

COMS W4170

Programming by Demonstration

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November 20, 2018

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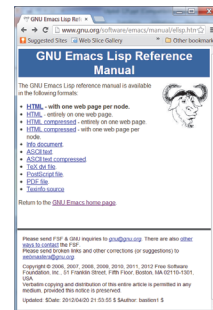
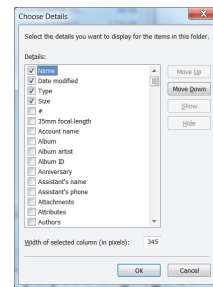
End User Programming

- Customization of application performance by *end users*: regular (typically “non programmer”) users
- Emphasis on application behavior that is conventionally accomplished by programming new or modified “commands”

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End User Programming Approaches

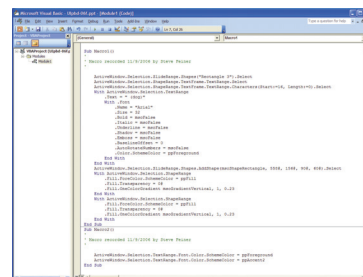
- Preferences
 - User chooses among alternative behaviors
 - Choices are limited and predefined
 - Often used for defining layout (e.g., windows in an IDE)
- Scripting languages
 - User writes code in special-purpose language customized for the application (e.g., shell script, elisp)
 - User needs to program



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End User Programming Approaches

- Macro recorders
 - User turns on macro recording, interacts with the application, and stops recording
 - System records interactions and makes it possible to reexecute them (e.g., GNU Emacs macros, Microsoft Visual Basic macros)
 - Too literal: Use exact/relative positions, keystrokes
 - Generalizing or fixing macros requires "real" programming



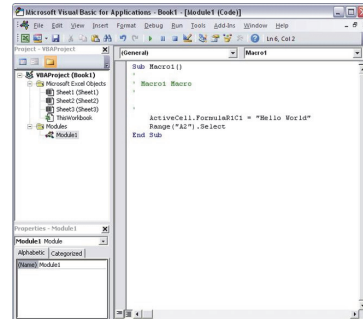
"The Visual Basic Editor is a program designed to make writing and editing macro code easy for beginners, and provides plenty of online Help. You don't have to learn how to program or use the Visual Basic language to make simple changes to your macros."

—Microsoft Office 2003 Help

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- Programming by demonstration
 - Generalizes macro recorders
 - www.acypher.com/wwid



“Before you begin a VBA project, ensure that you have the time to work with VBA. Programming requires focus and can be unpredictable. Especially as a beginner, never turn to programming unless you have time to work carefully. Trying to write a ‘quick script’ to solve a problem when a deadline looms can result in a very stressful situation. If you are in a rush, you might want to use conventional methods, even if they are monotonous and repetitive.”

—Getting Started with VBA in Office, 6/7/2017

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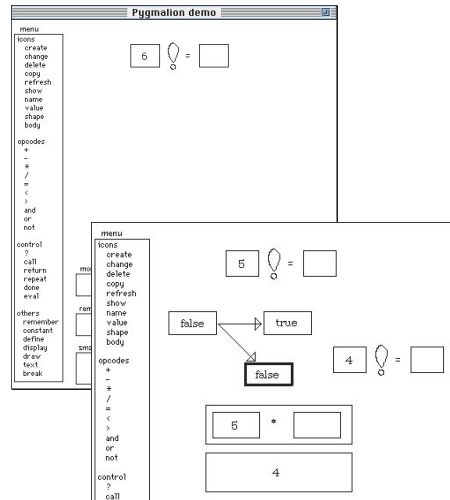
Programming by Demonstration Terminology

- *PBE: Programming by example* (AKA *Example-based programming*)
 - User provides one or more concrete examples of the behavior or effect of a more general program
 - System *infers* intent
- *PBD: Programming by demonstration*—D.C. Smith (AKA *Demonstrational programming*—B. Myers)
 - PBE in which the user demonstrates actions on example data (although PBD and PBE are often used interchangeably)
- *PITUI: Programming in the User Interface*—D. Halbert
 - PBD, emphasizing the use of existing UI commands
- *Inferencing*
 - Determining appropriate generalizations from examples

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Pygmalion D.C. Smith, 1975

- Introduced icons to computer UIs
- First PBD system
- Designed to work as “blackboard”
- *Programmer* demonstrates algorithm with an example
- No inferencing
- Many relationships not visible

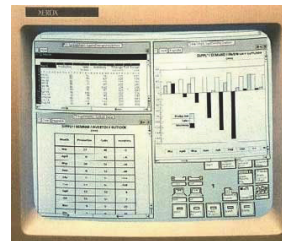


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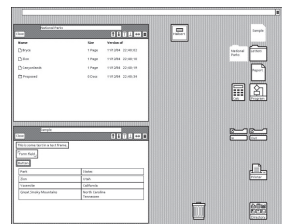
SmallStar 84 D. Halbert

<https://danhalbert.org/pbe.mp4>

- Reimplementation of Xerox Star subset to support PBD of desktop operations
- Approach
 - *User* performs a specific set of tasks
 - *System* records tasks to create a program (at this point, a macro)
 - *System* determines *data description* of any object selected by user (picks one arbitrarily if ambiguous), reuses it throughout program (i.e., no inferencing)
 - *User* can view data description of any object with “properties”
 - *User* must edit program to
 - Modify data descriptions, including generalization
 - Create flow of control

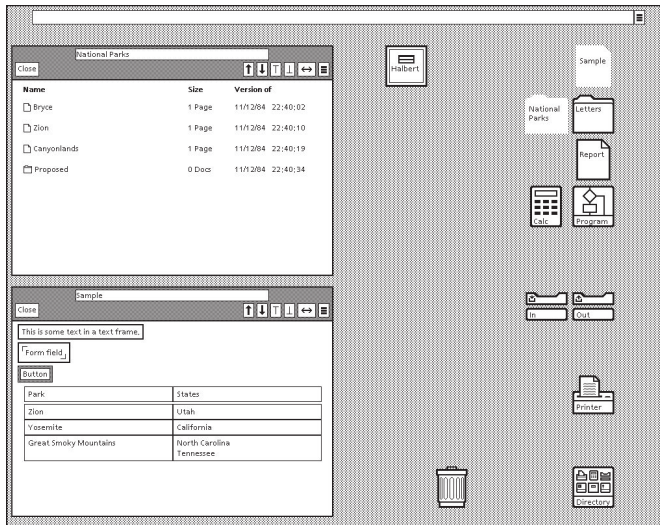


(Xerox Star icons created by DC Smith)



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SmallStar 84 D. Halbert



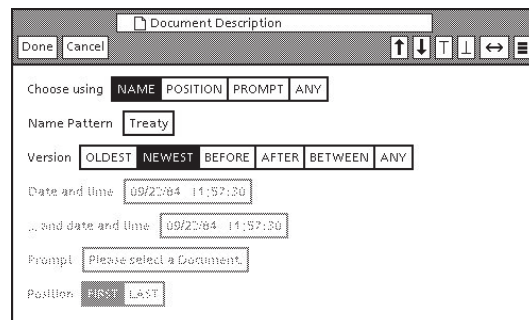
SmallStar desktop

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SmallStar 84 D. Halbert



Program to move
named document
"Treaty"



User selects
"Treaty" in the
program and
presses
"Properties" key
to display or
modify...

Document data
description sheet
for "Treaty"

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SmallStar 84 D. Halbert



Program to move
first document



Program to move
any document

- Editing data descriptions is used as a substitute for inferencing from multiple examples

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SmallStar 84 D. Halbert



Adding set
iteration loop by
selecting line(s) and
choosing "Repeat"
from popup menu



Create program to
move all files by
copying
"Negotiations any"
to "everything
matching" descriptor

- Editing programs is used to create flow of control

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SmallStar 84 D. Halbert

Mailing form

Mailing form program with unconditional conversion to first class

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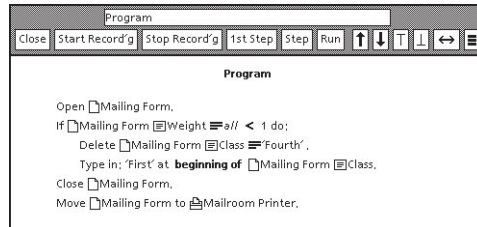
SmallStar 84 D. Halbert

Mailing form program with conditional template

Property sheet for conditional testing weight

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SmallStar 84 D. Halbert



Mailing form
program with
conversion to
first class
conditional
on weight