CS 273 Laboratory 4: Selection

This laboratory will give you experience with Java's if-statements (conditionals).

Preliminaries

1. Login to your machine and create a folder named `lab4` on the `cs273` area of your network drive.
2. Go to the course website on http://learning.up.edu; download the `lab4.zip` file; and unzip it into the `lab4` folder you just created. The project has already been built for you.
3. Open the project and run `Lab4Main`. It should display a primitive-looking drawing of a robot, with a set of labeled check-boxes above the robot.
4. Open the code editor for `Lab4Area`. This is the class that you will be changing. (Do not change `Lab4Main!`)
5. Examine the `paint` method. Notice the code fragment:
   ```
   g.fillPolygon(body);
   ```
6. The pre-defined polygon named "body" is defined in `Lab4BaseArea.java`, for which you have not been given the source code. `Lab4Area.java` currently uses these pre-defined polygons to draw the robot:
   - `body`
   - `leftEye`
   - `rightEye`
   - `smileMouth`
   - `leftEar`
   - `rightEar`
   - `leftArm`
   - `rightArm`
   - `leftLeg`
   - `rightLeg`
7. There are a number of other "body parts" that are also defined in `Lab4BaseApplet.class`. You should use these body parts instead of creating your own. The following is the entire list that is available:
   - `body` - the robot's body
   - arms:
     - `leftArm` - the robot's left arm, normal length, straight
     - `rightArm` - right arm, normal length, straight
     - `longLeftArm` - left arm, long, straight
     - `shortLeftArm` - left arm, very short
     - `longLeftArmBentUp` - left arm, long, bent up
     - `leftArmBentUp` - left arm, normal length, bent up
     - `longLeftArmBentDown` - left arm, long, bent down
     - `leftArmBentDown` - left arm, normal length, bent down
     - `longRightArm` - right arm, long, straight
     - `shortRightArm` - right arm, short
     - `longRightArmBentUp` - right arm, long, bent up
     - `rightArmBentUp` - right arm, normal length, bent up

    - `longRightArmBentDown` - right arm, long, bent down
    - `rightArmBentDown` - right arm, bent down
- legs
    - `leftLeg` - left leg, straight
    - `rightLeg` - right leg, straight
    - `rightLegBent` - right leg, bent
    - `leftLegBent` - left leg, bent
    - `rightLegBigFeet` - right leg, straight, with big feet
    - `leftLegBigFeet` - left leg, straight, with big feet
    - `rightLegBentBigFeet` - right leg, bent, with big feet
    - `leftLegBentBigFeet` - left leg, bent with big feet
- ears
    - `rightEar` - right ear, normal size
    - `bigRightEar` - right ear, big
    - `leftEar` - left ear, normal size
    - `bigLeftEar` - left ear, big
- mouths
    - `smileMouth` - smiling mouth
    - `frownMouth` - frowning mouth
    - `whistleMouth` - whistling mouth
- eyes:
    - `leftEye` - left eye, looking straight
    - `leftEyeOut` - left eye, looking outward (i.e., left)
    - `leftEyeIn` - left eye looking inward (i.e., right)
    - `rightEye` - right eye, looking straight
    - `rightEyeOut` - right eye, looking outward (i.e., right)
    - `rightEyeIn` - right eye, looking inward (i.e., left)

Most of this laboratory will consist of modifying the `paint` method in `Lab4Area` so that it examines one or more check-boxes, and, uses that information to draw a robot that is customized according to color and body-part options. Every time a check-box is checked or unchecked, `Lab4BaseArea` repaints itself by calling your `paint` method. Your program can therefore continually keep the display of the robot consistent with the boxes that are checked.

Laboratory

Part 1: Allow the user to specify an alternate (green) color for the robot's body.

Modify the `paint` method so that if the "green body" box is checked, the robot's body is painted green. If the "green body" box is not checked, the robot's body should be silver.

The `Lab4BaseArea` class provides a method, `isChecked()`, that allows you to test whether a particular box is checked. For example, the following code can be used to check whether the "green body" box is checked:

```
if (isChecked("green body"))
{
```

```
        (etc...)
    }
```

checkpoint 1 (10 points): Have your lab instructor or assistant verify that your robot's body changes to green when appropriate.

Part 2: Allow the user to further customize the color of the robot's body.

Modify the `paint` method so that if any of the following boxes are checked, the robot's body is painted be the corresponding color:

- `silver body`
- `green body`
- `pink body`
- `sky blue body`

If none of the above boxes are checked, the body color should be silver. If more than one is checked, select the one nearest to the top of the above list (e.g., silver has priority over green). **Note:** Your CS203 Graphics Handout has a list of custom colors that may prove useful.

checkpoint 2 (10 points): Have your lab instructor or assistant verify that your robot's body changes color appropriately.

Part 3: Allow the user to customize the robots legs.

Modify the `paint` method so that if the `bent legs` box is checked then the robot's legs are drawn as bent rather than straight. Also, if `big feet` is checked, then the robot's feet are drawn "big" rather than normal size. If both of these boxes are checked, the robot should be drawn with big feet *and* with bent legs. The robot's legs should always be green.

checkpoint 3 (10 points): Have your lab instructor or assistant verify that your robot's legs change appropriately.

Part 4: Allow the user to customize the robot's ears.

Modify the `paint` method so that if the `big ears` box is checked, the robot is drawn with big ears. Also, if either of the following is checked, give the ears the corresponding color rather than pink:

- `red ears`
- `blue ears`

If both of the above boxes are checked, make the ears *purple*.

checkpoint 4 (15 points): Have your lab instructor or assistant verify that your robot's ears change appropriately.

Part 5: Allow the user to customize the robot's mouth

Modify the `paint` method so that if either of boxes

- `frown`
- `whistle`

is checked, the corresponding mouth-shape is drawn instead of a smile.
If both boxes are checked, use the one that was checked the most recently. You can test whether the "whistle" box was checked more recently than the "frown" box using the `whistleMoreRecent` method, as in:

```
if (whistleMoreRecent())
{
      ...
}
```

The robot's mouth should always be red (for now).

checkpoint 5 (10 points): Have your lab instructor or assistant verify that your robot's mouth changes appropriately.

Part 6: Allow the user to customize the robot's eyes

Modify the `paint` method so that if one of

- `look left`
- `look right`
- `cross-eyed`

is checked, the robot's eyes look the corresponding direction (i.e., left or right) rather than straight ahead. (Note: that this is the robot's left/right not your left/right.) If more than one of the above boxes is checked, then:

- if `cross-eyed` is checked, it takes precedence over the other two
- otherwise, if `look left` and `look right` are both checked, then they cancel each other out, and the robot looks straight ahead.

The robot's eyes should always be blue (for now).

checkpoint 6 (15 points): Have your lab instructor or assistant verify that your robot's eyes change appropriately.

If you have *fully* completed all the above checkpoints, you now have a grade of C- (70) for this lab.

Part 7: Allow eyes to be green, changing body color if conflicting

If the `green eyes` box is checked, change the color of the eyes to green. If this is done and if the body color would also be green, then make the body color *light green* so that the eyes can still be seen against the background of the body.

checkpoint 7 (10 points): Have your lab instructor or assistant verify that your robot changes appropriately.

If you have *fully* completed all the above checkpoints, you now have a grade of B- (80) for this lab.

Part 8: Customize the color of the robot's mouth based on the number of boxes checked

Use cascaded if-else statements so that the robot's mouth is colored as follows (listed in order from highest to lowest precedence):

- If the total number of boxes checked is greater than 10, the mouth-color should be black.
- Otherwise, if the number of boxes checked is even, the mouth-color should be white. (**Note:** 0 is a an even number.)
- Otherwise if the number of boxes checked is a prime number, the mouth-color should be orange. (**Note:** 1 is not a prime number)
- Otherwise, the mouth-color should be red.

The `totalNumChecked()` method returns an `int` to you that tells you how many boxes are checked.

checkpoint 8 (10 points): Have your lab instructor or assistant verify that your robot's mouth changes color appropriately. Let him/her examine your code.

If you have *fully* completed all the above checkpoints, you now have a grade of A- (90) for this lab.

Part 9: Allow the user to customize the robot's arms

If any of the following boxes are checked, and draw the robot's arms as follows:

- `short arms` - draw a short-armed robot. In this case, ignore any directives about bent arms or long arms.
- `long arms` - draw a long-armed robot. In this case, any directives about bent arms should imply *long* bent arms.
- `arms bent up` - the robot's arms should be bent up (unless `short arms` are specified).
- `arms bent down` - the robot's arms should be bent down (unless `short arms` are specified).

If both `long arms` and `short arms` are checked, use *short arms*. If both directions of bending are checked (and short arms is not checked), bend the arms down.

checkpoint 9 (10 points): Have your lab instructor or assistant verify that your robot's arms change appropriately.

If you have *fully* completed all the above checkpoints, you now have a grade of A (100) for this lab.

Part 10: Allow the user to override all changes to the left side of the robot

If `left normal` is checked, have all body parts on the left side of the robot (arm, leg, ear, eye) be drawn according to their default appearance (including coloring). For example, the left ear would be small and pink, regardless of which other boxes might be checked. The right side should still have an appearance that is consistent with the check-boxes.

checkpoint 10 (10 points): Have your lab instructor or assistant verify that your robot changes appropriately.

Part 11: finish up

Close all windows.
Log off.
You're done!.