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20CG028103
300 Level, Computer Science

CSC313 Project
Encryption System using the Vigenère cipher (#5)
https://github.com/poopsicles/Eclipse

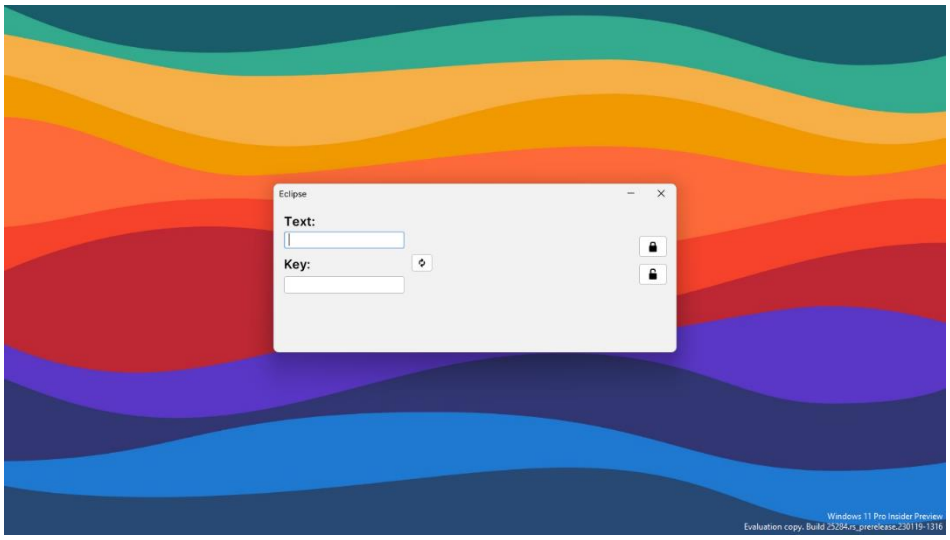
Introduction:

The project was to implement a small GUI application, using the Java Swing toolkit, that allows the user to encrypt and decrypt text using the Vigenère cipher.

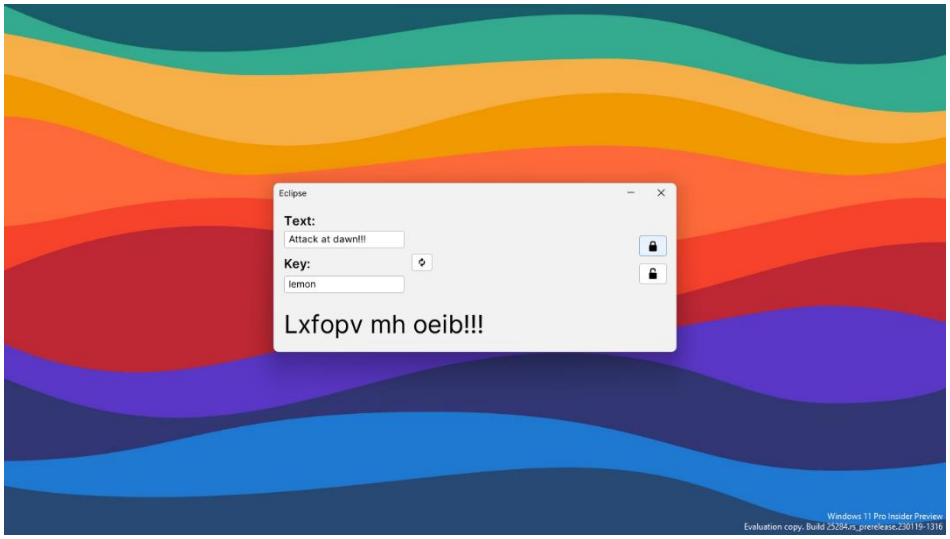
I did this, and added a few quality-of-life improvements, like a scrambling animation and text swap button.

Screenshots:

- The application when opened:

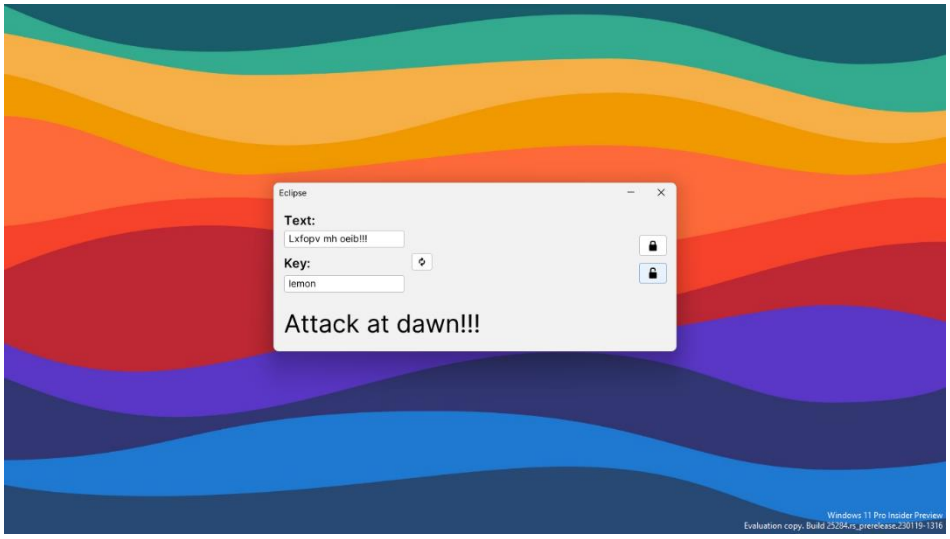


- The application encrypting a string:



- The application playing the scrambling animation:

- The application decrypting a string:



Button logic:

There're three buttons in the application: one to encrypt the text, one to decrypt, and another one to copy the output into the input text box, named `encryptButton`, `decryptButton`, and `swapButton`, respectively.

The logic for `swapButton` is the easiest:

```
swapButton.addActionListener(e -> {
    String output = outputText.getText();

    inputText.setText(output);
    outputText.setText("");
});
```

This simply sets the `inputTextbox` text to the current output and then clears the output, effectively "swapping" the contents and allowing the encryption/decryption to be reversed.

`encryptButton` and `decryptButton` are slightly more involved:

```
encryptButton.addActionListener(e -> {
    String input = inputText.getText();
    String key = keyText.getText();

    if (Objects.equals(input, "") || Objects.equals(key, "")) {
        return;
    }

    output = encrypt(input, key);

    scrambleTimer.start();
    endScrambleTimer.start();
});

decryptButton.addActionListener(e -> {
    String input = inputText.getText();
    String key = keyText.getText();

    if (Objects.equals(input, "") || Objects.equals(key, "")) {
        return;
    }

    output = decrypt(input, key);

    scrambleTimer.start();
    endScrambleTimer.start();
});
```

First, we get the text from the `inputText` and `keyText` textboxes (while making sure they're not empty). The strings are then passed to the respective encrypt/decrypt function and then the result is kept in `output`.

`scrambleTimer()` then begins, which triggers the playing of the scramble animation – which changes `outputText` to random characters every 50 milliseconds. At the same time, another timer starts, `endscrambleTimer()`, which waits for a second and then sets `outputText` to `output`, ending the animation.

Code:

Main.rs

```
// external imports for theme and font

import com.formdev.flatlaf.FlatLaf;
import com.formdev.flatlaf.FlatLightLaf;
import com.formdev.flatlaf.fonts.inter.FlatInterFont;

import javax.swing.*;
import java.awt.event.ActionEvent;
import java.awt.event.ActionListener;
import java.util.ArrayList;
import java.util.Objects;
import java.util.Random;

public class Main {
    // static imports for components that can be modified globally
    static JTextField inputText;
    static JTextField outputText;
    static Timer scrambleTimer;
    static Timer endScrambleTimer;
    static String output;

    public static void main(String[] args) {
        // set font to Inter
        FlatInterFont.install();
        FlatLaf.setPreferredFontFamily( FlatInterFont.FAMILY );
        FlatLaf.setPreferredLightFontFamily( FlatInterFont.FAMILY_LIGHT );
        FlatLaf.setPreferredSemiboldFontFamily(
FlatInterFont.FAMILY_SEMIBOLD );

        // fix anti-aliasing issue
        System.setProperty("awt.useSystemAAFontSettings","on");

        // round component corners
        UIManager.put("TextComponent.arc", 7);
        UIManager.put("Button.arc", 7);

        // setup L&F
        FlatLightLaf.setup();

        JFrame frame = new JFrame("Eclipse");
        frame.setSize(600, 253);
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        frame.setResizable(false);

        JPanel panel = new JPanel();
        frame.add(panel);
        placeComponents(panel);
```

```
    frame.setVisible(true);
    frame.setLocationRelativeTo(null);
}

// create components in a panel for easy adding
// manually layout code because automated layouts are bad
private static void placeComponents(JPanel panel) {
    panel.setLayout(null);

    JLabel inputLabel = new JLabel("Text:");
    inputLabel.setFont(UIManager.getFont("h2.font"));
    inputLabel.setBounds(15, 10, 100, 30);
    panel.add(inputLabel);

    inputText = new JTextField(0);
    inputText.setFont(UIManager.getFont("large.font"));
    inputText.setBounds(15, 40, 175, 25);
    panel.add(inputText);

    JLabel keyLabel = new JLabel("Key:");
    keyLabel.setFont(UIManager.getFont("h2.font"));
    keyLabel.setBounds(15, 75, 80, 25);
    panel.add(keyLabel);

    JTextField keyText = new JTextField(0);
    keyText.setFont(UIManager.getFont("large.font"));
    keyText.setBounds(15, 105, 175, 25);
    panel.add(keyText);

    outputText = new JTextField(0);
    outputText.setFont(UIManager.getFont("h00.font"));
    outputText.setEditable(false);
    outputText.setBackground(null);
    outputText.setBorder(null);
    outputText.setBounds(15, 150, 460, 50);
    outputText.setText("");
    panel.add(outputText);

    JButton encryptButton = new JButton("🔒");
    encryptButton.setFont(UIManager.getFont("h2.font"));
    encryptButton.setBounds(530, 47, 40, 30);
    panel.add(encryptButton);

    JButton decryptButton = new JButton("🔓");
    decryptButton.setFont(UIManager.getFont("h2.font"));
    decryptButton.setBounds(530, 87, 40, 30);
    panel.add(decryptButton);
```

```
    JButton swapButton = new JButton("🔃");
    swapButton.setBounds(200, 73, 30, 25);
    panel.add(swapButton);

    scrambleTimer = new Timer(50, new ScrambleAction());
    endScrambleTimer = new Timer(1000, new EndScrambleAction());

    // onclick event handlers
    encryptButton.addActionListener(e -> {
        String input = inputText.getText();
        String key = keyText.getText();

        if (Objects.equals(input, "") || Objects.equals(key, "")) {
            return;
        }

        output = encrypt(input, key);

        scrambleTimer.start();
        endScrambleTimer.start();
    });

    decryptButton.addActionListener(e -> {
        String input = inputText.getText();
        String key = keyText.getText();

        if (Objects.equals(input, "") || Objects.equals(key, "")) {
            return;
        }

        output = decrypt(input, key);

        scrambleTimer.start();
        endScrambleTimer.start();
    });

    swapButton.addActionListener(e -> {
        String output = outputText.getText();

        inputText.setText(output);
        outputText.setText("");
    });
}

// take two characters and return the cipher of a by b
private static char wrappingAdd(char a, char b) {
    return (char) (97 + ((a + b - 97) % 123) % 97);
}

// decipher the original character
```

```
    private static char wrappingSub(char c, char b) {
        return (char) (97 + ((Math.floorMod((Math.floorMod(c - b - 97,
123) - 97), 97)) % 26));
    }

    // to store original capitalisation
    private static ArrayList<Boolean> getCapsArray(String s) {
        ArrayList<Boolean> capsArray = new ArrayList<>();

        for (int i = 0; i < s.length(); i++) {
            if (Character.isUpperCase(s.charAt(i))) {
                capsArray.add(true);
            } else {
                capsArray.add(false);
            }
        }

        return capsArray;
    }

    // grab inputs and return encrypted version
    // skip non-letters
    public static String encrypt(String input, String key) {
        int keyLen = key.length();
        int inpLen = input.length();
        StringBuilder res = new StringBuilder(inpLen);
        ArrayList<Boolean> capsArray = getCapsArray(input);

        input = input.toLowerCase();
        key = key.toLowerCase();

        for (int i = 0; i < input.length(); i++) {
            char c = input.charAt(i);

            if (Character.isLetter(c)) {
                c = wrappingAdd(input.charAt(i), key.charAt(i % keyLen));

                res.append(
                        capsArray.get(i) ? Character.toUpperCase(c) : c
                );
            } else {
                res.append(c);
            }
        }

        return res.toString();
    }

    // grab inputs and return decrypted version
    // skip non-letters
```

```
    public static String decrypt(String input, String key) {
        int keyLen = key.length();
        int inpLen = input.length();
        StringBuilder res = new StringBuilder(inpLen);
        ArrayList<Boolean> capsArray = getCapsArray(input);

        input = input.toLowerCase();
        key = key.toLowerCase();

        for (int i = 0; i < input.length(); i++) {
            char c = input.charAt(i);

            if (Character.isLetter(c)) {
                c = wrappingSub(input.charAt(i), key.charAt(i % keyLen));

                res.append(
                        capsArray.get(i) ? Character.toUpperCase(c) : c
                );
            } else {
                res.append(c);
            }
        }

        return res.toString();
    }

    public static String scrambleText(String originalText) {
        String ALL_POSSIBLE_CHARACTERS =
"abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789!\"#$%&'()*+
,-./:;<=>?@[\\]^_`{|}~";
        Random RANDOM = new Random();

        char[] originalTextArray = originalText.toCharArray();
        java.util.List<Character> characters = new ArrayList<>();
        for (char c : originalTextArray) {
            characters.add(c);
        }
        for (int i = 0; i < characters.size(); i++) {
            int randomIndex = RANDOM.nextInt(characters.size());
            char randomChar =
ALL_POSSIBLE_CHARACTERS.charAt(RANDOM.nextInt(ALL_POSSIBLE_CHARACTERS.leng
th()));
            characters.set(randomIndex, randomChar);
        }
        StringBuilder scrambledText = new StringBuilder();
        for (char c : characters) {
            scrambledText.append(c);
        }
        return scrambledText.toString();
    }
```

```
    private static class ScrambleAction implements ActionListener {
        @Override
        public void actionPerformed(ActionEvent e) {
            String scrambledText = scrambleText(inputText.getText());
            outputText.setText(scrambledText);
        }
    }

    private static class EndScrambleAction implements ActionListener {
        @Override
        public void actionPerformed(ActionEvent e) {
            scrambleTimer.stop();
            endScrambleTimer.stop();

            outputText.setText(output);
        }
    }
}
```