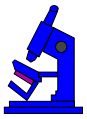
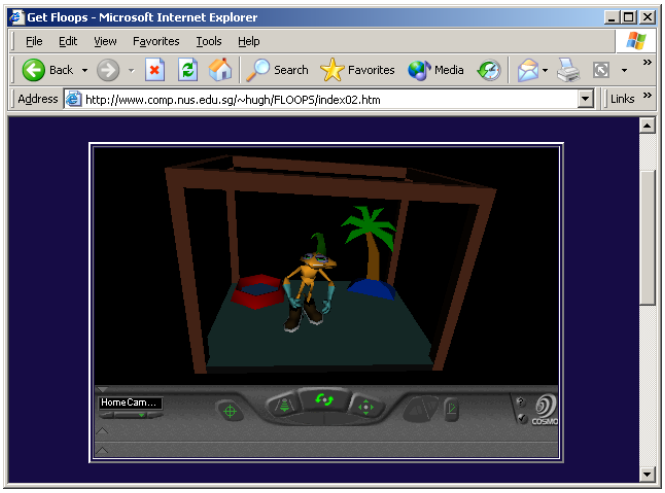
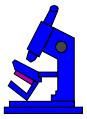



Chapter 12

Blending...


FLOOPS



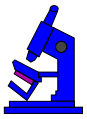


Blending languages

- ✔ SWIG - Simplified Wrapper and Interface Generator
- ✔ S/W tool that connects C and C++ with scripting languages
- ✔ Generates wrapper code that scripting languages use to access C/C++.
  - ✔ Perl, Python, Tcl/Tk, Ruby, Java, OCAML, C# ...

Today though...

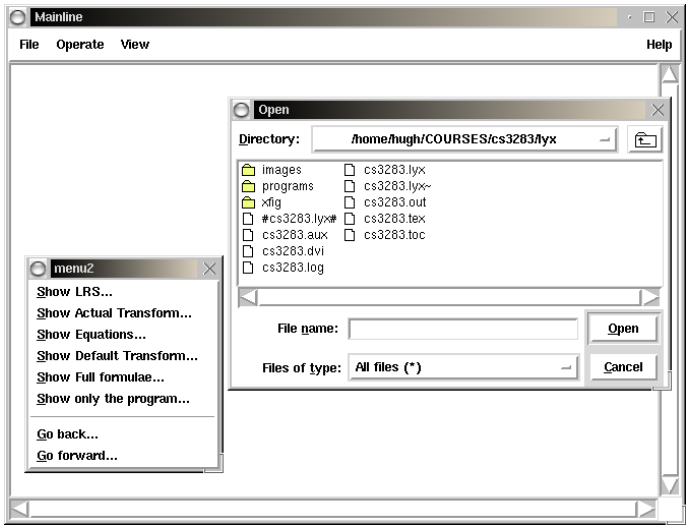
- ✔ Perl and Tk
- ✔ C and Tk
- ✔ VRML and Java
- ✔ Java and Tk

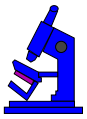


Perl and Tk

- ✔ Have to install the Tk module for perl
- ✔ Download Tk-804.026.tar.gz, and then
  - ✔ perl Makefile.pl XFT=1
  - ✔ make
  - ✔ make install

GUI





Perl/Tk code

Perl has a Tk module:

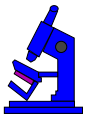
CODE LISTING **mainline.pl**

```
use Tk;
my $currentslice = 0;
my $currentpp    = 0;
my $disptype     = 2;
my $main = new MainWindow;

<<SetupMenu>>
<<SetupFileMenu>>
<<SetupEditMenu>>
<<SetupViewMenu>>

$main->configure(-menu =>$menubar);

<<SetupScrolledMainArea>>

MainLoop;

<<FileOpenDialogBox>>
```


Menu bar

CODE LISTING **SetupMenu.pl**

```
$menubar = $main->Menu;
$filemenu = $menubar->cascade(-label=>"File" );
$editmenu = $menubar->cascade(-label=>"Operate" );
$viewmenu = $menubar->cascade(-label=>"View" );
$helpmenu = $menubar->cascade(-label=>"Help");
$helpmenu->command(-command => \&about_choice,
                   -label => "About TkMenu...",
                   -underline => 0);
```




Menu items

CODE LISTING **SetUpFileMenu.pl**

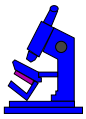
```
$filemenu->command(-command => sub { fileDialog( $main, 'open' );
                                     printf "Opening $thisfile\n";
                                     readfile($thisfile);
                                     writefile($thisfile . ".ppx");},
                   -label => "Open...",
                   -underline => 0);
$filemenu->separator;
$filemenu->command(-label => "Exit",
                   -command => \&exit_choice,
                   -underline => 1);
```



Edit menu

CODE LISTING **SetUpEditMenu.pl**

```
$editmenu->command(-command => sub {Tp($currentslice,1,1);},
                   -label => "Crank with widening...",
                   -underline => 0);
$editmenu->command(-command => sub {Tp($currentslice,1,10);},
                   -label => "Crank with widening (10X)...",
                   -underline => 0);
$editmenu->command(-command => sub {Tp($currentslice,0,1);},
                   -label => "Crank...",
                   -underline => 0);
$editmenu->command(-command => sub {Tp($currentslice,0,10);},
                   -label => "Crank (10X)...",
                   -underline => 0);
$editmenu->command(-command => sub {Cousot($currentslice);},
                   -label => "Cousot...",
                   -underline => 0);
$editmenu->separator;
$editmenu->command(-command => sub {widening($currentslice);},
                   -label => "Widen...",
                   -underline => 0);
```




View menu

CODE LISTING **SetUpViewMenu.pl**

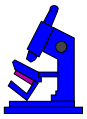
```
$viewmenu->command(-command => sub {$disptype=0;display($currentslice,0);},
                   -label => "Show LRS...",
                   -underline => 0);
$viewmenu->command(-command => sub {$disptype=1;display($currentslice,1);},
                   -label => "Show Actual Transform...",
                   -underline => 0);
$viewmenu->command(-command => sub {$disptype=2;display($currentslice,2);},
                   -label => "Show Equations...",
                   -underline => 0);
$viewmenu->command(-command => sub {$disptype=3;display($currentslice,3);},
                   -label => "Show Default Transform...",
                   -underline => 0);
$viewmenu->command(-command => sub {$disptype=4;display($currentslice,4);},
                   -label => "Show Full formulae...",
                   -underline => 0);
$viewmenu->command(-command => sub {$disptype=5;display($currentslice,5);},
                   -label => "Show only the program...",
                   -underline => 0);
$viewmenu->separator;
$viewmenu->command(-command => sub { if ($currentslice>0) {
                                        $currentslice=$currentslice-1;
                                        if ($currentpp==0) {
                                           $currentpp=$codesize;
                                        }
                                        $currentpp=$currentpp-1;
                                        display($currentslice,$disptype);
                                   }},
                   -label => "Go back...",
                   -underline => 0);
$viewmenu->command(-command => sub { if ($currentslice+1<$maxslice){
                                        $currentslice=$currentslice+1;
                                        $currentpp=$currentpp+1;
                                        if ($currentpp==$codesize) {
                                           $currentpp=0;
                                        }
                                        display($currentslice,$disptype);
                                   }},
                   -label => "Go forward...",
                   -underline => 0);
```



Dialog box

CODE LISTING **FileOpenDialogBox.pl**

```
sub exit_choice {
   exit;
}

sub fileDialog {
   my $w = shift;
   my $operation = shift;
   my $types; my $file;
   @types = (["Code files", '.pp'],
             ["Work files", '.ppx'],
             ["All files", '*'] );
   $file = $w->getOpenFile(-filetypes => \@types);
   if (defined $file and $file ne '') {
      $thisfile = $file;
   }
}
```



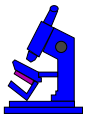
Code

http://www.comp.nus.edu.sg/~cs3283/ftp/original.pl

It may be run by typing "**perl original.pl**".

C and Tk

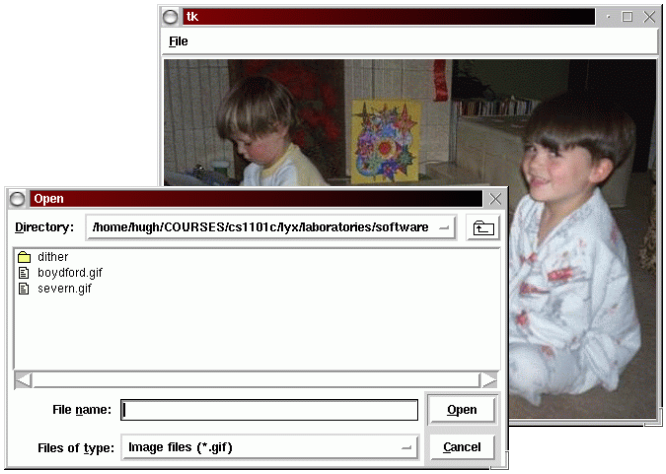
- ✔ There are various ways...
  - ✔ Call C within Tk
  - ✔ Call Tk within C
  - ✔ Communication

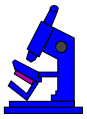


C and Tk

- ✔ This one is a C program
- ✔ It loads and runs a Tk program along with its interpreter.
- ✔ Tk in turn can call-back C procedures if needed

Viewer





C and Tk

CODE LISTING **CplusTclTk.c**

```
#include <stdio.h>
#include <tcl.h>
#include <tk.h>

char tclprog[] = "\
        proc fileDialog {w} {\
          set types {\
            { \"Image files\" {.gif} }\
            { \"All files\" *}\
          };\
          set file [tk_getOpenFile -filetypes $types -parent $w];\
          image create photo picture -file $file;\
          set glb_tx [image width picture];\
          set glb_ty [image height picture];\
          .c configure -width $glb_tx -height $glb_ty;\
          .c create image 1 1 -anchor nw -image picture -tags \"myimage\";\
        };\
        frame .mbar -relief raised -bd 2;\
        frame .dummy -width 10c -height 0;\
        pack .mbar .dummy -side top -fill x;\
        menubutton .mbar.file -text File -underline 0 -menu .mbar.file.menu;\
        menu .mbar.file.menu -tearoff 1;\
        .mbar.file.menu add command -label \"Open...\" -command \"fileDialog .\";\
        .mbar.file.menu add separator;\
        .mbar.file.menu add command -label \"Quit\" -command \"destroy .\";\
        pack .mbar.file -side left;\
        canvas .c -bd 2 -relief raised;\
        pack .c -side top -expand yes -fill x;\
        bind . <Control-c> {destroy .};\
        bind . <Control-q> {destroy .};\
        focus .mbar";

int
main (argc, argv)
     int argc;
     char **argv;
{
     Tk_Window mainWindow;
     Tcl_Interp *tcl_interp;

     setenv ("TCL_LIBRARY", "/cygnus/cygwin-b20/share/tcl8.0");
     tcl_interp = Tcl_CreateInterp ();
     if (Tcl_Init (tcl_interp) != TCL_OK || Tk_Init (tcl_interp) != TCL_OK) {
          if (*tcl_interp->result)
               (void) fprintf (stderr, "%s: %s\n", argv[0], tcl_interp->result);
          exit (1);
     }
     mainWindow = Tk_MainWindow (tcl_interp);
     if (mainWindow == NULL) {
          fprintf (stderr, "%s\n", tcl_interp->result);
          exit (1);
     }
     Tcl_Eval (tcl_interp, tclprog);
     Tk_MainLoop ();

     exit (1);
}
```

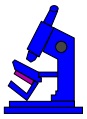

Compilation

On a Win32 system, we compile this as:

```
gcc -o myexe CplusTclTk.c -mwindows -ltcl80 -ltk80
```

On a UNIX system we use:

```
gcc -o myexe CplusTclTk.c -ltk -ltcl -lX11 -lm -ldl
```



VRML and Java

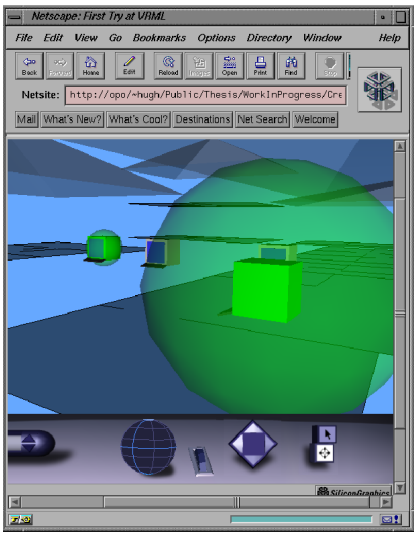
VRML is a scene description language

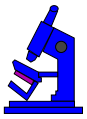
> *"The EAI allows you to control the contents of a VRML browser window embedded in a web page from a Java (tm) applet on the same page."*

http://www.frontiernet.net/~imaging/eaifaq.html

(People poser and Tiny3D are OK but there are problems...)

VRML and Java3DVNT





VRML software

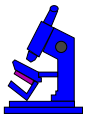
CODE LISTING **defaulthtml.txt** Page 1/1

```
<html> <head> <title>Sample 3DVNT Page</title> </head>
<center><H1>Sample 3DVNT Page </H1></center>
<center> <embed src="root.wrl" height="600" width="700"> </center>
<center> <applet code="View1.class" width="100" height="10" mayscript>
<PARAM name="segment" value="MACS"> <PARAM name="port" value="9876">
<PARAM name="host" value="opo.usp.ac.fj"> </applet> </center>
OK?
</html>
```


The *root.wrl* file

CODE LISTING **root.wrl** Page 1/1

```
PROTO CLUSTER  [] { ... }     # Cluster definition
PROTO KEYBOARD [] { ... }     # Keyboard definition
PROTO SCREEN   [] { ... }     # Screen definition
PROTO GLOBE    [] { ... }     # Traffic sphere definition
# Some setting up declarations
Background { skyColor .4 .66 1 }
NavigationInfo { type [ "EXAMINE", "ANY" ] speed 400 }
Viewpoint { position 0 400 0 orientation 0 1 0 4 description "Camera 1" }
# Lines, floors and roofs
DEF LINES  Transform { ... }
DEF FLOORS Transform { ... }
DEF ROOFS  Transform { ... }
# and then the nodes
DEF node1  Transform { ... }
DEF node2  Transform { ... }
# ... and so on ...
```



VRML nodes

CODE LISTING **node.wrl** Page 1/1

```
DEF node1 Transform {
   translation 4350 150 4365
   rotation 0 1 0 4.71238
   children [
      KEYBOARD {}
      SCREEN {}
      DEF node1box Transform {
         children [
            Shape {
               appearance Appearance {
                  material DEF node1boxcolor Material {
                     diffuseColor 0.8 0.8 0.8
                  }
               }
               geometry Box { size 50 50 50 }
            }
         ]
      }
      DEF node1sphere Transform {
         scale 1 1 1
         children [
            Shape {
               appearance GLOBE {}
               geometry Sphere { radius 1 }
            }
         ]
      }
   ]
}
```


Java

The java software maintains a link to a remote data collector,
Uses the EAI to modify the images in the VRML view.

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Mar 05, 99 11:51 **View1.java** Page 1/3

```
// using the VRML External Interface.

import java.applet.*;
import java.awt.*;
import java.util.*;
import vrml.external.field.*;
import vrml.external.exception.*;
import vrml.external.Node;
import vrml.external.Browser;
import java.io.*;
import java.net.*;

public class View1 extends Applet {
// public static final int DEFAULT_PORT = 9877;
  Browser browser;
  Socket s = null;
  DataInputStream in = null;
  String line;

  public void init() {
    System.out.println("Test.init()...");
  }
  void SocketStart () throws java.io.IOException {
    String port = this.getParameter("port");
    int p = Integer.parseInt(port);
    try {
      String host = getCodeBase().getHost();
      System.out.println("Request came from: " + host);
      s = new Socket(host, p);
    }
    catch (UnknownHostException e) {
      System.out.println("No socket: " + e);
    }
  }
  public void start() {
    int count=0;
    Node node2sphere=null;
    Node appear=null;
    EventInSFVec3f[] scalein=new EventInSFVec3f[100] ;
    EventInSFColor[] appears=new EventInSFColor[100] ;
    float[] val = new float[3];
    int[] lastval  = new int[100];
    int n;
    String id,vl;

    while (count != 100) {
        scalein[count] = null;
        appears[count] = null;
        lastval[count] = 0;
        count=count+1;
    }
    try {
      SocketStart();
    }
    catch (java.io.IOException e) {
      System.out.println("No socket: " + e);
    }

    System.out.println("Test.start()...");
    browser = (Browser) vrml.external.Browser.getBrowser(this);
    System.out.println("Got the browser: " + browser);

    count = 0;
        try {
          in = new DataInputStream(s.getInputStream());
```

Thursday August 26, 1999 1/3

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Mar 05, 99 11:51 **View1.java** Page 2/3

```
            while(true) {
                line = in.readLine();
                if (line == null) {
                  System.out.println("Server closed connection.");
                  break;
                }
                if (line.regionMatches(0,"n",0,1)) {
                n = line.indexOf(32,2);
                id = line.substring(2,n);
//                System.out.println("===="+id+"<<<");
                vl= line.substring(n+1);
//                System.out.println("+++"+vl+"---");
                Integer a = Integer.valueOf(id);
                Integer b = Integer.valueOf(vl);
                if (scalein[a.intValue()]==null) {
                    try {
                      node2sphere = browser.getNode("node"+id+"sphere");
                      System.out.println("Got the sphere node: " + node2sphere);
                    }
                    catch (InvalidNodeException e) {
                      System.out.println("PROBLEMS! node2sphere: " + e);
                    }
                    try {
                      scalein[a.intValue()] = (EventInSFVec3f) node2sphere.ge
tEventIn("scale");
                      System.out.println("Got the sphere scale node: " + appears[a.in
tValue()]);
                    }
                    catch (InvalidNodeException e) {
                      System.out.println("PROBLEMS! (scalein): " + e);
                    }
                    try {
                      appear = browser.getNode("node"+id+"boxcolor");
                      System.out.println("Got the Boxcolor node: " + appear);
                    }
                    catch (InvalidNodeException e) {
                      System.out.println("PROBLEMS! appearance: " + e);
                    }
                    try {
                      appears[a.intValue()] = (EventInSFColor) appear.getEven
tIn("set_diffuseColor");
                      System.out.println("Got the Boxcolor color node: " + appears[a.i
ntValue()]);
                    }
                    catch (InvalidNodeException e) {
                      System.out.println("PROBLEMS! appearance color: " + e);
                    }
                }
                if (b.intValue()==-1){
                   val[0] = (float)1.0;
                   val[1] = (float)1.0;
                   val[2] = (float)1.0;
                } else {
                   val[0] = (float)(b.intValue()*20)+1;
                   val[1] = (float)(b.intValue()*20)+1;
                   val[2] = (float)(b.intValue()*20)+1;
                }
                scalein[a.intValue()].setValue(val);

                if ((b.intValue()==0) |=(lastval[a.intValue()]==0)) {
                    if (b.intValue()==0) {
                       val[0] = (float)0.8;
                       val[1] = (float)0.8;
                       val[2] = (float)0.8;
                       appears[a.intValue()].setValue(val);
```

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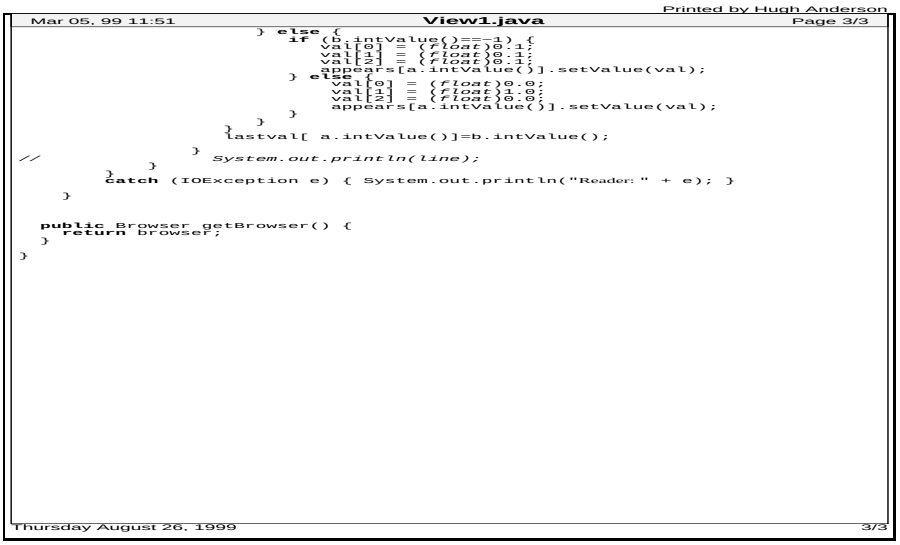
Java 3



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Mar 05, 99 11:51 **View1.java** Page 3/3

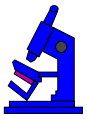
```
                        } else {
                            if (b.intValue()==-1) {
                                val[0] = (float)0.1;
                                val[1] = (float)0.1;
                                val[2] = (float)0.1;
                                appears[a.intValue()].setValue(val);
                            } else {
                                val[0] = (float)0.0;
                                val[1] = (float)1.0;
                                val[2] = (float)0.0;
                                appears[a.intValue()].setValue(val);
                            }
                        }
                        lastval[ a.intValue()]=b.intValue();
                    }
//                  System.out.println(line);
                }
            }
            catch (IOException e) { System.out.println("Reader: " + e); }
        }

      public Browser getBrowser() {
        return browser;
      }
}
```

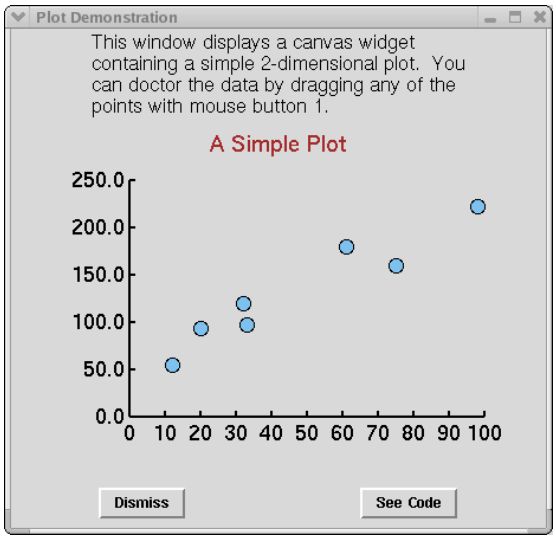
Thursday August 26, 1999 3/3

Java/Tk code

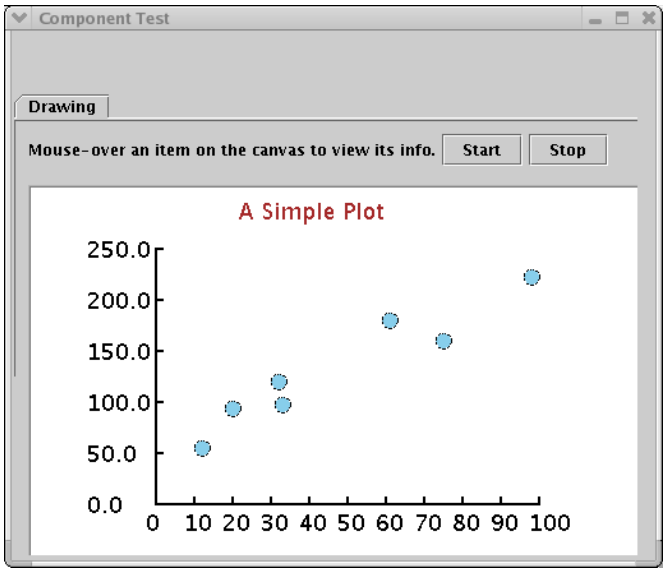
- ✔ As for C.... we have
  - ✔ Java calls to Tk
  - ✔ Tk calls to Java
- ✔ Partial implementation of Tk inside Java/Swing

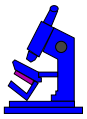


Tk code



Java/Tk code





Tk code

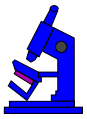
CODE LISTING **tkplot.tcl** Page 1/1

```
   canvas $c -relief raised -width 450 -height 300
   set plotFont {Helvetica 18}
...
   $c create line 100 250 100 50 -width 2
   $c create text 225 20 -text "A Simple Plot" -font $plotFont -fill brown
...
   for {set i 0} {$i <= 10} {incr i} {
       set x [expr {100 + ($i*30)}]
       $c create line $x 250 $x 245 -width 2
       $c create text $x 254 -text [expr 10*$i] -anchor n -font $plotFont
   }
...
   $c bind point <Any-Enter> "$c itemconfig current -fill red"
...
   proc plotMove {w x y} {
       global plot
       $w move selected [expr $x-$plot(lastX)] [expr $y-$plot(lastY)]
       set plot(lastX) $x
       set plot(lastY) $y
   }
```


The JavaKit code

CODE LISTING **tkplot.java** Page 1/1

```
   C = new canvas(jf, width, height, bgColor);
   plotFont = "-font [fontName Helvetica fontSize 18 fontStyle plain]";
...
   C.create("-item line -coords [100 250 100 50] -width 2.0");
   C.create("-item text -coords [225 20] -text \"A Simple Plot\" " + plotFont );
...
   for(int i = 0; i <= 10; i++) {
     int x = 100 + (i*30);
     C.create("-item line -coords [" + x + " 250 " + x + " 245] -width 2.0");
     C.create("-item text -coords [" + (x+9) + " 264] -text " + (10*i) + " " + plotFont );
   }
...
   C.bind("point", new command("enter") {
     public void action(eventInfo ei) { C.itemConfig("current", "-fill red"); }});
...
   public void plotMove(canvas w, double x, double y) {
     w.move("selected", x - lastX, y - lastY);
     lastX = x; lastY = y;
   }
```



Summary of topics

- ✔ Tk blended with C
- ✔ Tk blended with perl
- ✔ VRML, Java and the EAI
- ✔ Tk blended with Java