

# CS 535 Object-Oriented Programming & Design

## Spring Semester, 2003

### Doc 1 Introduction

### Contents

Introduction .....	2
Learning Smalltalk .....	7
VisualWorks .....	12
Starting VisualWorks .....	13
Some VisualWorks Environment .....	17
Windows on Startup .....	18
Examples.....	21
Using the Transcript .....	23
Exiting from VisualWorks .....	24
Some Text Editing Short Cuts .....	25

### References

VisualWorks Application Developer's Guide, doc/vwadg.pdf in the VisualWorks installation. Chapter 1 The VisualWorks Environment.

Smalltalk Best Practice Patterns, Kent Beck

Object-Oriented Design Heuristics, Arthur Riel

Software Productivity Research, Inc. ([www.spr.com](http://www.spr.com))

2003 SDSU & Roger Whitney, 5500 Campanile Drive, San Diego, CA 92182-7700 USA.  
OpenContent (<http://www.opencontent.org/opl.shtml>) license defines the copyright on this document.

# Introduction

## Goal

Understand how to use classes & objects in code

Syntax of language is easy

How to create code that is:

- Understandable
- Modifiable
- Maintainable
- Reusable

## **Main Idea in Object-Oriented Programming**

Related data and operations belong together

### **Design Heuristic 3.3**

Beware of classes with many public accessor methods

Many accessors indicate that related data and behavior are not being kept in one place

## **Kent Beck's Indicators of Good Style**

### **Once and only once**

Don't repeat

- Logic
- Methods

### **Lots of little pieces**

### **Rates of change**

Don't put two rates of change together

Don't mix variables that change hourly with those that change monthly

## Why Smalltalk

- Best language to learn object-oriented thinking
- Productivity Gains

### Software Productivity Research Study

Language	Lines of code/function point
Smalltalk	21
Ada 95	49
Java	53
C++	53
COBOL	107
C	128

## **Why Smalltalk**

- Experience with dynamic typed language
- Reading Code
- Tool Support in software development

## Learning Smalltalk

- Smalltalk language syntax

While Smalltalk syntax is simple it is not like C/C++/Java

- Smalltalk Programming Environment

Requires more effort to learn at first, but worth the effort

- Smalltalk Class Library

Smalltalk has a large library of useful code

Don't code without it

- Object-oriented thinking

This is the hardest part

- Smalltalk culture

Smalltalker's have standard ways to code & solve problems

See Smalltalk Best Practice Patterns by Kent Beck

## Some History

1967 Simula-67

Language developed in Norway for simulations

Use classes and objects

Late 1960's Alan Kay – Father of Personal Computer

Kay Ph. D. thesis addresses the question:

How will we interact with notebook size computers?

Dynabook

1970-80 Xerox Parc

Alan Kay, Dan Ingalls, Ted Kaehler and others work on Smalltalk

Small – Originally for children

talk - Code is to communicate

## **Smalltalk Influences**

Object-Oriented Programming

GUI

Macintosh

Windows

Refactoring

Extreme Programming

## **Versions of Smalltalk**

VisualWorks

VisualAge for Smalltalk

Squeak

Dolphin  
Smalltalk MT

Smalltalk X

Smallscript (.NET Smalltalk)

PocketSmalltalk

## Smalltalk & Bytecode

Smalltalk is compiled to a bytecode for a virtual machine

Bytecode is same on all machines

VisualWorks has VM's for:

- Windows
- Macintosh
- Unix

VisualWork's virtual machine (VM) uses a JIT to compile bytecodes

Just-in-time compilers (JIT)

- Compile bytecode to native machine code

- Cache the native machine code

- Run the native machine code

- Usually runs faster than interpreting bytecode

Smalltalk started using just-in-time compilers in early 1980s

## **VisualWorks Parts of VisualWorks**

Executable Virtual Machine (visual, visual.exe)

This is the VM that interprets Smalltalk bytecode

visual.sou

Source code for most of class library

visual.cha

Source code for changes & new classes

Does not exist until after you first use VisualWorks

visual.im

Bytecode of sources that are executed

At first the image will appear to be an IDE for Smalltalk

parcels

Code bundles

## **Starting VisualWorks**

See the class wiki for instructions on downloading VW 5i4

### **Before Starting VisualWorks**

Before you start VisualWorks make a copy of visual.im

You will need it later

### **Starting VisualWorks on Windows**

#### Method 1

Drag and drop the image file on the Visual application or visual.exe

#### Method 2

Double click on the image file

The first time you do this you may get a dialog asking for the application to run the image. Select visual. You will have to find it first. It is in the bin directory.

## **Starting VisualWorks on Macintosh**

### Method 1

Drag and drop the image file on the visual application

### Method 2

Double click on the image file

## Starting VisualWorks on UNIX

Type:

visual imageFilename &

where you need to replace imageFilename with the actual name of the image file you wish to run

Your path has to be set to include the program visual

## VisualWorks on Rohan

Image requires ~9MegBytes of disk space

Copy `/opt/smalltalk/vw7nc/image/visualnc.im` to a local directory

Change permissions so you have write permission on the local copy

Set the VISUALWORK environment variable

```
setenv VISUALWORKS /opt/smalltalk/vw7nc (csh or tcsh)
```

```
set VISUALWORKS='/opt/smalltalk/vw7nc' (sh)
```

Add the following to you path

```
/opt/smalltalk/vw7nc/bin/solaris
```

To start the image:

```
visual imageName
```

## Some VisualWorks Environment

VisualWorks uses three logical buttons

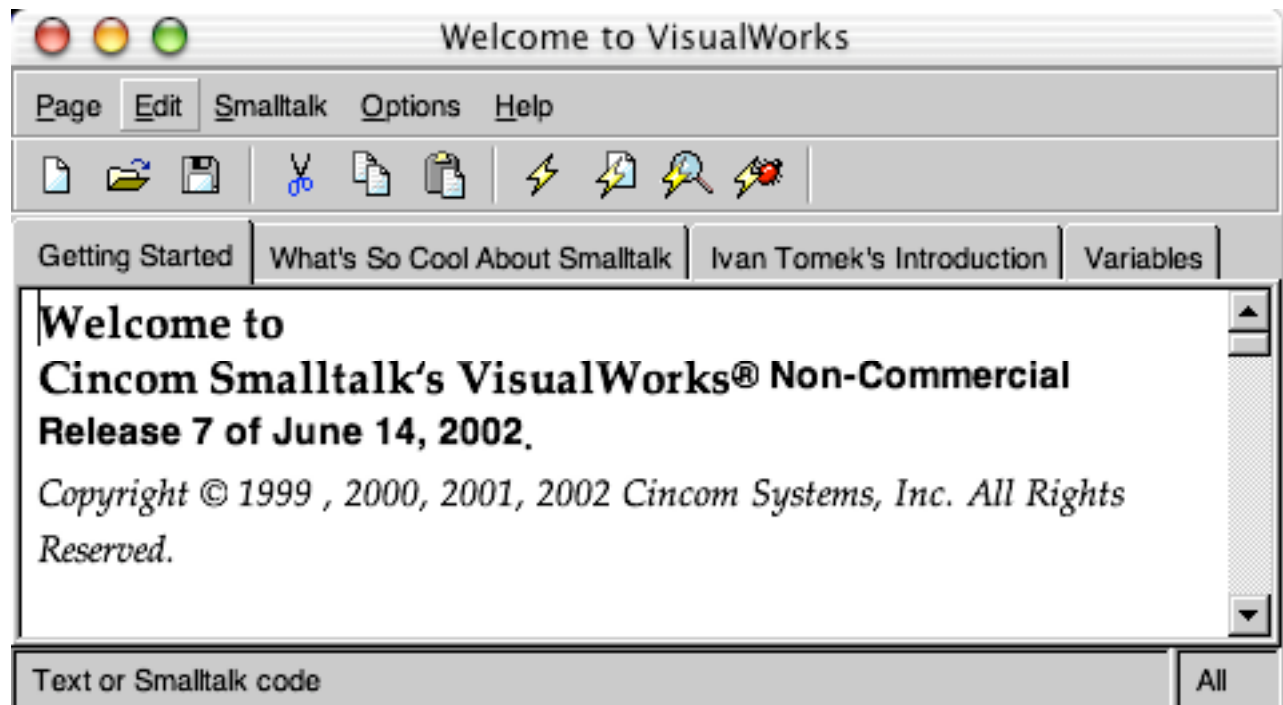
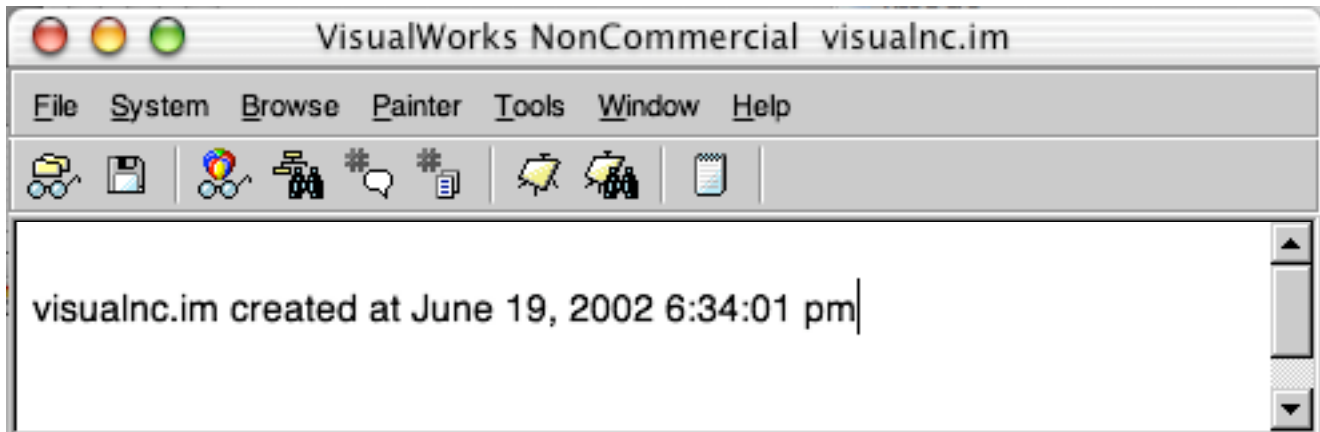
- **Select** button  
Selects objects and text
- **Operate** button  
Opens a menu with context-sensitive commands
- **Window** button  
Opens a menu with window commands

### Mapping Logical to Physical Mouse Buttons

	3-Button	2-Button	1-Button
Select	Left button	Left Button	Button
Operate	Right button	Right button	Ctrl+Button
Window	Middle button	Ctrl+Left button	command+Button

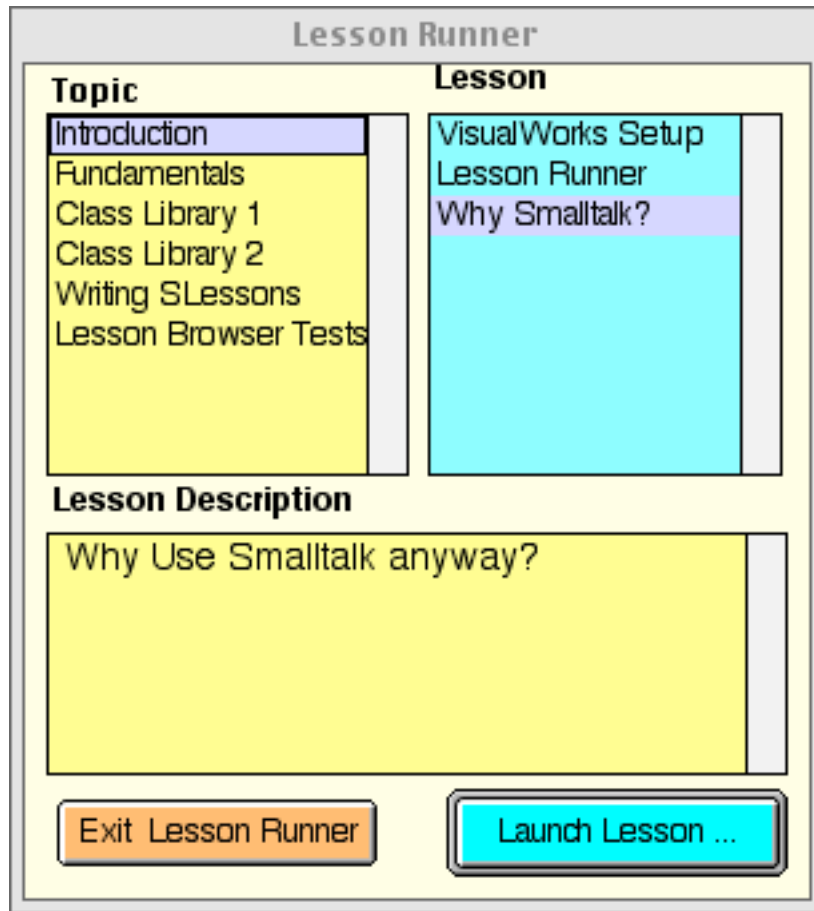
You should perform the action described in the next few pages. One learns what one does.

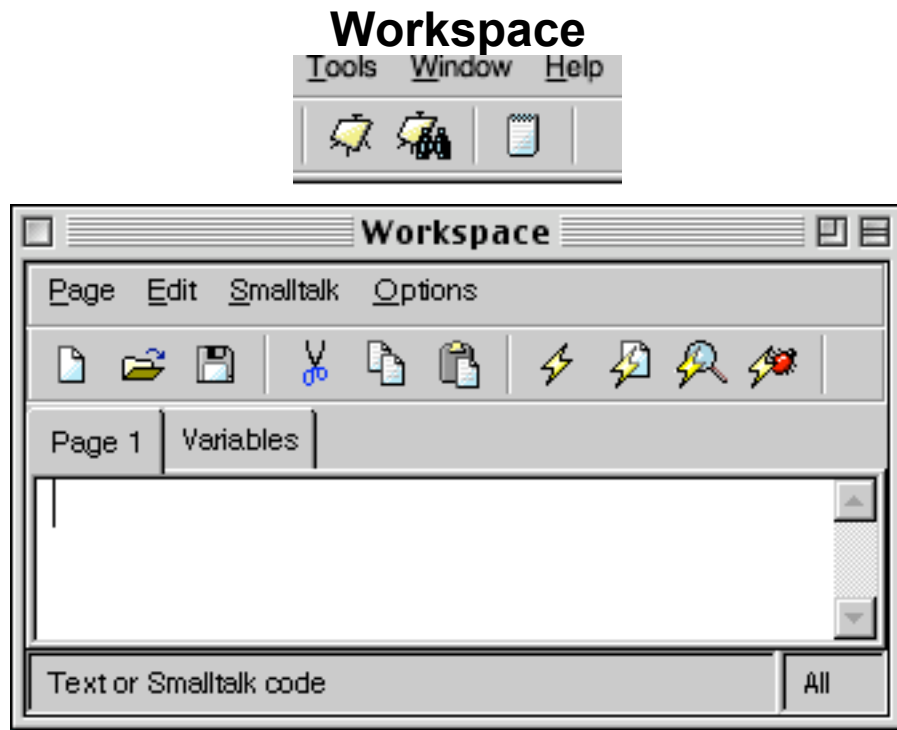
## Windows on Startup Launcher



Ivan Tomek's Introduction is a good way to start to learn about Smalltalk

# Lesson Runner





Do it (ctrl-d)

Compile and execute the selected code



Print it (ctrl-p)

Same as "do it" but also prints the result of running the code



Inspect it (ctrl-i)

Same as "do it" but also opens an inspector window on the result of running the code

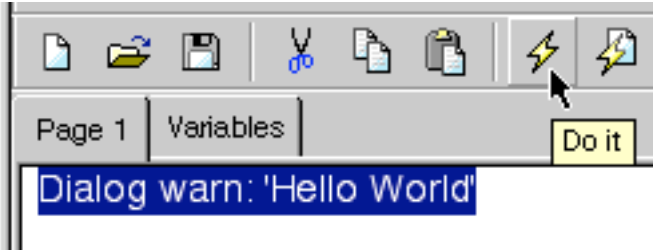


Debug it (ctrl-d)

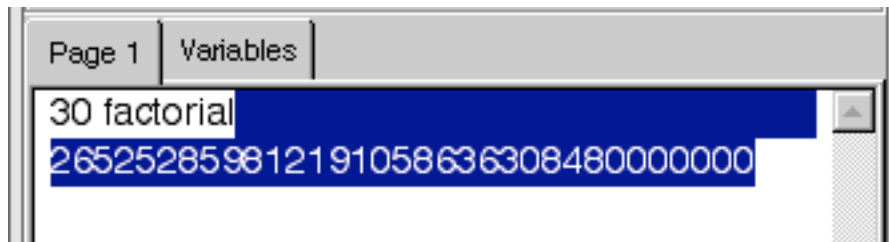
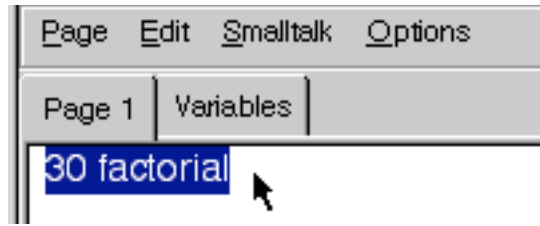
Opens the debugger to allow you to step through the selected code. We will cover the debugger later.

# Examples

## Do it

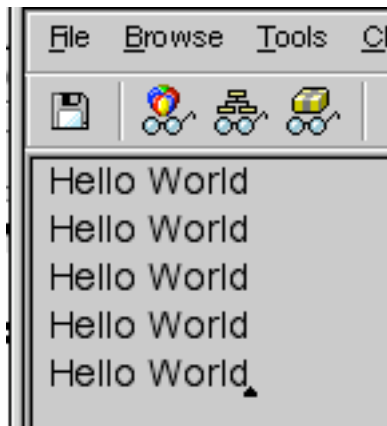


# Print it

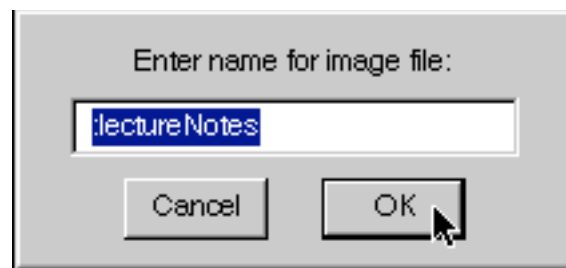
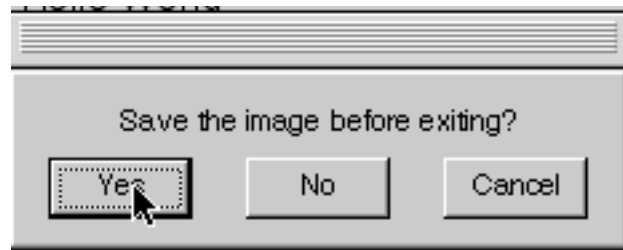
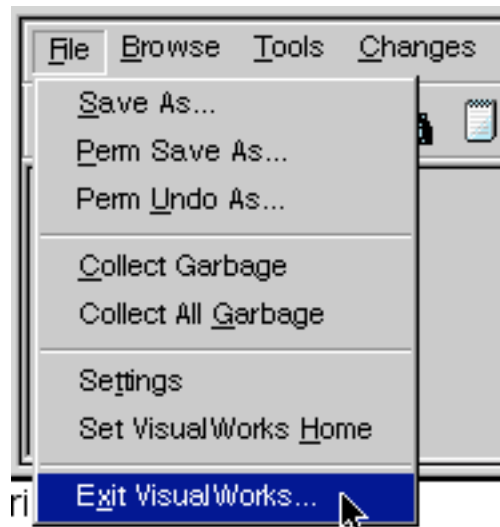


# Using the Transcript

```
Page 1 | Variables |
5 timesRepeat:
  [Transcript
   show: 'Hello World';
   cr]
```



## Exiting from VisualWorks



## Some Text Editing Short Cuts

### Selection shortcuts (double click)

To select text, use the following double-click shortcuts.

Double-click at start or end of a window to select all text in the window.

Double-click at start of line to select the line. Does not work on the first line.

Double-click at end of line to select the line. Does not work on the last line.

Double-click just after an opening (or just before the closing) of ' or [ or ( or " selects all text surrounded by the symbols.

Double-click inside a word or selector to select the word or selector.

### Ctrl keys

Press at the same time the control key and the second key to:

<Ctrl> f inserts ifFalse: into the text.

<Ctrl> t inserts ifTrue: into the text.

<Ctrl> g inserts := into the text.

<Ctrl> d inserts today's date into the text.

<Ctrl> s (search or find) finds the next instance of the string in your copy buffer (last copied or cut string)

<Ctrl> e (replace) opens a replace dialog

<Ctrl> a (find) opens a find dialog

<Ctrl> c is equivalent to Copy,

<Ctrl> z will Undo the most recent text change,

<Ctrl> v is equivalent to Paste

### ESC keys

Press and release the ESC key then press the second key to:

ESC b changes the selected text to bold.

ESC i changes the selected text to italic.

ESC u underlines the selected text.

When the letter is uppercase (B, I, U), the effect is reversed: ESC U removes underline, etc.

ESC + increases the font size of the selected text

ESC - decreases font size of the selected text

ESC followed by < or ' or " or [ or ( adds surrounding < ' " [ ( to the selected text.

ESC followed by <tab> selects the text just typed in

ESC x removes style changes to current selection and returns to default font.