CSGE601021 Foundations of Programming 2
(Dasar-Dasar Pemrograman 2)

Programming Assignment 3:
Key Events and Stick Figures

- Deadline for submitting the final result of your work to SCeLE: Monday 15.May.2023 (11:55 PM SCeLE Time). Use github for storing your partial works.
- Zip all files of your Java project (1 folder) and its runnable JAR file, into one file with name: TP03_<class>_<TAcode>_<StudentName>_<NPM>.zip, for example: TP03_A_XY_Unyil_1234567890.zip
- Arrange a demo session with your Asdos as soon as possible, while everything about this assignment is still fresh in your memory.
- Start working on this assignment immediately. You will need enough time to understand the problem, read the background materials, and design your solution.
- We learn best by not doing plagiarism.

Evaluation scheme:

60 % correctness
30 % explanation in demo session
10 % program documentation (comments, neatness)

Task Description

Build a Java project for this assignment.

Moving A Stick Man Using Keyboard

The file **StickFigure.java** contains a class that represents a stick figure. Study the file and note that in addition to a method to draw the stick figure there are methods to manipulate it:

- The method **move** repositions ("moves") the figure up, down, left or right on the panel by changing the instance variables *baseX* and *baseY*.
- The method **grow** changes the size of the figure by a given factor by modifying the instance variable *height* and others.
- The method **setLegPosition** sets the position of the legs (number of pixels from vertical).
- The method **setArmPosition** sets the position of the arms (number of pixels from horizontal).

The file **MoveStickMan.java** contains a program that draws a single stick figure that can be moved around and modified using the keyboard. The file **MovePanel.java** represents the panel on which the stick figure is displayed. Note that the constructor adds a KeyListener and contains a call to the setFocusable method. There is a partially defined inner class named *MoveListener* that implements the KeyListener interface. Currently the MoveListener listens only for two arrow keys (left and right) and the g key. The arrow keys move the stick figure left and right on the panel (the number of pixels moved is in the constant *JUMP*) and when the user presses the g key, the figure "grows" (increases in height by 50%). Compile, and run the program. Test out the arrow keys and the g key.

Now change the program so that it responds to the following additional key events:

- When the up and down arrow keys are pressed the figure should move JUMP pixels up or down, respectively, on the panel.
- When the s key is pressed the figure should shrink by 50%. Make sure the figure can not become too small so that it can grow back.
- When the letter u (for up) is pressed, the stick figure should move its arms up and legs out; to make this happen add a call to *setArmPosition* to set the arm position and a call to *setLegPosition* to set the leg position. For example, when the u is pressed set the arm position to 60 and the leg position to 40 as follows:

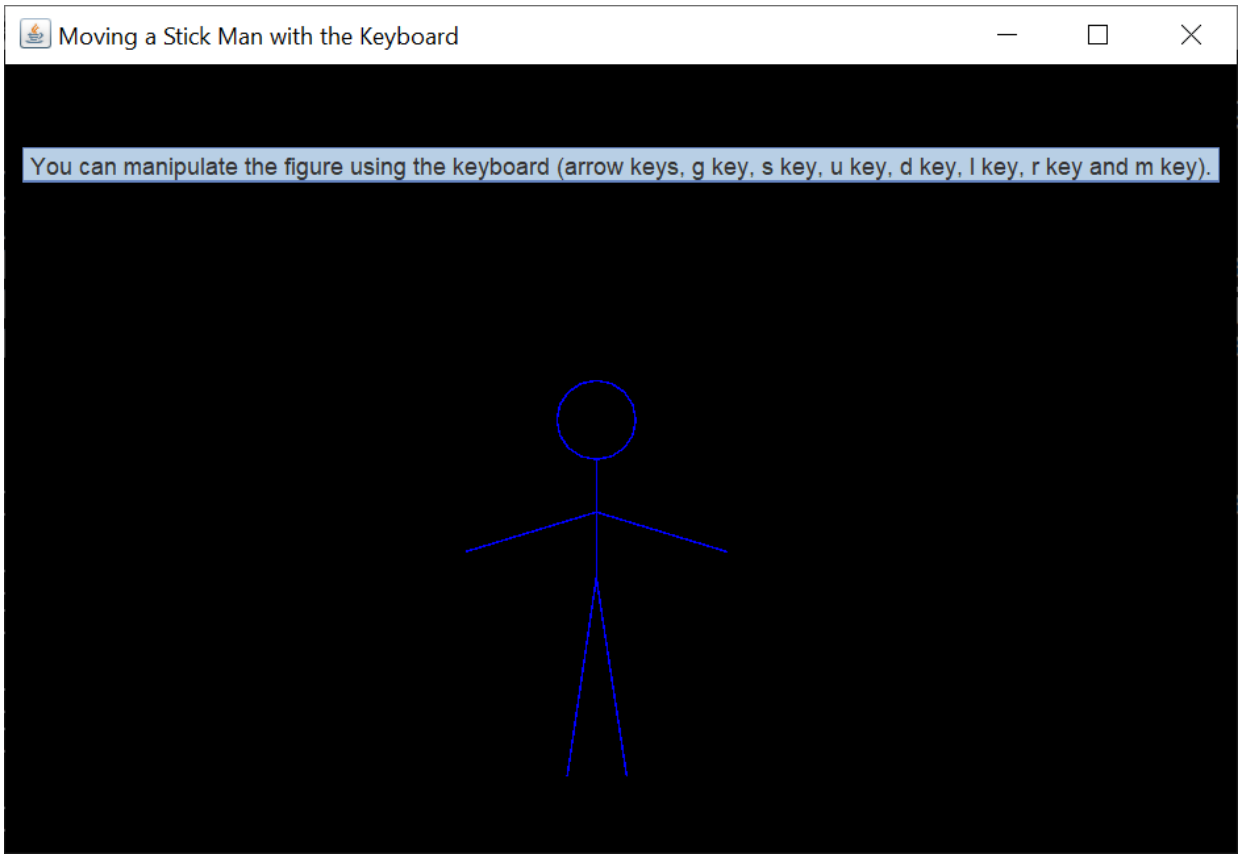
```
stickMan.setArmPosition(60);

stickMan.setLegPosition(40);
```

- When the letter m (for middle) is pressed, the stick figure should place its arms horizontally with legs not quite as far out. To do this the arm position needs to be 0 (0 pixels above horizontal); a value of 20 for the leg position is good.
- When the letter d (down) is pressed, the figure should move its arms down and its legs closer together. (Use -60 and 10 for the arm and leg positions, respectively).

Any Swing component can be assigned a ***tool tip***, which is a short line of text that will appear when the cursor is rested momentarily on top of the component. Tool tips are usually used to inform the user about the component, such as the purpose of a particular panel or button. A tool tip can be assigned using the `setToolTipText` method of a Swing component.
For example:

```
JButton button = new JButton ("GPA");
button.setToolTipText("Calculate the GPA of this student.");
```

- Add a tool tip to the MovePanel object created in the method **main**. The tool tip text should say "You can manipulate the figure using the keyboard (arrow keys, g key, s key, u key, d key, l key, r key and m key)." Or in Bahasa Indonesia: "Anda dapat memanipulasi gambar orang ini dengan keyboard (tombol-tombol panah, g, s, u, d dan m)."




```
// ********************************************************************
//   MoveStickMan.java
//
//   Uses key events to move a stick figure around.
// ********************************************************************

package TP03;

import javax.swing.*;

public class MoveStickMan
{
    // -----------------------------------------------
    //  Creates and displays the application frame.
    // -----------------------------------------------
    public static void main (String[] args)
    {
      JFrame frame = new JFrame ("Moving a Stick Man with the Keyboard");
      frame.setDefaultCloseOperation (JFrame.EXIT_ON_CLOSE);

      frame.add (new MovePanel());

      frame.pack();
      frame.setVisible(true);
    }
}
```

```
// ********************************************************
//    StickFigure.java
//
//    Represents a graphical stick figure
// ********************************************************
package TP03;

import java.awt.*;

public class StickFigure
{
    private int baseX;      // center of the figure
    private int baseY;      // bottom of the feet
    private Color color;    // color of the figure
    private int height;     // height of the figure
    private int headW;      // width of the head
    private int legLength;  // length of the legs
    private int legPosition;// # pixels the legs are up from vertical
    private int armLength;  // horizontal length of the arms
    private int armToFloor; // distance from base to arms
    private int armPosition;// # pixels arm is above/below horizontal

    // -------------------------------------------------------------
    // Construct a stick figure given its four attributes
    // -------------------------------------------------------------
    public StickFigure (int center, int bottom, Color shade, int size)
    {
      baseX = center;
      baseY = bottom;
      color = shade;
      height = size;

      // define body positions proportional to height
      headW = height / 5;
      legLength = height / 2;
      armToFloor = 2 * height / 3;
      armLength =  height / 3;

      // set initial position of arms and legs
      armPosition = -20;
      legPosition = 15;
    }

    // ----------------------------------------------
    // Draw the figure
    // ----------------------------------------------
    public void draw (Graphics page)
    {
      // compute y-coordinate of top of head
      int top = baseY - height;

      page.setColor (color);

      // draw the head
      page.drawOval(baseX-headW/2, top, headW, headW);

      // draw the trunk
      page.drawLine (baseX, top+headW, baseX, baseY - legLength);
```

```
      // draw the legs
      page.drawLine(baseX, baseY-legLength, baseX-legPosition, baseY);
      page.drawLine(baseX, baseY-legLength, baseX+legPosition, baseY);

      // draw the arms
      int startY = baseY - armToFloor;
      page.drawLine(baseX, startY, baseX-armLength, startY-armPosition);
      page.drawLine(baseX, startY, baseX+armLength, startY-armPosition);
    }

    // -----------------------------------------------------
    // Move the figure -- first parameter gives the
    // number of pixels over (to right if over is positive,
    // to the left if over is negative) and up or down
    // (down if the parameter down is positive, up if it is
    // negative)
    // -----------------------------------------------------
    public void move (int over, int down)
    {
      baseX += over;
      baseY += down;
    }

    // -----------------------------------------------------
    // Increase the height by the given factor (if the
    // factor is > 1 the figure will "grow" else it will
    // shrink)
    // -----------------------------------------------------
    public void grow (double factor)
    {
      height = (int) (factor * height);

      // reset body parts proportional to new height
      headW = height / 5;
      legLength = height / 2;
      armToFloor = 2 * height / 3;
      armLength = height / 3;
    }

    // -------------------------------------------------
    // set the legPosition (dist. from vertical) to
    // new value
    // -------------------------------------------------
    public void setLegPosition (int newPosition)
    {
      legPosition = newPosition;
    }

    // ---------------------------------------
    // set the arm position to the new value
    // ---------------------------------------
    public void setArmPosition (int newPos)
    {
      armPosition = newPos;
    }
}
```

```
// ********************************************************************
// MovePanel.java
//
// The display panel for a key events program  -- arrow keys are used
// to move a stick figure around, the g key is used to make the figure
// grow by 50% (increase in height by 50%), the s key causes the
// figure to shrink (to half its size)
// ********************************************************************
package TP03;

import javax.swing.*;
import java.awt.*;
import java.awt.event.*;

public class MovePanel extends JPanel
{
    private final int WIDTH = 600;
    private final int HEIGHT = 400;

    private final int JUMP = 5;    // number of pixels moved each step

    // the following give the initial parameters for the figure
    private final int START_CENTER = WIDTH/2;
    private final int START_BOTTOM = HEIGHT - 40;
    private final int SIZE = HEIGHT / 2;

    private StickFigure stickMan;

    // -----------------------------------------
    //   Constructor:  Sets up the panel
    // -----------------------------------------
    public MovePanel ()
    {
      addKeyListener(new MoveListener());

      stickMan = new StickFigure (START_CENTER, START_BOTTOM,
                        Color.blue, SIZE);

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

    // -----------------------------------------
    //    Draws the figure
    // -----------------------------------------
    public void paintComponent (Graphics page)
    {
      super.paintComponent (page);
      stickMan.draw (page);
    }
```

```
    // *********************************************************
    //  Represents a listener for keyboard activity.
    // *********************************************************
    private class MoveListener implements KeyListener
    {
      // -------------------------------------------------
      // Handle a key-pressed event: arrow keys cause the
      // figure to move horizontally or vertically; the g
      // key causes the figure to "grow", the s key causes
      // the figure to shrink, the u key causes arms and
      // legs to go up, m puts them in the middle, and d
      // down.
      // -------------------------------------------------
      public void keyPressed (KeyEvent event)
      {
          switch (event.getKeyCode())
          {
                case KeyEvent.VK_LEFT -> stickMan.move(-1*JUMP, 0);

                case KeyEvent.VK_RIGHT -> stickMan.move(JUMP, 0);

                case KeyEvent.VK_G -> stickMan.grow (1.5);

                default -> {}
          }

          repaint();
      }

      // -----------------------------------------
      // Define empty bodies for key event methods
      // not used
      // -----------------------------------------
      public void keyTyped (KeyEvent event) {}
      public void keyReleased (KeyEvent event) {}
    }
}
```

Happy Programming!
Selamat Mengerjakan!
'Met Ngoding! ☺
L.Y.Stefanus & the Asdos Team