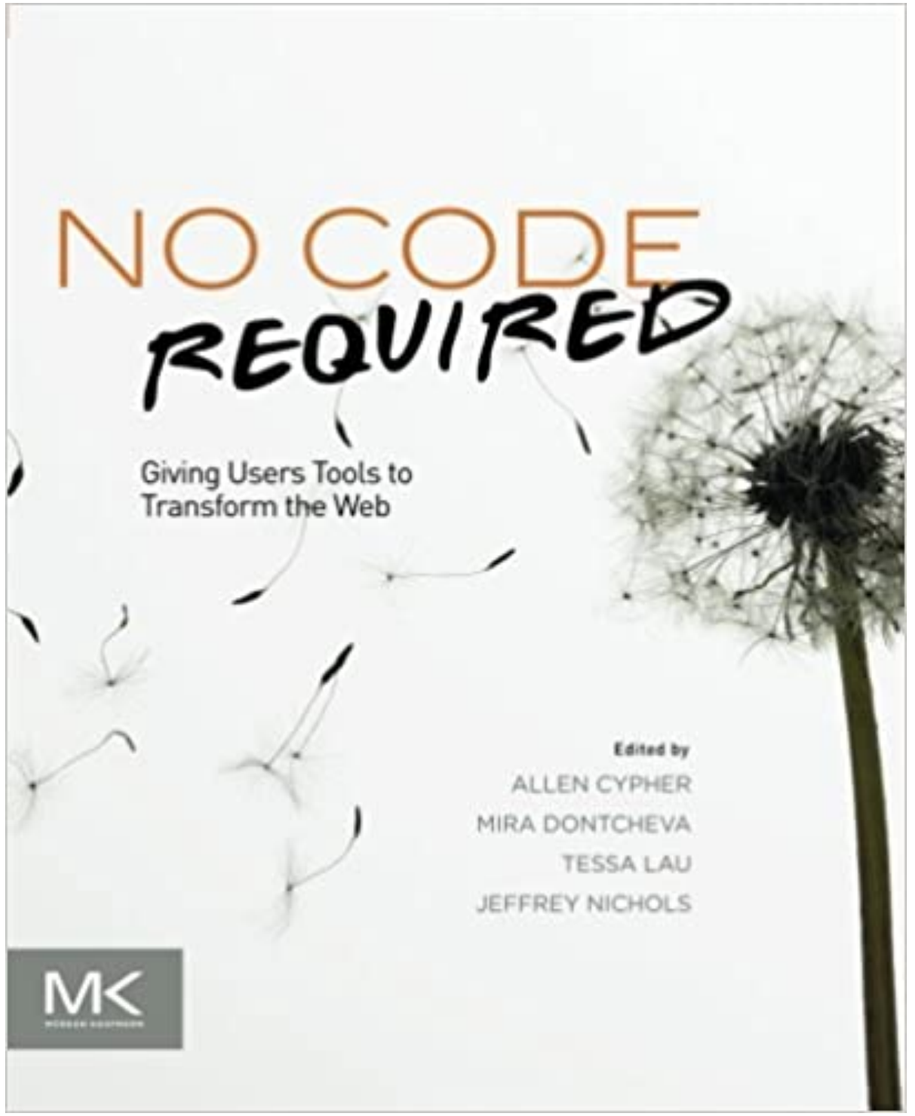
» I will monitor during class

Today's Agenda

» Topic overview: *Authoring & end-user programming*

» Discussion: *Group discussions*

Cyper et al., 2010, No Code Required: Giving Users Tools to Transform the Web



What is end-user programming?

Definition: "Activities and tools that allow end-users—people who are not professional software developers—to program computers," specifically "tools to create or modify software artifacts (descriptions of automated behavior) and complex data objects without significant knowledge of a programming language."[1]

Academic definition: "End-User Development can be defined as a set of methods, techniques, and tools that allow users of software systems, who are acting as non-professional software developers, at some point to create, modify or extend a software artifact."[2]

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[1] Wikipedia: End-user development

[2] Lieberman et al., 2006, End-User Development: An Emerging Paradigm

Why do end users want to program?

1. **Customization:** Adapting complex services to individual needs and circumstances. E.g., setting up voice mail, connecting systems.

2. **Automation:** Creating routines to perform recurring tasks. E.g., paying monthly bills, recording a TV show.

Approaches to end-user programming

1. Scripting
2. Structure editors
3. Visual programming
4. Programming by demonstration
5. Sloppy programming

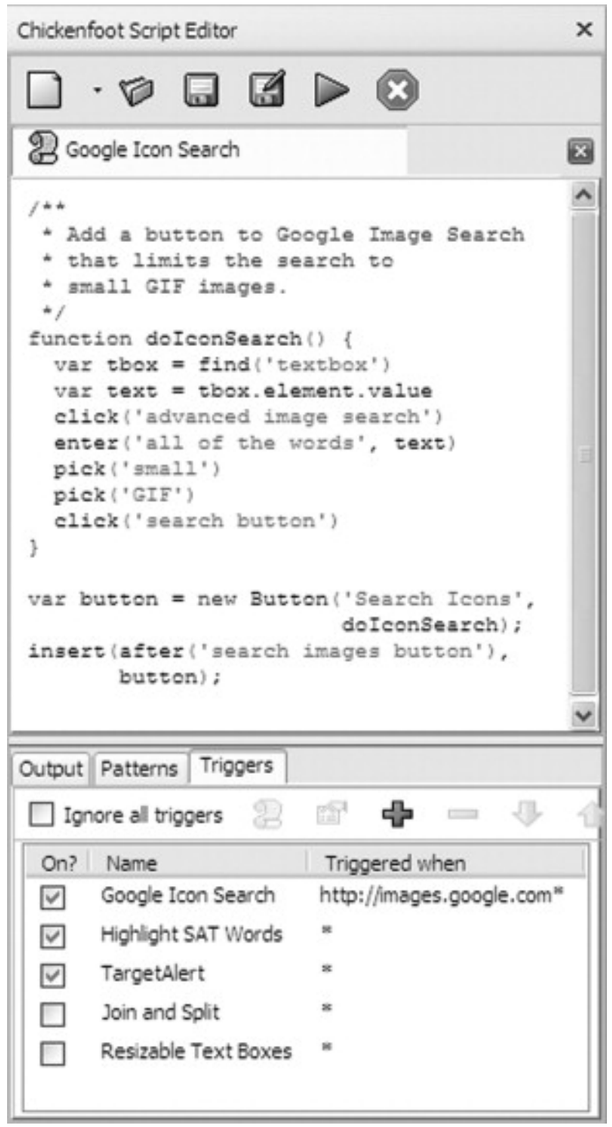
Scripting

Definition: "Scripting languages approach end user programming by still using a programming language, but by making that language simpler and easier to use. To accomplish this, they may restrict their solutions to a limited domain – such as spreadsheets or Web pages – and offer only limited power within that domain."[3]

[3] Cyper et al., 2010, No Code Required: Giving Users Tools to Transform the Web

What are some examples?

Mission of Chickenfoot:[4] "a user should not have to view the HTML source of a Web page to customize or automate it."



[4] Miller et al., 2010, Rewriting the web with Chickenfoot


Google Image Search - Mozilla Firefox
Chickenfoot Script Editor
Google Icon Search
Web Images Maps News Video Gmail more
Google Image Search
pencil
Search Images
Search Icons
The most comprehensive image search on the web.
New! Search the newly digitized LIFE photo archive
World's Fair
Academy Awards
Apollo 11
Marilyn Monroe
Want to help improve Google Image Search? Try Google Image Labeler
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b
Google Advanced Image Search
Find results
related to all of the words
related to the exact phrase
related to any of the words
not related to the words
Google Search
Search Icons
Content types
Return images that contain
any content
news content
photo content
clip art
Size
Return images that are
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Exact size
Return images exactly the size
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Moderate SafeSearch is on
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Showing
Small images
Any content
Showing only small images (show all image sizes)
Pencils
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Flash drawing by pencil
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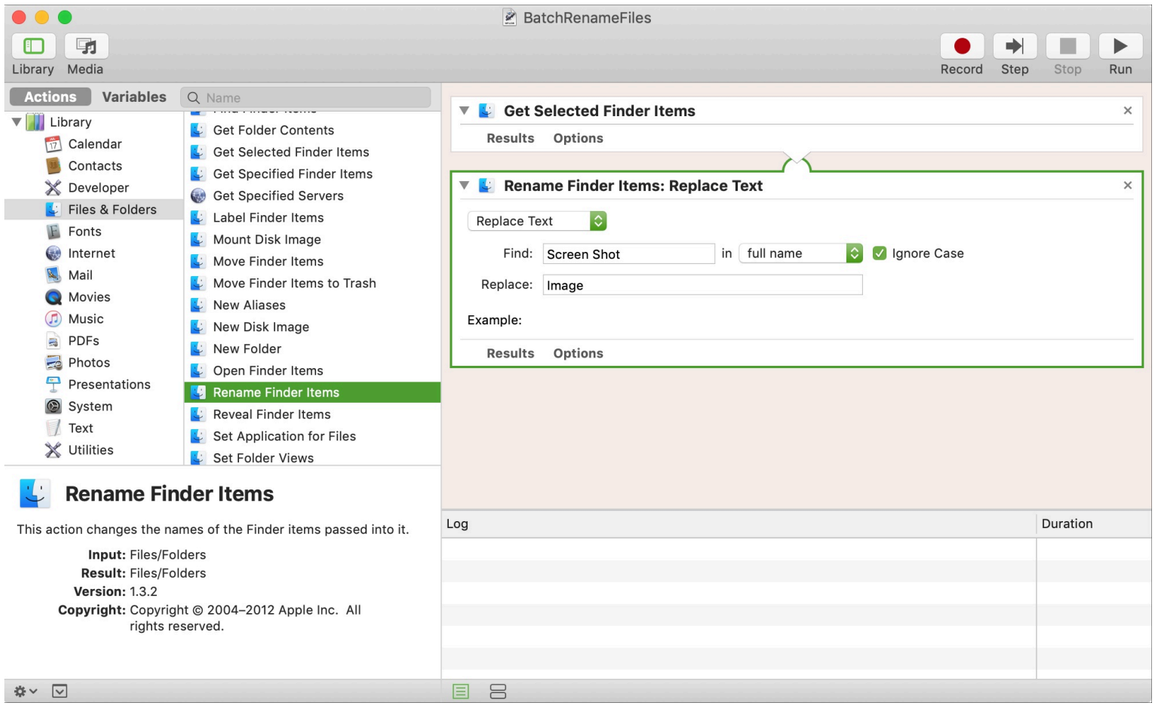
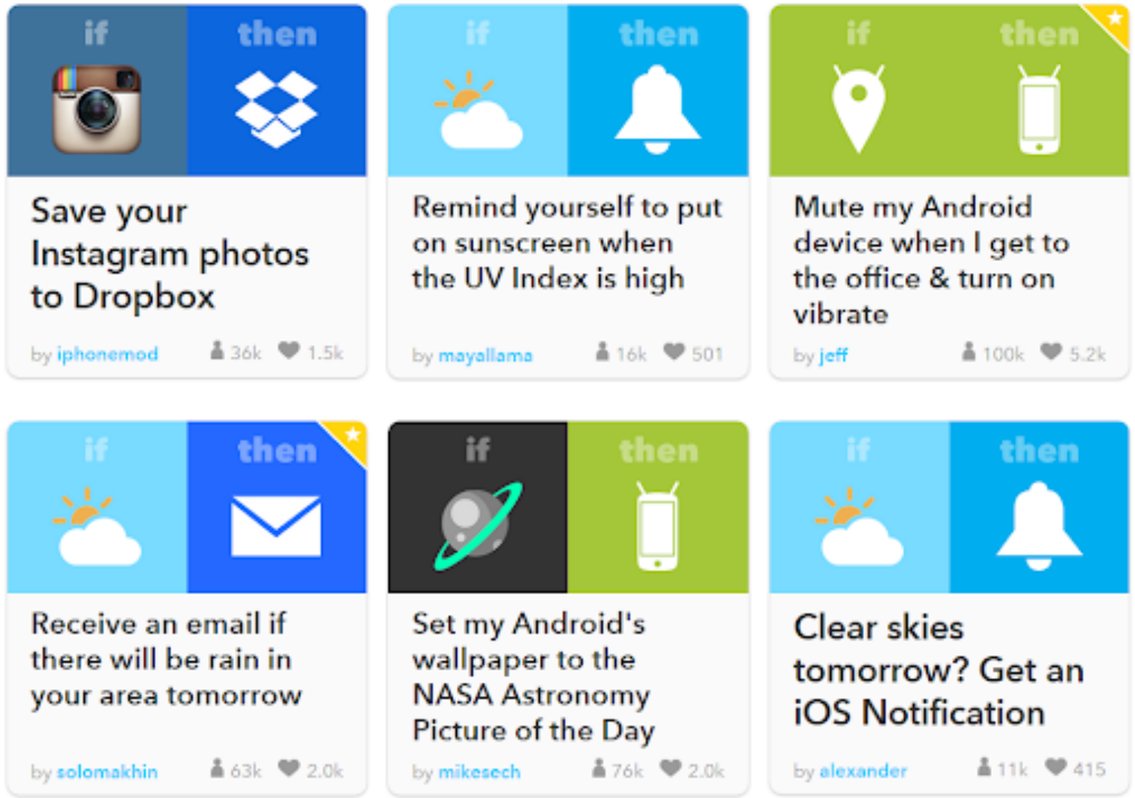
Structure editors

Definition: An approach to making scripting languages easier, "where the end user creates commands by selecting words from menus, and the editor guarantees that only legal combinations of words can be selected."[5]

[5] Cyper, 2010, End user programming on the Web

What are some examples?[6]

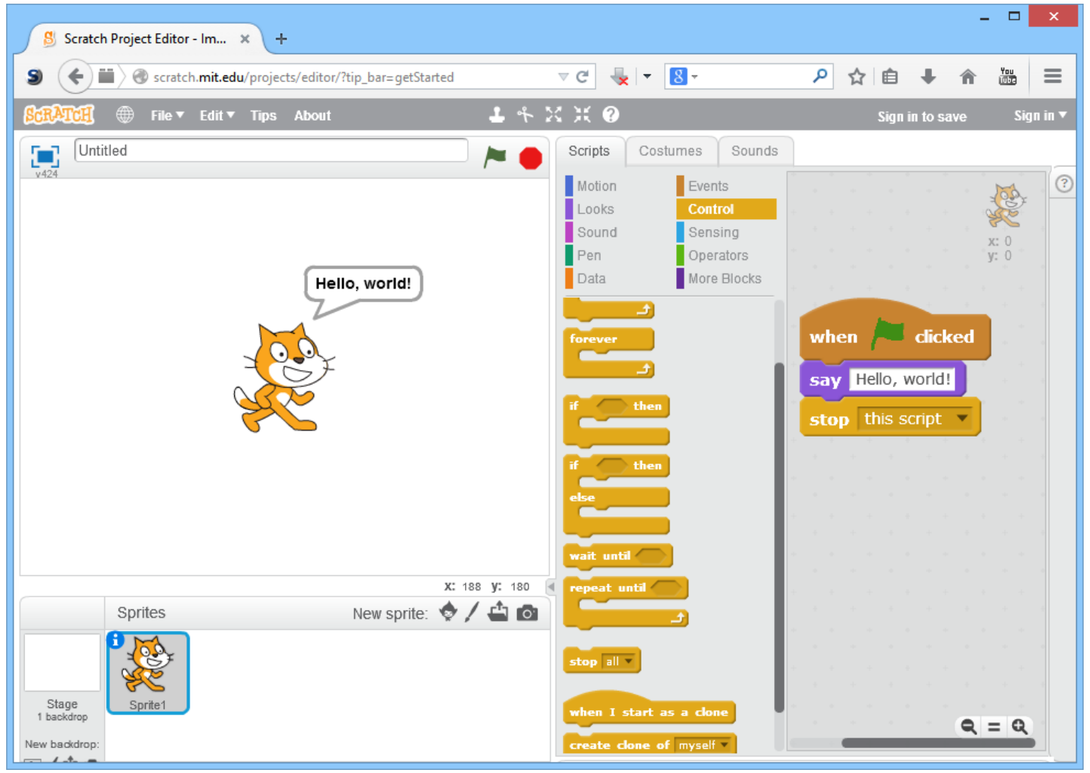




[6] Image sources: Left, Right

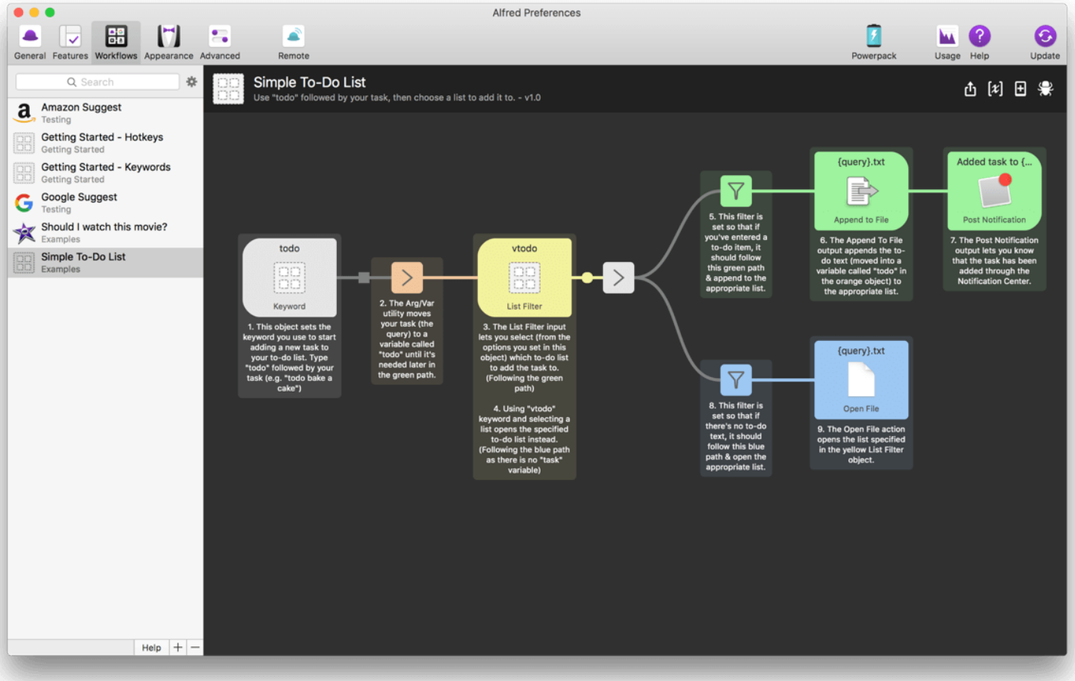
Visual programming

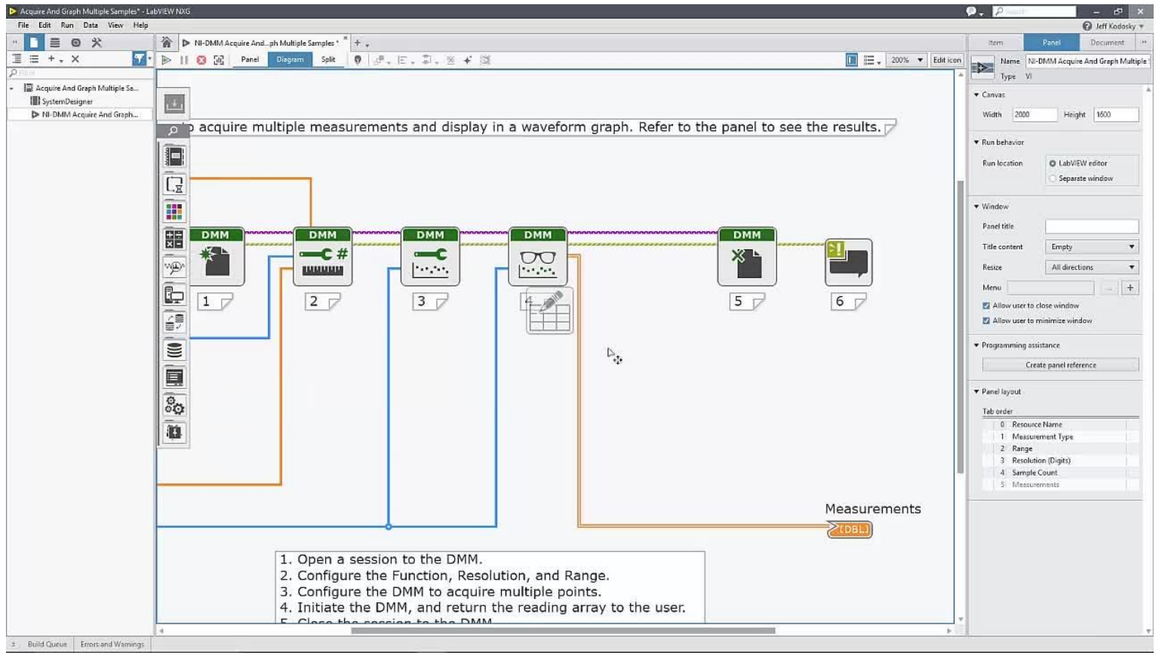
Definition: A "visual programming language (VPL) is any programming language that lets users create programs by manipulating program elements graphically rather than by specifying them textually."[7]



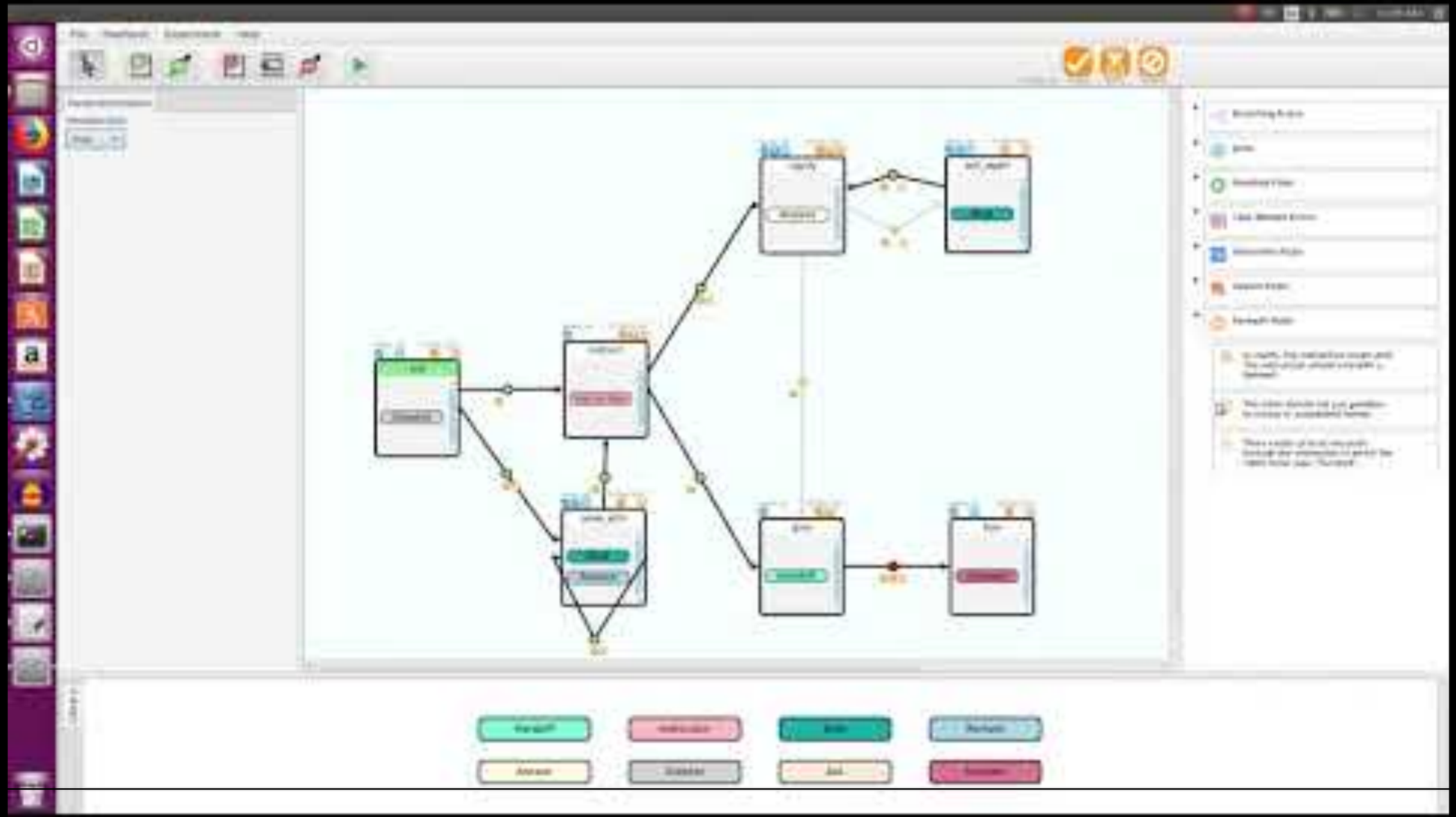
[7] Wikipedia: Visual programming language

What are some examples?[8]





[8] Image sources: Left, Right

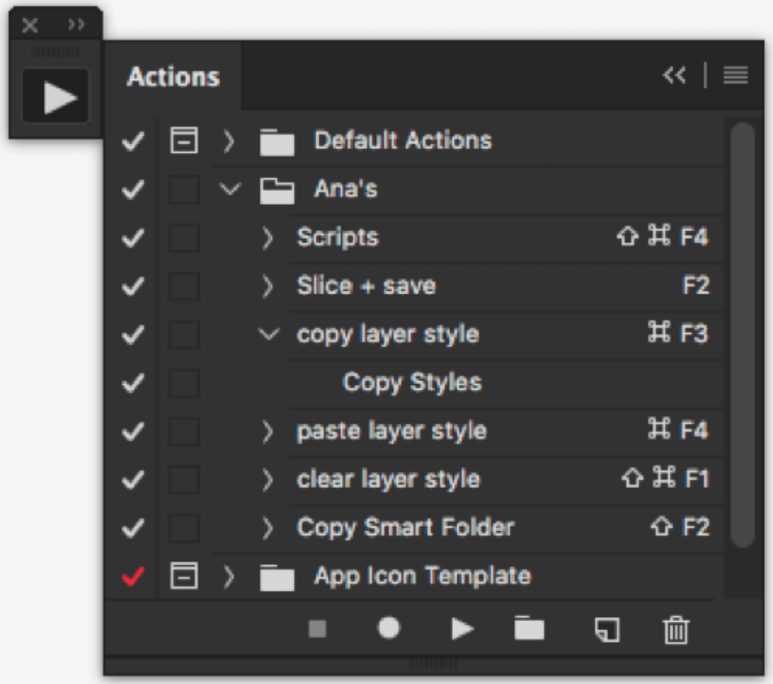


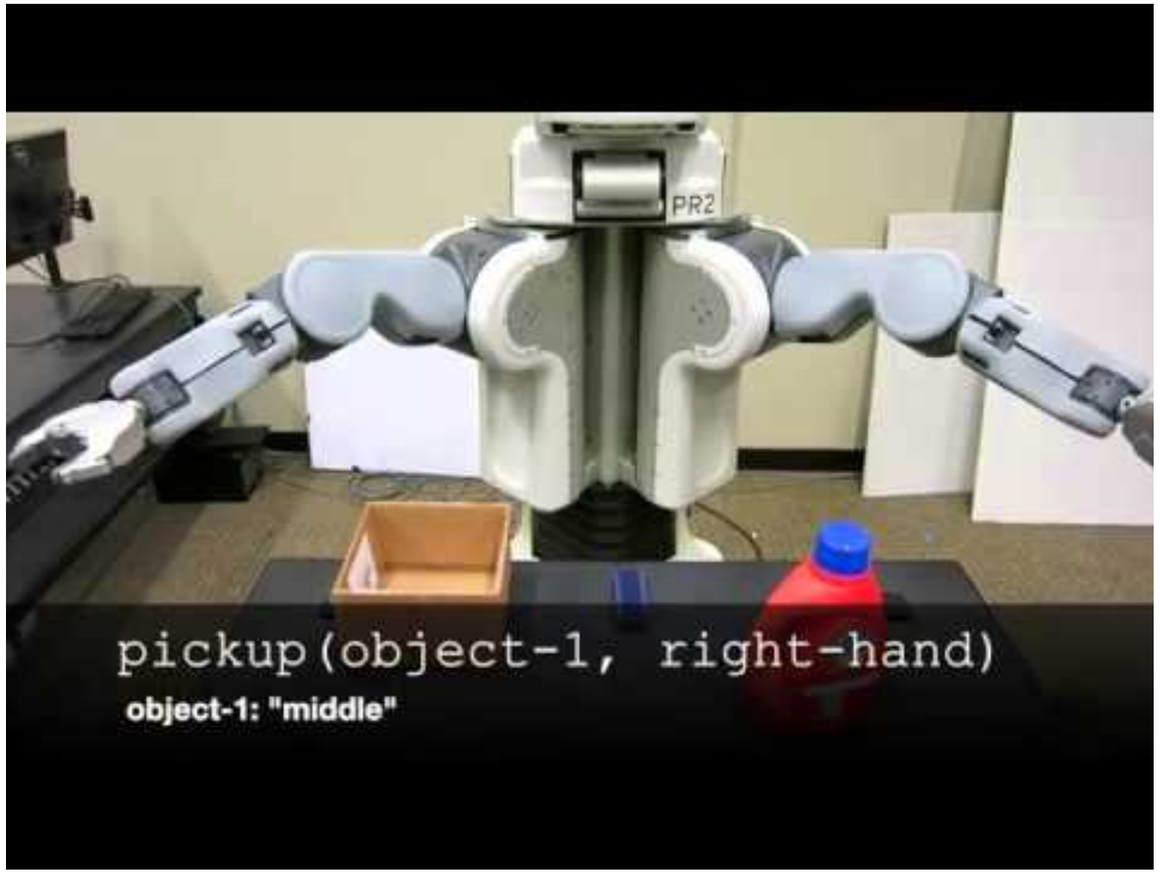
Programming by demonstration

Definition: Programming by demonstration (PBD) is an innovative paradigm that can enable novice users to build a program by just showing a computer what users do.[10]

[10] Cypher, 1993, Watch what I do: Programming by demonstration

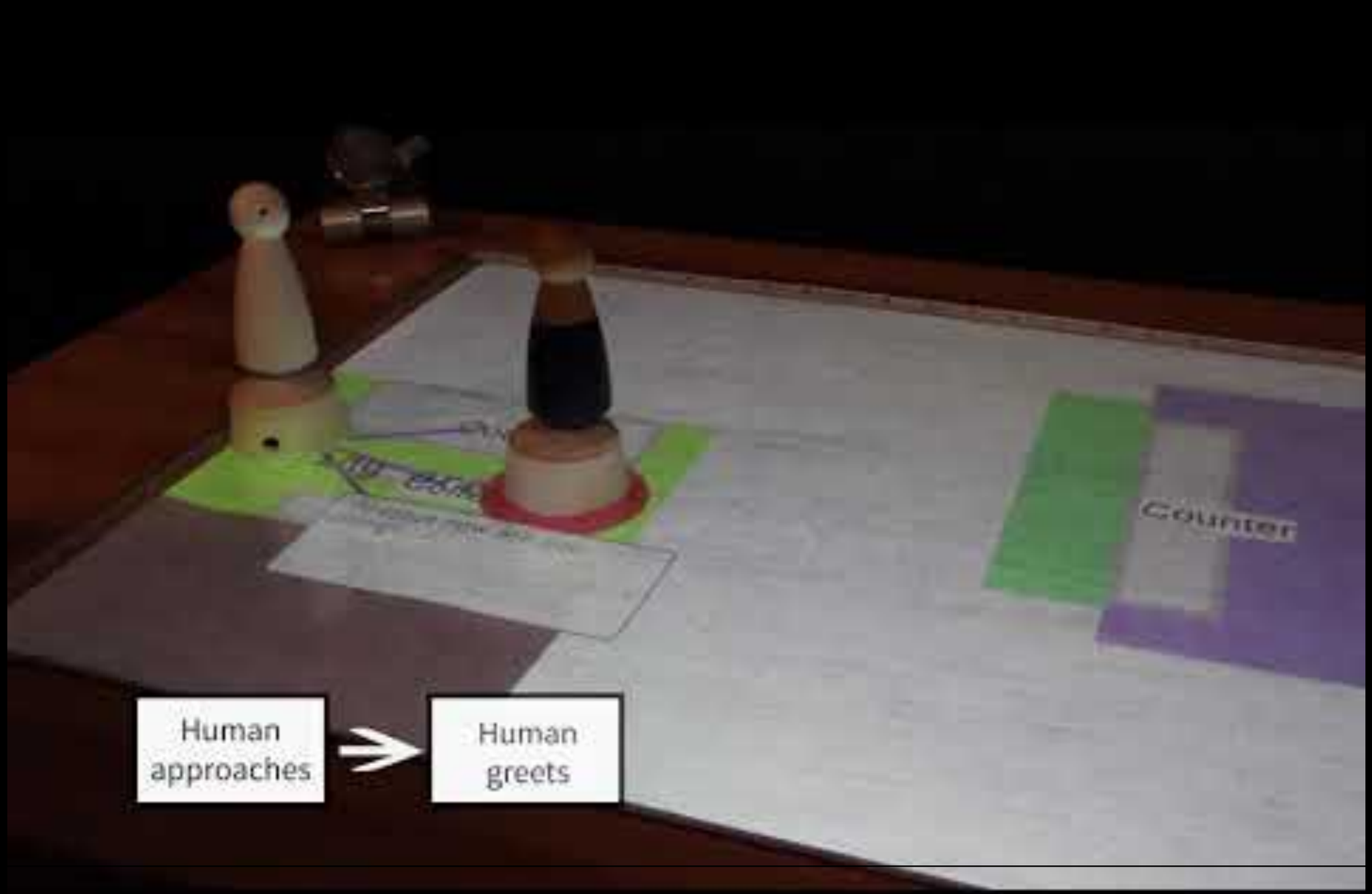
What are some examples?[11]





[11] Sources: Right, Left


Microphone


Counter
Human approaches
Human greets

Sloppy programming[13]

Definition: The essence of sloppy programming is that the user should be able to enter something simple and natural, like a few keywords, and the computer should try everything within its power to interpret and make sense of this input.

An example

User types "left margin 2 inches" in a sloppy command-line interface for Microsoft Word

```
ActiveDocument.PageSetup.LeftMargin = InchesToPoints(2)
```

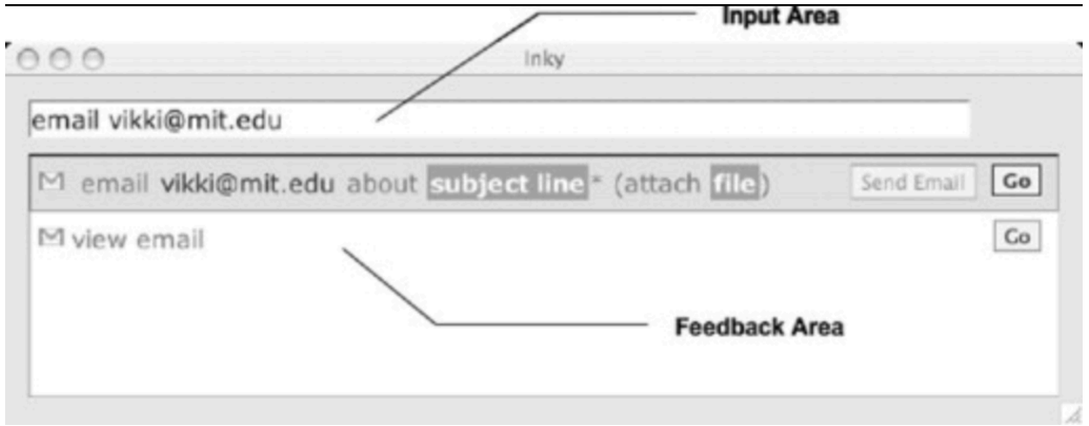
[13] Little et al., 2010, Sloppy programming

What are the benefits of this approach?

1. No punctuation or grammar requirements; the user can be *sloppy*
2. No requirement to follow particular syntax or method (`InchesToPoints()`) invocation
3. No need to know property names (`LeftMargin`) or which object (`ActiveDocument`) the property belongs to
4. The use of pure text is intuitive, universal, and very easy to use

Sloppy web command-line interface[14]

Inky[15]



[14] Little & Miller, 2006

[15] Miller et al., 2008

Discussion Format

- Group discussion ~15 minutes
  - Separate to 9 groups randomly
  - Discuss with your group members
  - Take notes in the shared doc– pick your group number
- Summary from each group & discussion ~15 minutes

Discussion Questions

- What authoring/end-user programming tools do you use?
- What are strengths and weaknesses of this approach?
- What are opportunities and challenges do you see in this space?
- What external resources did you find?