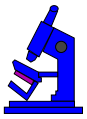


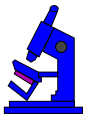

Chapter 11

Code Samples


Assignment 2 - Code quality?

CODE LISTING **lect9.1.tcl** Page 1/1

```
#!/usr/local/bin/wish
if {![info exists widgetDemo]} {
    error "This script should be run from the \"widget\" demo."
}
set w .plot
catch {destroy $w}
toplevel $w
wm title $w "Plot Demonstration"
wm iconname $w "Plot"
positionWindow $w
set c $w.c
label $w.msg -font $font -wraplength 4i -justify left -text "This window ..."
pack $w.msg -side top
frame $w.buttons
pack $w.buttons -side bottom -fill x -pady 2m
button $w.buttons.dismiss -text Dismiss -command "destroy $w"
button $w.buttons.code -text "See Code" -command "showCode $w"
pack $w.buttons.dismiss $w.buttons.code -side left -expand 1
canvas $c -relief raised -width 450 -height 300
pack $w.c -side top -fill x
set plotFont {Helvetica 18}
$c create line 100 250 400 250 -width 2
$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 $plotFont
}
for {set i 0} {$i <= 5} {incr i} {
    set y [expr {250 - ($i*50)}]
    $c create line 100 $y 105 $y -width 2
    $c create text 96 $y -text [expr $i*50].0 -anchor e -font $plotFont
}
foreach point {{12 56} {20 94} {33 98} {32 120} {61 180}
        {75 160} {88 223}} {
    set x [expr {100 + (3*[lindex $point 0])}]
    set y [expr {250 - (4*[lindex $point 1])/5}]
    set item [$c create oval [expr $x-6] [expr $y-6] \
            [expr $x+6] [expr $y+6] -width 1 -outline black \
            -fill SkyBlue2]
    $c addtag point withtag $item
}

$c bind point <Any-Enter> "$c itemconfig current -fill red"
$c bind point <Any-Leave> "$c itemconfig current -fill SkyBlue2"
$c bind point <1> "plotDown $c %x %y"
$c bind point <ButtonRelease-1> "$c dtag selected"
bind $c <B1-Motion> "plotMove $c %x %y"
set plot(lastX) 0
set plot(lastY) 0
proc plotDown {w x y} {
    global plot
    $w dtag selected
    $w addtag selected withtag current
    $w raise current
    set plot(lastX) $x
    set plot(lastY) $y
}
```



Assignment 2 - Code quality?

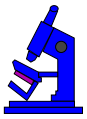
CODE LISTING **lect9.2.tcl** Page 2/2

```
#!/usr/local/bin/wish
#
# This demonstration script creates a canvas widget showing a 2-D
# plot with data points that can be dragged with the mouse.
#
# RCS: @(#) $Id: plot.tcl,v 1.2 1998/09/14 18:23:29 stanton Exp $

if {![info exists widgetDemo]} {
error "This script should be run from the \"widget\" demo."
}
set w .plot
catch {destroy $w}
toplevel $w
wm title $w "Plot Demonstration"
wm iconname $w "Plot"
positionWindow $w
set c $w.c
canvas $c -relief raised -width 450 -height 300
pack $w.c -side top -fill x
set plotFont {Helvetica 18}
$c create line 100 250 400 250 -width 2
$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 $plotFont
}
for {set i 0} {$i <= 5} {incr i} {
set y [expr {250 - ($i*40)}]
$c create line 100 $y 105 $y -width 2
$c create text 96 $y -text [expr $i*50].0 -anchor e -font $plotFont
}
foreach point {{12 56} {20 94} {33 98} {32 120} {61 180}} {
set x [expr {100 + (3*[lindex $point 0])}]
set y [expr {250 - (4*[lindex $point 1])/5}]
set item [$c create oval [expr $x-6] [expr $y-6] \
[expr $x+6] [expr $y+6] -width 1 -outline black \
-fill SkyBlue2]
$c addtag point withtag $item
}
$c bind point <ButtonRelease-1> "$c dtag selected"
bind $c <B1-Motion> "plotMove $c %x %y"
set plot(lastX) 0
set plot(lastY) 0
# plotDown --
# This procedure is invoked when the mouse is pressed over one of the
# data points. It sets up state to allow the point to be dragged.
#
# Arguments:
# w -           The canvas window.
# x, y -        The coordinates of the mouse press.

proc plotDown {w x y} {
global plot
$w dtag selected
$w addtag selected withtag current
$w raise current
set plot(lastX) $x
set plot(lastY) $y
```


Assignment 2 - Code quality?

CODE LISTING **lect9.3.tcl** Page 1/1

```
#!/usr/local/bin/wish
#
# This demonstration script creates a canvas widget showing a 2-D
# plot with data points that can be dragged with the mouse.
#
# RCS: @(#) $Id: plot.tcl,v 1.2 1998/09/14 18:23:29 stanton Exp $

set w .px
catch {destroy $w}
label $w.m -font $font -wraplength 4i -justify left -text "This window ..."
pack $w.m -side top
frame $w.bs
pack $w.bs -side bottom -fill x -pady 2m
button $w.bs.dismiss -text Dismiss -command "destroy $w"
canvas $c -relief raised -width 450 -height 300
pack $w.c -side top -fill x
set pf {Helvetica 18}
$c create line 100 250 400 250 -width 2
$c create line 100 250 100 50 -width 2
for {set i 0} {$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 $pf
}
for {set i 0} {$i <= 5} {incr i} {
    set y [expr {250 - ($i*40)}]
    $c create line 100 $y 105 $y -width 2
    $c create text 96 $y -text [expr $i*50].0 -anchor e -font $pf
}

foreach pt {{12 56} {20 94} {33 98} {32 120} {61 180}
        {75 160} {98 223}} {
    set x [expr {100 + (3*[lindex $pt 0])}]
    set y [expr {250 - (4*[lindex $pt 1])/5}]
    set im [$c create oval [expr $x-6] [expr $y-6] \
            [expr $x+6] [expr $y+6] -width 1 -outline black \
            -fill SkyBlue2]
    $c addtag pt withtag $im
}

$c bind pt <Any-Enter> "$c itemconfig ct -fill red"
$c bind pt <Any-Leave> "$c itemconfig ct -fill SkyBlue2"
```



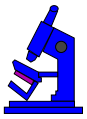
Assignment 2 - debugging?

Write code clearly: Edit, document, comment...

```
############################################################
#  GetCommandString( x,y,itemID ):string
#        Returns a string that is later executed as a
#        command
#        The parameters x and y are the current cursor
#        position, and itemID is the closest visible
#        item on the canvas .canv
#  Requires:   Uses global variable canvas .canv
#  Ensures:    Always returns a command of some sort
#              Sets global variable ErrorID if there is
#              any error...
#  Last modified: 12/2/2004 - by Hugh
############################################################
```


Assignment 2 - debugging?

- ✔ Run wish, and then use **`source x.tcl`**
- ✔ ... then interact with running program...



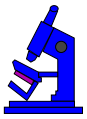
Assignment 3

3 options:

1. Re-implement YOUR assignment 2
2. A simple (but actually useful) visualization
3. Image library assistant...

Assignment 3 (option a)

- ✔ The tricky thing is the graphics component
- ✔ Some help with it...

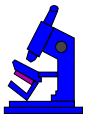


Java Graphics API

```
public void paintComponent(Graphics g) {
      super.paintComponent(g); //paint background
      //Paint a filled rectangle at user's chosen point.
      if (point != null) {
        g.drawRect(point.x, point.y, rectWidth-1, rectHeight-1);
        g.setColor(Color.yellow);
        g.fillRect(point.x+1,point.y+1,rectWidth-2,rectHeight-2);
      }
}
```


Graphics API

1. Basic/AWT - Abstract Graphics class
2. Java2D



Coordinate system

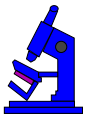
- ✔ Upper left of each component is (0,0)
- ✔ Behind the title bar of a window
- ✔ Container class has **`getInsets`** method
- ✔ Graphics objects contain methods for drawing

Graphics API

- ✔ Swing components have a method **`paintComponent`** which takes a graphics object as an argument

```
public void paintComponent( Graphics g )
```

- ✔ Overide this to draw your objects.
- ✔ Also may call the **`repaint()`** method



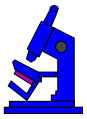

Graphics class methods

```
clearRect(int x, int y, int width, int height);
draw3DRect(int x, int y, int width, int height, boolean raised);
drawImage(Image img, int x, int y, Color bgcolor, ImageObserver observer);
drawLine(int x1, int y1, int x2, int y2);
drawOval(int x, int y,int width, int height);
drawPolygon(int xPoints[], int yPoints[], int nPoints);
drawRect(int x, int y,int width, int height);
drawRoundRect(int x, int y, int width, int height, int arcWidth, int arcHeight);
drawString(String str, int x, int y);
```



Graphics class methods

```
fill3DRect(int x, int y, int width, int height, boolean raised);
fillArc(int x, int y, int width, int height, int startAngle, int arcAngle);
fillOval(int x, int y, int width, int height);
fillPolygon(int xPoints[], int yPoints[], int nPoints);
fillRect(int x, int y, int width, int height);
fillRoundRect(int x, int y, int width, int height, int arcWidth, int arcHeight);
```

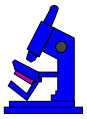


Graphics class methods

```
Color getColor();
Font getFont();
FontMetrics getFontMetrics();
setColor(Color c);
setFont(Font font);
```


Graphics API

- ✔ Use JPanel instead of JComponent
- ✔ UI delegate (for look-and-feel painting) is called in JPanel
- ✔ UI delegate not called in JComponent



Text in Graphics API

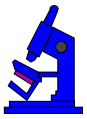
- Note - you paint text using **`drawString()`**
- **`getFontMetrics()`** to get a **`FontMetrics`** object

```
getHeight()
getAscent()
getDescent()
charWidth()
```

- and so on...

Assignment 3 (option b)

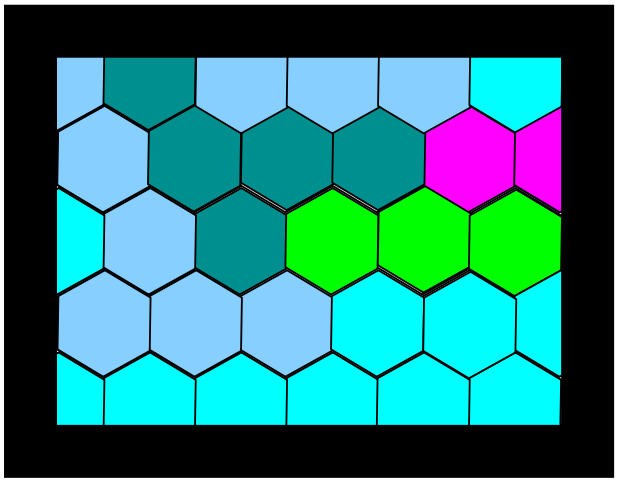
- Start with a large number (>1000000) points to be plotted, explored, displayed.
- If only a 1024*768 screen there are <1000000 points on screen.
- In some small region with (say) 10*10 points, there might be no difference between a display with 100 dots and one with 100000 dots.

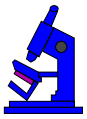


Assignment 3 (option b)

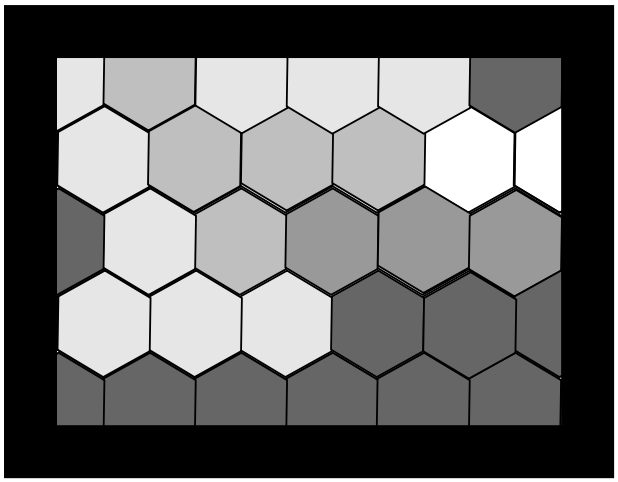
- ✔ So...
- ✔ Tile the display
- ✔ Black and white? Colour?

Assignment 3 (option b)

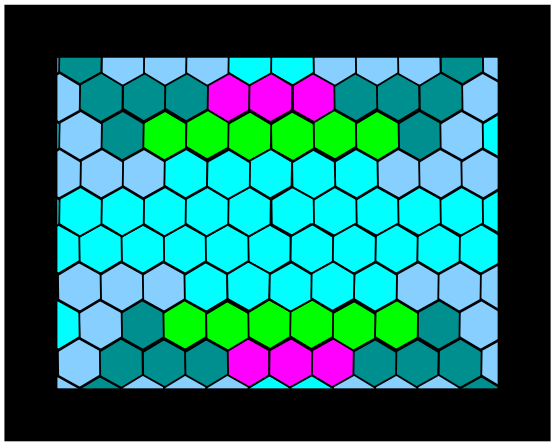


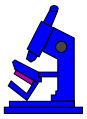


Assignment 3 (option b)

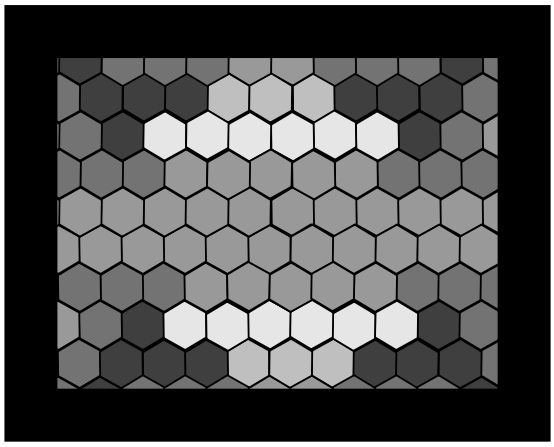


Assignment 3 (option b)



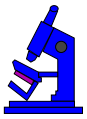


Assignment 3 (option b)



Assignment 3 (option b)

- ✔ Must use a slider to change the tiling.
- ✔ May show different zoom levels, and locations of data
- ✔ Processing of other tilings in background using threads... (i.e. no pauses)

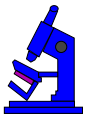


Assignment 3 (option c)

- ✔ Java *application* or a Java *applet*
- ✔ User interface to assist in the management of *large* numbers of images.
- ✔ Principally display TEXT information (spreadsheet),
- ✔ May also display small (thumbnail) versions of the images

Assignment 3 (option c)

- ✔ Database
- ✔ Special purpose editor for ...
  - ✔ classifying,
  - ✔ annotating and
  - ✔ querying a large number of images.



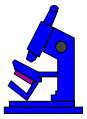
Assignment 3 (option c)

- ✔ Image DSCN0100.JPG (Tim at a party): It is in
  - "*Friends*"
  - "*Trip to NZ in Dec 2003*", which is itself in the section "*Trips*"
  - "*Hooligans*"
- ✔ Main screen shows a list of images.

Assignment 3 (option c)

Editable and fi xed annotation fi elds:

- The date and time the image was entered into the section (not editable).
- A unique identifi er for the image
- A scrollable text box with (say) 5 visible lines of text description.



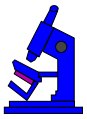
Assignment 3 (option c)

Minimum flow of operation:

1. create, locate and delete new sections,
2. import image(s), using selection or cut and paste.
3. edit image/section information annotations,
4. save and load new databases,
5. query the system with a text search.

Deliverables:

- ✔ Single (zipped) fi le with sourcecode, README, docs in PDF
- ✔ Documentation:
  - ✔ A title page, Table of contents...
  - ✔ A one page introduction to the application
  - ✔ A one page technical section
  - ✔ A one to three page section describing the interface

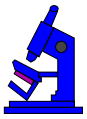


Assessment:

The assessment is as follows:

Documentation	15%
Code style/quality	35%
Operation of the interface	50%

Assignment 3 - code quality?



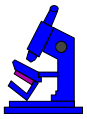
Debugging Java

- ✔ Netbeans debugger
- ✔ The java debugger **`jdb`**

Debugging Java

On suns...diffi culty with versions of java and jdb and ddd

```
PATH=/usr/local/java/j2sdk1_3_1_02/bin:$PATH;export PATH
```



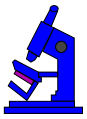
MFC

- ✔ Microsoft Foundation Classes - classes needed to produce GUI Windows programs.
- ✔ Development cycle - RAD, then editing.

MFC menus

A resource fi le for a simple File/Quit menu:

```
#define MYAPP_EXIT 3210
MyApp MENU
    POPUP "File"
    {
      MENUITEM "Exit",MYAPP_EXIT
    }
}
```



Menus

In the **`Create`** call, you can do something like this:

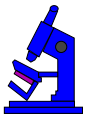
```
Create( NULL, “Example”, ..., CRect(...), NULL, “MyApp” );
```

The **`MYAPP_EXIT`** message may be bound using the **`DECLARE_MESSAGE_MAP()`** macro, and with the following declaration:

```
ON_COMMAND( MYAPP_EXIT,OnExit )
```


Message handler

```
afx_msg void CMenusWin::OnExit()
{
    SendMessage( WM_CLOSE );
}
```

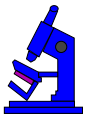



MFC Program


MFC program

CODE LISTING **FirstApp.cpp**

```
#include <afxwin.h>

class CFirstWindow : public CFrameWnd {
public:
    CFirstWindow();
    ~CFirstWindow();
private:
    CStatic *m_pGreeting;
};

CFirstWindow::CFirstWindow()
{
    Create( NULL,
            "First Application",
            WS_OVERLAPPEDWINDOW,
            CRect( 100, 100, 400, 220 ) );
    m_pGreeting = new CStatic;
    m_pGreeting->Create(
       "Hello World!", // text
       WS_CHILD | WS_VISIBLE | WS_BORDER
       | SS_CENTER,
       CRect( 80, 30, 200,50 ),
       this );
}

CFirstWindow::~CFirstWindow()
{
    delete m_pGreeting;
}

class CFirstApp : public CWinApp {
public:
    BOOL InitInstance()
    {
        m_pMainWnd = new CFirstWindow();
        m_pMainWnd->ShowWindow( m_nCmdShow );
        m_pMainWnd->UpdateWindow();
        return TRUE;
    }

} FirstApp;
```



Hungarian notation

Prefix	Meaning
`C`	Class declaration
`m_`	Class member variable
`p`	Pointer
`n` or `i`	Integer
`On`	Event or message handler

MFC class hierarchy