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/**
 * This program defines two classes: A NumberConversionCalculator class
 * and a NumberConversion class. The NumberConversionCalculator class
 * sets up the GUI for the methods defined in the NumberConversion class
 * that actually allow for the base conversions to occur.
 *
 * @author Suchir Agarwal
 */

// All required imports
import javafx.application.Application;
import javafx.event.*;
import javafx.scene.Scene;
import javafx.scene.control.Label;
import javafx.scene.control.TextField;
import javafx.scene.control.Button;
import javafx.scene.layout.GridPane;
import javafx.scene.paint.Color;
import javafx.stage.Stage;
import javafx.geometry.Insets;

public class NumberConversionCalculator extends Application {
   private TextField inputTF;
   private TextField base1TF;
   private TextField base2TF;
   private TextField resultTF;
   private Label errMsg;

   public void start(Stage myStage) {
      // Set title
      myStage.setTitle("Number Base Conversion Calculator");

      // Create new GridPane and set padding, vertical, and horizontal spacing
      GridPane pane = new GridPane();
      pane.setPadding(new Insets(10, 10, 10, 10));
      pane.setVgap(5);
      pane.setHgap(5);

      // Create new scene
      Scene myScene = new Scene(pane);

      // Create Labels
      Label label1 = new Label("Input Number: ");
      Label label2 = new Label("Current input base \n(accepted values from 2-16): ");
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    Label label3 = new Label("Desired output base \n(accepted values from 2-16): ");
    Label label4 = new Label("Result: ");
    errMsg = new Label("Please enter valid inputs");

    errMsg.setTextFill(Color.web("#FF0000"));
    errMsg.setVisible(false);

    // Create TextFields
    inputTF = new TextField();
    base1TF = new TextField();
    base2TF = new TextField();
    resultTF = new TextField();

    // Create Button
    Button convert = new Button("Convert");

    // Create event handler object
    ButtonHandler buttonHandler = new ButtonHandler();

    // Register event handler
    convert.setOnAction(buttonHandler);

    // Add all Labels, TextFields, and Button to GridPane
    pane.add(label1, 0, 0);
    pane.add(label2, 0, 1);
    pane.add(label3, 0, 2);
    pane.add(label4, 0, 3);
    pane.add(errMsg, 0, 5);


    pane.add(inputTF, 1, 0);
    pane.add(base1TF, 1, 1);
    pane.add(base2TF, 1, 2);
    pane.add(resultTF, 1, 3);

    pane.add(convert, 1, 5);

    // Display
    myStage.setScene(myScene);
    myStage.show();
}

class ButtonHandler implements EventHandler<ActionEvent> {
    private String input;
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```
    private int base1;
    private int base2;

    public void handle(ActionEvent a) {
      try {
        input = inputTF.getText();
        base1 = Integer.parseInt(base1TF.getText());
        base2 = Integer.parseInt(base2TF.getText());
        resultTF.setText(NumberConversion.baseConvert(input, base1, base2));
        errMsg.setVisible(false);
      }
      catch (Exception e) {
        errMsg.setVisible(true);
      }
    }
  }

  public static void main( String[] args ) {
    launch();
  }
}

/**
 * This class consists of methods that
 * convert numbers between different number
 * systems.
 */
class NumberConversion {

  public static char charFromVal(int num) {
    if (num >= 0 && num <= 9)
      return (char) (num + 48);
    else
      return (char) (num + 55);
  }

  public static int valFromChar(char c) {
    if (c >= '0' && c <= '9')
      return (int) c - '0';
    else
      return (int) c - 'A' + 10;
  }
```

```
    public static String baseConvert(String input, int base1, int base2) {
        int temp = toDecimal(input, base1);
        String result = fromDecimal(temp, base2);

        return result;
    }

    public static String fromDecimal(int input, int base) {
        String revResult = "";

        while (input > 0) {
            revResult += charFromVal(input % base);
            input /= base;
        }

        String result = "";

        for (int i = revResult.length() - 1; i >= 0; i--) {
            result += revResult.substring(i, i + 1);
        }

        return result;
    }


    public static int toDecimal(String input, int base) {
        int power = 1;
        int num = 0;

        for (int i = input.length() - 1; i >= 0; i--) {
            num += valFromChar(input.charAt(i)) * power;
            power *= base;
        }

        return num;
    }

}
```