Java Swing GUI Programming 4

Learning Objectives

- New UI components
  - File chooser, Text area, Color chooser, Slider, Combo box (menu)
- Tooltips and short-cuts
- Mouse events
  - Dynamic drawing
- Key events
- Timer events and animation

Useful Components

- Let's examine some other UI components that come in handy

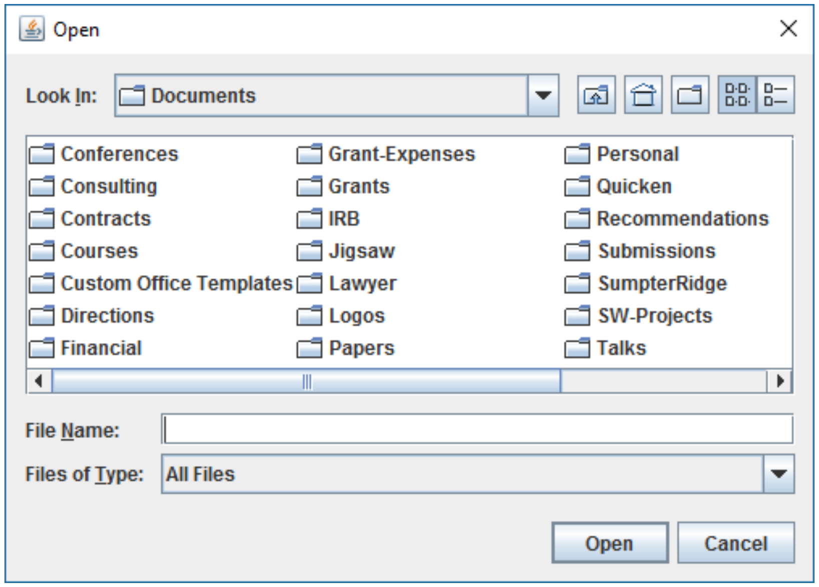
Choosing Files

Convenient way to select files – `JFileChooser`

To use

1. Call constructor
2. Call `showOpenDialog` method that displays the chooser

   Returns int (`JFileChooser.APPROVE_OPTION`)



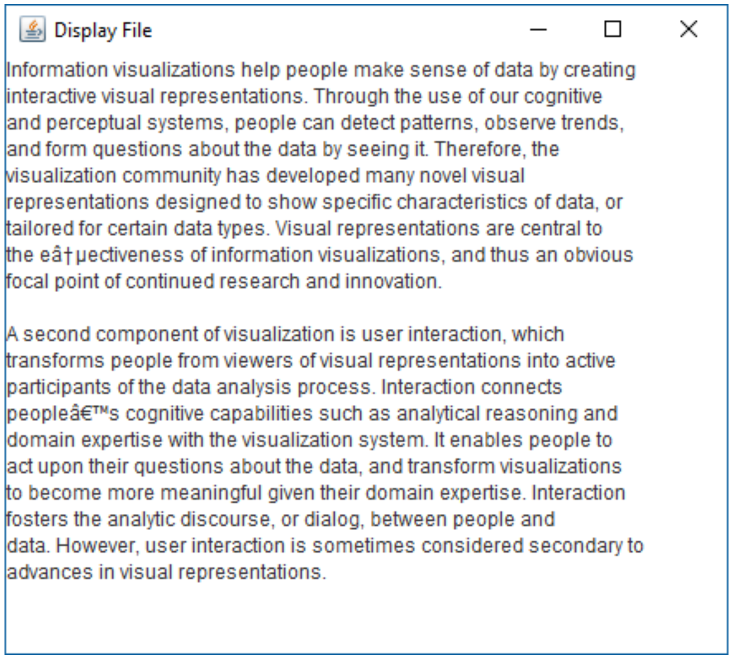
Bigger Text Areas

`JTextArea` – Multiple rows of text

Constructor `JTextArea(int rows, int cols)`

`setText` method puts text in there

By default, editable – Change via `.setEditable(false)`



```
Information visualizations help people make sense of data by creating
interactive visual representations. Through the use of our cognitive
and perceptual systems, people can detect patterns, observe trends,
and form questions about the data by seeing it. Therefore, the
visualization community has developed many novel visual
representations designed to show specific characteristics of data, or
tailored for certain data types. Visual representations are central to
the eâ†µectiveness of information visualizations, and thus an obvious
focal point of continued research and innovation.

A second component of visualization is user interaction, which
transforms people from viewers of visual representations into active
participants of the data analysis process. Interaction connects
peopleâ€™s cognitive capabilities such as analytical reasoning and
domain expertise with the visualization system. It enables people to
act upon their questions about the data, and transform visualizations
to become more meaningful given their domain expertise. Interaction
fosters the analytic discourse, or dialog, between people and
data. However, user interaction is sometimes considered secondary to
advances in visual representations.
```

DisplayFile program

Program

```
public class DisplayFile
{
   public static void main (String[] args) throws IOException
   {
      JFrame frame = new JFrame ("Display File");
      frame.setDefaultCloseOperation (JFrame.EXIT_ON_CLOSE);

      JTextArea ta = new JTextArea (20, 30);
      JFileChooser chooser = new JFileChooser();

      int status = chooser.showOpenDialog (null);

      if (status != JFileChooser.APPROVE_OPTION)
         ta.setText ("No File Chosen");
      else
      {
         File file = chooser.getSelectedFile();
         Scanner scan = new Scanner (file);

         String info = "";
         while (scan.hasNext())
            info += scan.nextLine() + "\n";

         ta.setText (info);
      }

      frame.getContentPane().add (ta);
      frame.pack();
      frame.setVisible(true);
   }
}
```

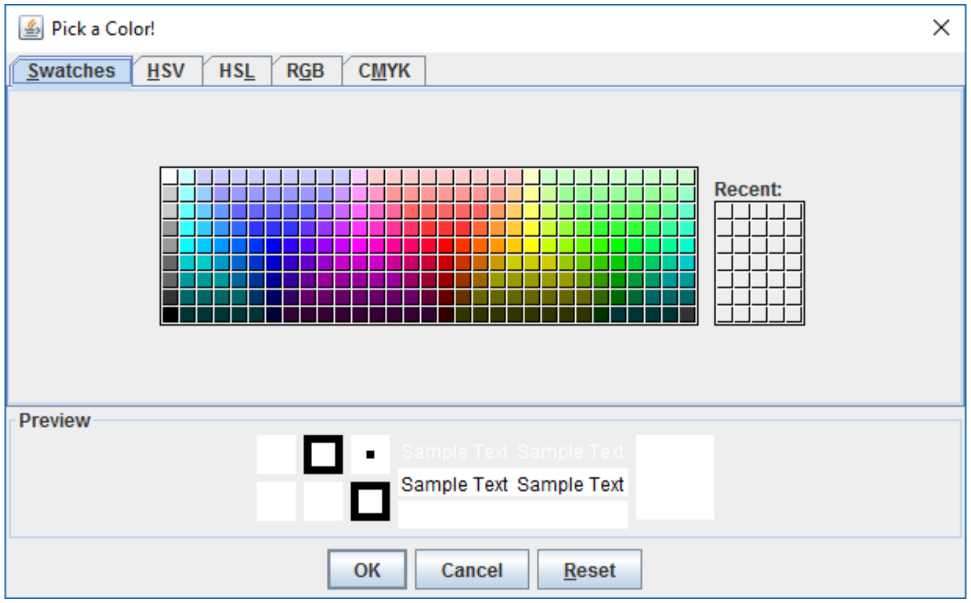
Uses both components

Choosing Colors

`JColorChooser` – Special color choice dialog

```
JColorChooser.showDialog(Component parent, String s, Color initCol)
```

Different method, just invoke static method rather than create an object



DisplayColor program

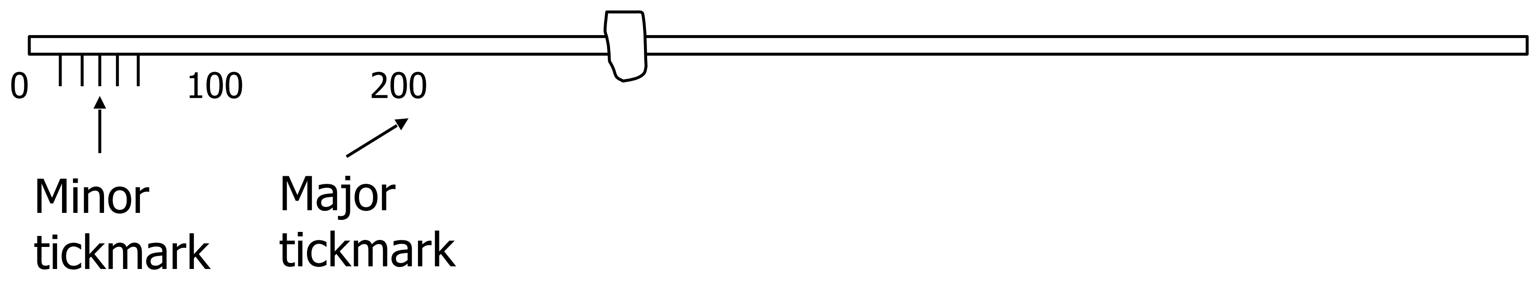
Program

```
public class DisplayColor
{
   public static void main (String[] args)
   {
      JFrame frame = new JFrame ("Display Color");
      frame.setDefaultCloseOperation (JFrame.EXIT_ON_CLOSE);

      JPanel colorPanel = new JPanel();
      colorPanel.setBackground (Color.white);
      colorPanel.setPreferredSize (new Dimension (300, 100));

      frame.getContentPane().add (colorPanel);
      frame.pack();
      frame.setVisible(true);

      Color shade = Color.white;
      int again;

      do
      {
         shade = JColorChooser.showDialog (frame, "Pick a Color!", shade);
         colorPanel.setBackground (shade);

         again = JOptionPane.showConfirmDialog (null,
            "Display another color?");
      }
      while (again == JOptionPane.YES_OPTION);
   }
}
```

Choosing a Value

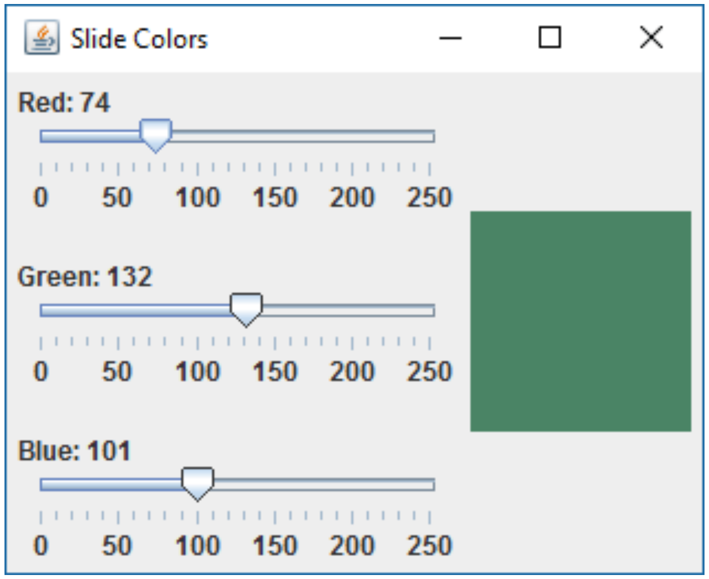
`JSlider` – Java scrollbar

`JSlider(HorizOrVert, minval, maxval, startval)`



Uses `ChangeListener` interface and `stateChanged()` method

Generates `ChangeEvent` object



Code in t-square

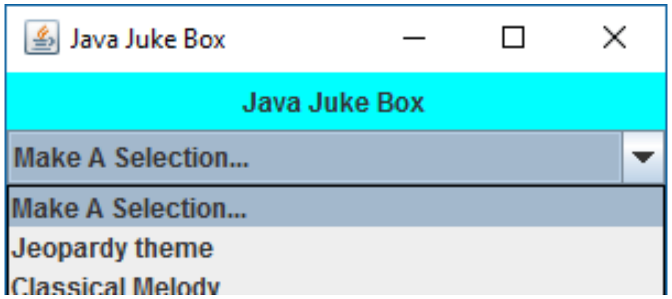
SlideColor program

Pull-down Menus

`JComboBox` takes an array of strings (menu choices)

Menu choice triggers actionPerformed

`combo.getSelectedIndex()` gets index of choice



JukeBox program

Key Code

```
    URL url1, url2;
    url1 = url2 = null;

    // Obtain and store the audio clips to play
    try
    {
       url1 = new URL ("file", "localhost", "jeopardy.au");
       url2 = new URL ("file", "localhost", "classical.wav");
    }
    catch (Exception exception) {}

    music = new AudioClip[7];
    music[0] = null;  // Corresponds to "Make a Selection..."
    music[1] = JApplet.newAudioClip (url1);
    music[2] = JApplet.newAudioClip (url2);

    // Create the list of strings for the combo box options
    String[] musicNames = {"Make A Selection...", "Jeopardy theme",
             "Classical Melody"};

    musicCombo = new JComboBox (musicNames);
    musicCombo.setAlignmentX (Component.CENTER_ALIGNMENT);

    //  Set up the buttons
    playButton = new JButton ("Play", new ImageIcon ("play.gif"));
    playButton.setBackground (Color.white);
    playButton.setMnemonic ('p');

    musicCombo.addActionListener (new ComboListener());
    playButton.addActionListener (new ButtonListener());

    current = null;
  }
// continued…
```

```
//continuing…

 private class ComboListener implements ActionListener
   {
      public void actionPerformed (ActionEvent event)
      {
         if (current != null)
            current.stop();

         current = music[musicCombo.getSelectedIndex()];
      }
    }

   private class ButtonListener implements ActionListener
   {
      public void actionPerformed (ActionEvent event)
      {
         if (current != null)
            current.stop();

         if (event.getSource() == playButton)
            if (current != null)
               current.play();
      }
   }
}
```

JukeBox program

Neat Stuff

Add tooltips to buttons

```
JButton button = new JButton("Compute");
button.setToolTipText("Calculates total cost");
```

Add a short-cut key method

```
button.setMnemonic('C');
```

ALT-C activates it

Disable a button

```
button.setEnabled(false);
```

Mouse Events

Mouse events

Pressed

Released

Clicked – no movement in between

Entered
Exited (component)

Get (order):

press

release

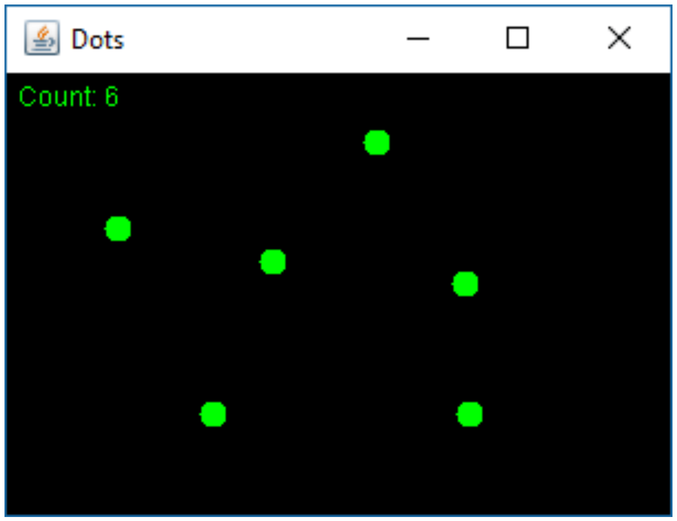
click

Mouse motion events

Moved
Dragged (get lots of them)

We have to decide what we want to listen for

Example Program 1



Dots program

Example Program I

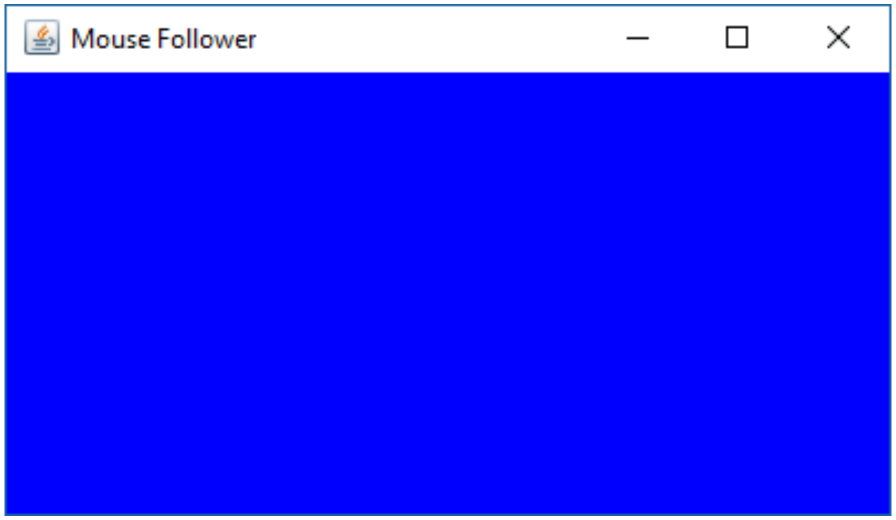
```
public class DotsPanel extends JPanel
{
   private final int SIZE = 6;  // radius of each dot
   private ArrayList<Point> pointList;

   public DotsPanel()
   {
      pointList = new ArrayList<Point>();

      addMouseListener (new DotsListener());

      setBackground (Color.black);
      setPreferredSize (new Dimension(300, 200));
   }

   public void paintComponent (Graphics page)
   {
      super.paintComponent(page);

      page.setColor (Color.green);

      for (Point spot : pointList)
         page.fillOval (spot.x-SIZE, spot.y-SIZE, SIZE*2, SIZE*2);

      page.drawString ("Count: " + pointList.size(), 5, 15);
   }
// continued…
```

```
//continuing…

private class DotsListener implements MouseListener
   {
      public void mousePressed (MouseEvent event)
      {
         pointList.add(event.getPoint());
         repaint();
      }
      public void mouseClicked (MouseEvent event) {}
      public void mouseReleased (MouseEvent event) {}
      public void mouseEntered (MouseEvent event) {}
      public void mouseExited (MouseEvent event) {}
   }
}
```

Mouse listening has the five events

Dots program

Example Program 2



(Color changes if in left or right)

MouseFollow program

Example Program 2

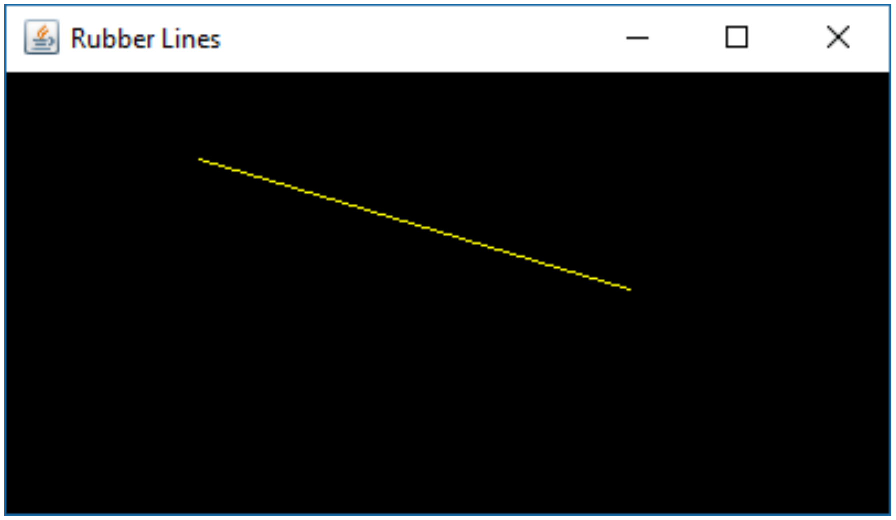
```
public class MouseFollowPanel extends JPanel
{
    private boolean left = true;

   public MouseFollowPanel()
   {
      LineListener listener = new LineListener();
      addMouseMotionListener (listener);

      setBackground (Color.black);
      setPreferredSize (new Dimension(400, 200));
   }

   public void paintComponent (Graphics page)
   {
       super.paintComponent(page);
       if (left == true)
         setBackground(Color.blue);
       else
         setBackground(Color.red);
   }

// continuing…
```

```
//continuing…

 private class LineListener implements
MouseMotionListener
   {
      public void mouseDragged (MouseEvent event)
      {
         Point p;

         p = event.getPoint();
         if (p.getX() < 200)
            left = true;
         else
            left = false;
         repaint();
      }

      public void mouseMoved (MouseEvent event)
      {
         Point p;
         p = event.getPoint();
         if (p.getX() < 200)
           left = true;
         else
           left = false;
            repaint();
       }
   }
}
```

Two motion events

MouseFollow program

Example Program 3



RubberLines program

Example Program 3

```
public class RubberLinesPanel extends JPanel
{
   private Point point1 = null, point2 = null;

   public RubberLinesPanel()
   {
      LineListener listener = new LineListener();
      addMouseListener (listener);
      addMouseMotionListener (listener);

      setBackground (Color.black);
      setPreferredSize (new Dimension(400, 200));
   }

   public void paintComponent (Graphics page)
   {
      super.paintComponent (page);

      page.setColor (Color.yellow);
      if (point1 != null && point2 != null)
         page.drawLine (point1.x, point1.y, point2.x, point2.y);
   }
// continues…
```

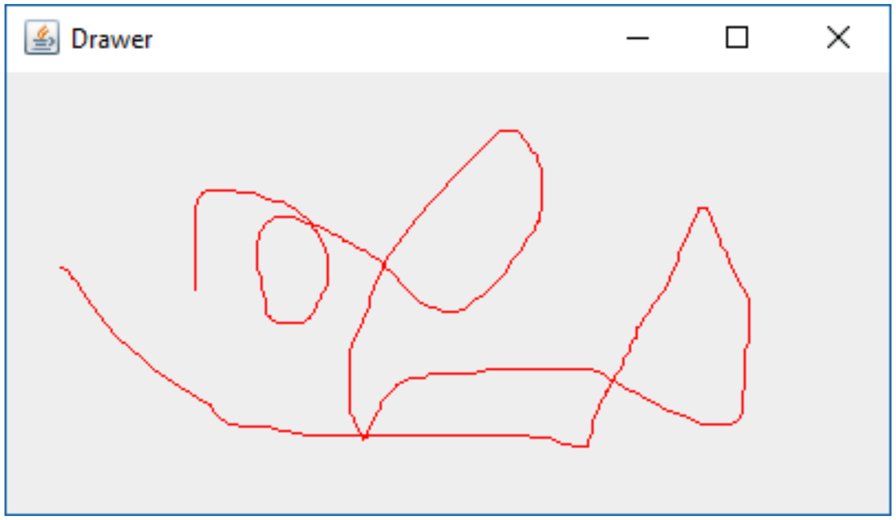
```
//continuing…

private class LineListener implements MouseListener,

MouseMotionListener
   {
      public void mousePressed (MouseEvent event)
      {
         point1 = event.getPoint();
      }

      public void mouseDragged (MouseEvent event)
      {
         point2 = event.getPoint();
         repaint();
      }

      public void mouseClicked (MouseEvent event) {}
      public void mouseReleased (MouseEvent event) {}
      public void mouseEntered (MouseEvent event) {}
      public void mouseExited (MouseEvent event) {}
      public void mouseMoved (MouseEvent event) {}
   }
}
```

RubberLines program

Things to Try

- Comment out super.paintComponent()
- Put point1 = point2 in dragged first
  - That doesn't work – Why?
- Put point1 = point2 in repaint()

Example Program 4



Draw program

Example Program 4

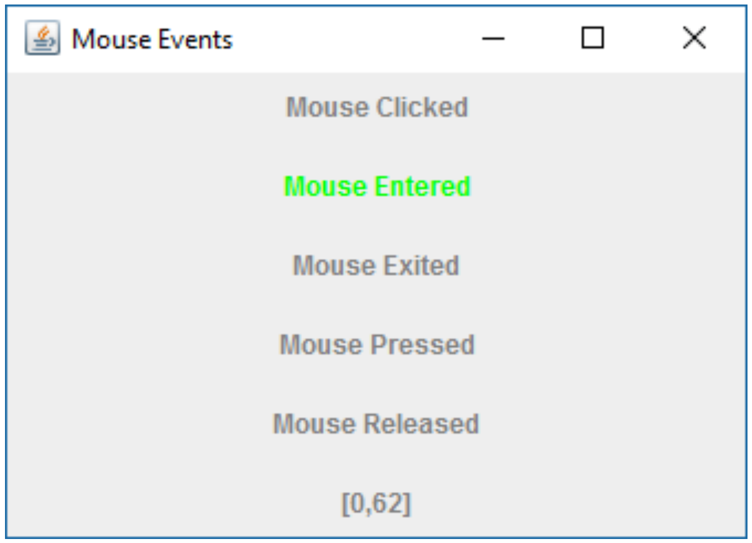
```
public class DrawPanel extends JPanel
{
   private Point point1 = null, point2 = null;

   public DrawPanel()
   {
      LineListener listener = new LineListener();
      addMouseListener (listener);
      addMouseMotionListener (listener);

      setBackground (Color.black);
      setPreferredSize (new Dimension(400, 200));
   }

   public void paintComponent (Graphics page)
   {
      //super.paintComponent (page);
      // This will wipe out the previous drawing

      page.setColor (Color.red);
      if (point1 != null && point2 != null)
         page.drawLine (point1.x, point1.y, point2.x, point2.y);
   }

// continued…
```

Note

```
//continuing…

 private class LineListener implements MouseListener,
                     MouseMotionListener
   {
      public void mousePressed (MouseEvent event)
      {
         point1 = event.getPoint();
      }

      public void mouseDragged (MouseEvent event)
      {
        point1 = point2;    // added this line to
                            // update old position

        point2 = event.getPoint();
        repaint();

      }

      public void mouseClicked (MouseEvent event) {}
      public void mouseReleased (MouseEvent event) {}
      public void mouseEntered (MouseEvent event) {}
      public void mouseExited (MouseEvent event) {}
      public void mouseMoved (MouseEvent event) {}
   }
}
```

Draw program

Example Program 5



Mouse Clicked

Mouse Entered

Mouse Exited

Mouse Pressed

Mouse Released

[0,62]

MouseExample program

Code

- Communicates the different style of events
- Very different style of program
  - No Panel class way we've been doing it
- Try click down, then release outside

In t-square

Key Events

Generated when key is pressed

`KeyListener` – Interface for handling key events

```
keyPressed(KeyEvent evt)
keyReleased(KeyEvent evt)
keyTyped(KeyEvent evt)
```

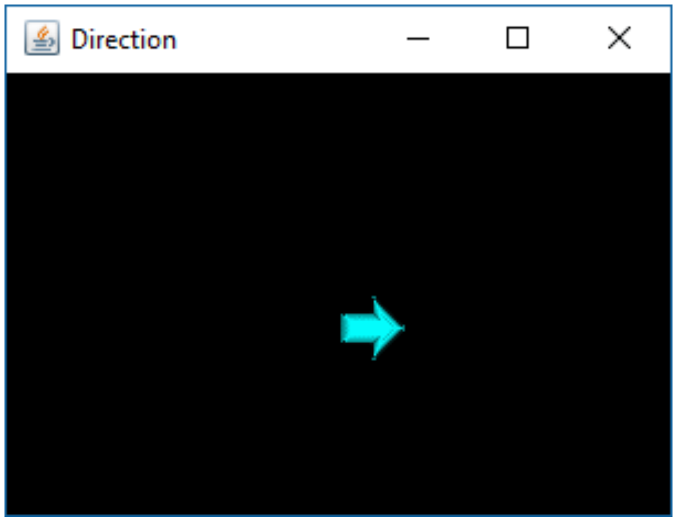
Three types of events

`evt.getKeyCode()`

capital A
ctrl-D

Gets the key pressed (In API)

Example Program



Direction program

Example Program

```
public class DirectionPanel extends JPanel
{
   private final int WIDTH = 300, HEIGHT = 200;
   private final int JUMP = 10;  // increment for image movement

   private final int IMAGE_SIZE = 31;

   private ImageIcon up, down, right, left, currentImage;
   private int x, y;

   public DirectionPanel()
   {
      addKeyListener(new DirectionListener());

      x = WIDTH / 2;
      y = HEIGHT / 2;

      up = new ImageIcon("arrowUp.gif");
      down = new ImageIcon("arrowDown.gif");
      left = new ImageIcon("arrowLeft.gif");
      right = new ImageIcon("arrowRight.gif");

      currentImage = right;

      setBackground(Color.black);
      setPreferredSize(new Dimension(WIDTH, HEIGHT));
      setFocusable(true);
   }

   public void paintComponent(Graphics page)
   {
      super.paintComponent(page);
      currentImage.paintIcon(this, page, x, y);
   }

// continued…
```

```
//continuing…

    private class DirectionListener implements KeyListener
   {
      public void keyPressed(KeyEvent event)
      {
         switch (event.getKeyCode())
         {
            case KeyEvent.VK_UP:
               currentImage = up;
               y -= JUMP;
               break;
            case KeyEvent.VK_DOWN:
               currentImage = down;
               y += JUMP;
               break;
            case KeyEvent.VK_LEFT:
               currentImage = left;
               x -= JUMP;
               break;
            case KeyEvent.VK_RIGHT:
               currentImage = right;
               x += JUMP;
               break;
         }

         repaint();
      }

      public void keyTyped(KeyEvent event) {}
      public void keyReleased(KeyEvent event) {}
   }
}
```

Direction program

Animation

Redraw scene repeatedly with slight movement

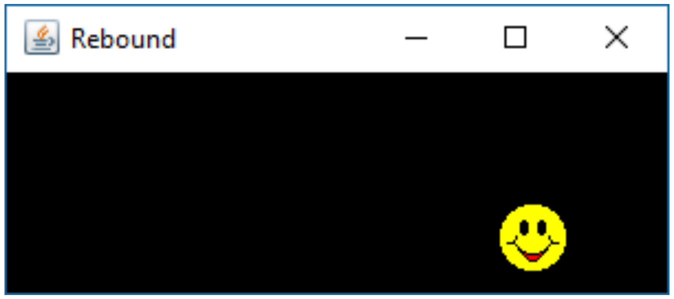
`Timer` class – In Swing, generates an event at regular intervals

To do animation:
- Set up timer to generate events
- Provide right listener

<u>Methods</u>

```
         Timer(int delay, ActionListener list)  //delay is in msecs
void     addActionListener(ActionListener list)
boolean  isRunning()
void     setDelay(int delay)
void     start()
void     stop()
```

Example Program



What determines velocity?

Rebound program

Example Program

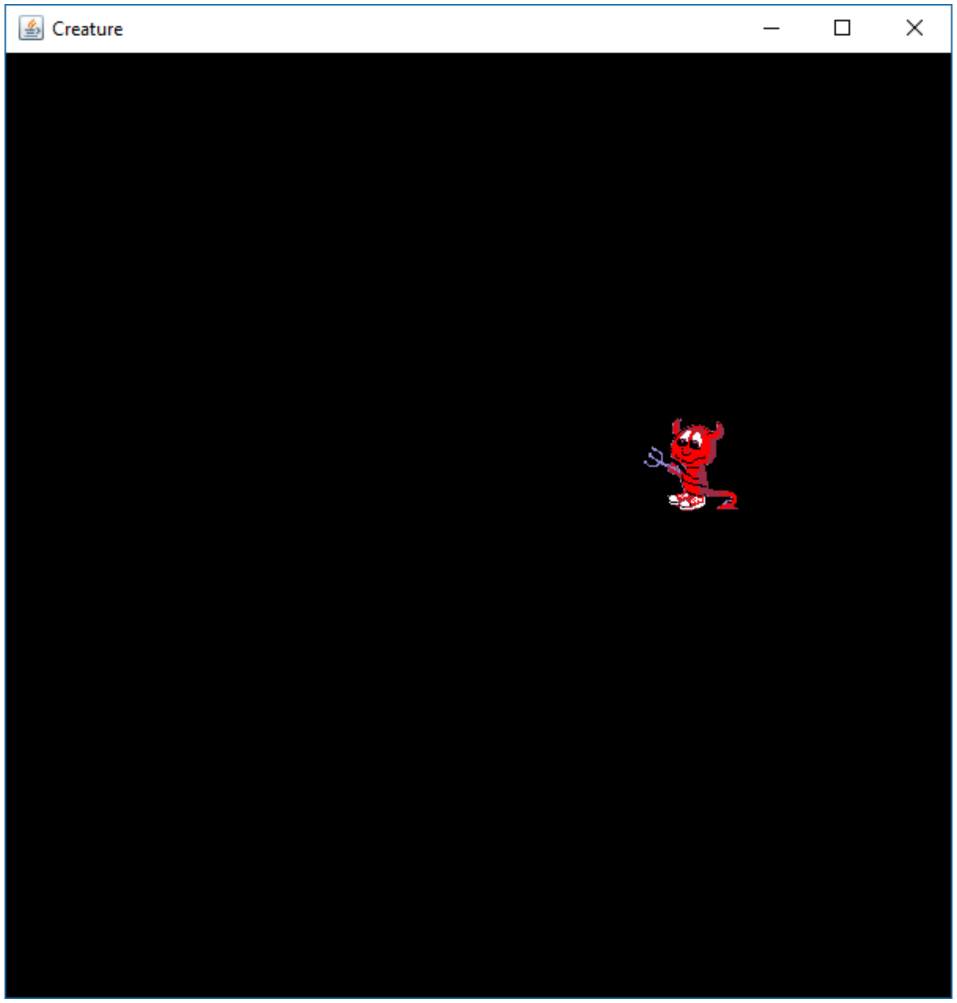
```
public class ReboundPanel extends JPanel
{
   private final int WIDTH = 300, HEIGHT = 100;
   private final int DELAY = 20, IMAGE_SIZE = 35;

   private ImageIcon image;
   private Timer timer;
   private int x, y, moveX, moveY;

   public ReboundPanel()
   {
      timer = new Timer(DELAY, new ReboundListener());

      image = new ImageIcon ("happyFace.gif");

      x = 0;
      y = 40;
      moveX = moveY = 3;

      setPreferredSize (new Dimension(WIDTH, HEIGHT));
      setBackground (Color.black);
      timer.start();
   }

   public void paintComponent (Graphics page)
   {
      super.paintComponent (page);
      image.paintIcon (this, page, x, y);
   }

// continued…
```

```
//continuing…


 private class ReboundListener implements ActionListener
   {
      public void actionPerformed (ActionEvent event)
      {
         x += moveX;
         y += moveY;

         if (x <= 0 || x >= WIDTH-IMAGE_SIZE)
            moveX = moveX * -1;

         if (y <= 0 || y >= HEIGHT-IMAGE_SIZE)
            moveY = moveY * -1;

         repaint();
      }
   }
}
```

Rebound program

Example Program

Game:
System moves the image and you must click in it by a preset amount of time such as one second



Creature program

Example Program

```
public class CreaturePanel extends JPanel
{
   private final int WIDTH=600, HEIGHT=600;
   private Timer timer;
   private ImageIcon image;
   private int iconWidth,iconHeight;
   private int x,y;
   private Random generator;
   private boolean chasing = false;
   private boolean inTime = false;
   private int tryCount = 0;
   private int hitCount = 0;
   private int hitX,hitY;
   private static final int DELAY =1000;  // one second

   public CreaturePanel()
   {
      generator = new Random();

      ActionListener timerListener;
      timerListener = new TimerListener();
      timer = new Timer(DELAY,timerListener);
      MyMouseListener mouseListener = new MyMouseListener();
      addMouseListener (mouseListener);

      image = new ImageIcon("creature.gif");
      iconWidth = image.getIconWidth();
      iconHeight = image.getIconHeight();

      setBackground (Color.black);
      setPreferredSize(new Dimension(WIDTH,HEIGHT));
   }

   public void paintComponent (Graphics page)
   {
      super.paintComponent (page);

      image.paintIcon(this, page, x,y);
   }
// continued…
```

```
//continuing…
 private class MyMouseListener implements MouseListener
   {
      public void mousePressed (MouseEvent event)
      {
        Point point;

        if (chasing == false) {
           x = generator.nextInt(WIDTH-iconWidth) + 1;
           y = generator.nextInt(HEIGHT-iconHeight) + 1;
           timer.start();
           repaint();
           chasing = true;
           inTime = true;
           }
        else {
           tryCount++;
           if (inTime == true) {
              point = event.getPoint();
              hitX = point.x;
              hitY = point.y;
              if ((x <= hitX) && (hitX <= (x+iconWidth)) &&
                  (y <= hitY) && (hitY <= (y+iconHeight)))
                hitCount++;
              }
           System.out.println(hitCount+" / "+tryCount);
           chasing = false;
           timer.stop();
           }
      }
      public void mouseClicked (MouseEvent event) {}
      public void mouseReleased (MouseEvent event) {}
      public void mouseEntered (MouseEvent event) {}
      public void mouseExited (MouseEvent event) {}
     }

   private class TimerListener implements ActionListener
   {
      public void actionPerformed (ActionEvent event)
      {
        inTime = false;
      }
   }
}
```

Creature program

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