Smart Traffic Signal

Tasks:

1. **Data Collection and Modelling:**

   Define a data structure to collect real-time traffic data from sensors

Code:

```
public class TrafficData {
    private int vehicleCount;
    private double averageSpeed;
    private int intersectionId;
    private long timestamp;

    public TrafficData(int vehicleCount, double averageSpeed, int intersectionId,
long timestamp) {
        this.vehicleCount = vehicleCount;
        this.averageSpeed = averageSpeed;
        this.intersectionId = intersectionId;
        this.timestamp = timestamp;
    }
}
```

2. **Algorithm Design:**

Develop algorithms to analyze the collected data and optimize traffic signal timings.

CODE:

```
public class TrafficSignalOptimizer {
    public static int calculateGreenTime(TrafficData data) {
        int baseGreenTime = 30; // Base green time in seconds
        int maxGreenTime = 120; // Maximum green time in seconds
        int greenTime = baseGreenTime + data.getVehicleCount() / 10;
        return Math.min(greenTime, maxGreenTime);
    }
    public static void optimizeSignal(TrafficData[] trafficDataArray) {
        for (TrafficData data : trafficDataArray) {
            int greenTime = calculateGreenTime(data);
            System.out.println("Intersection " + data.getIntersectionId() + ": Set
green time to " + greenTime + " seconds");
        }
    }
}
```

3.Implementation:

Implement a Java application that integrates with traffic sensors and controls traffic signals.

CODE:

```
import java.util.Timer;

import java.util.TimerTask;

public class TrafficSignalController {

    private TrafficSensor trafficSensor;

    private TrafficSignal trafficSignal;
    public TrafficSignalController(TrafficSensor trafficSensor, TrafficSignal trafficSignal) {
        this.trafficSensor = trafficSensor;
        this.trafficSignal = trafficSignal;
    }
    public void start() {
        Timer timer = new Timer();
        timer.schedule(new TimerTask() {
            @Override
            public void run() {
                TrafficData data = trafficSensor.collectData();
                int greenTime = TrafficSignalOptimizer.calculateGreenTime(data);
                trafficSignal.setGreenTime(greenTime);
            }
        }, 0, 10000); // Adjust traffic signals every 10 seconds
    }
}
```

4. Visualization and Reporting:

Develop visualizations and generate reports.

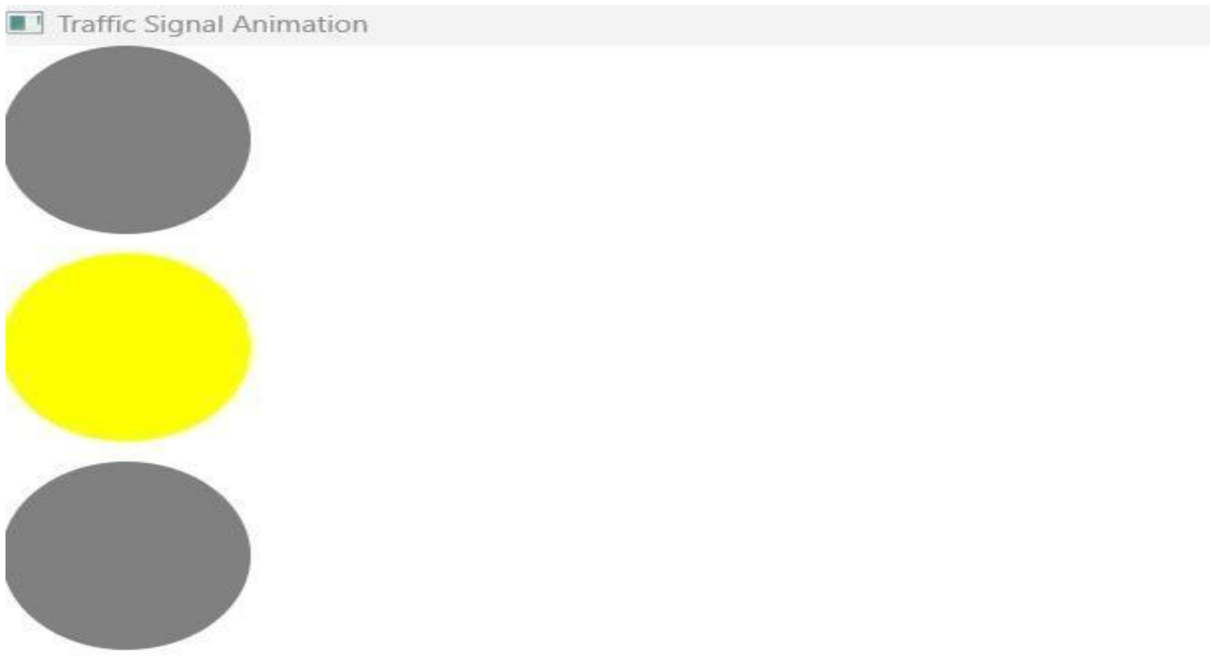
CODE:

```
package com.example.trafficsignalsnew;
```

```
import javafx.animation.KeyFrame;
import javafx.animation.Timeline;
import javafx.application.Application;
import javafx.scene.Scene;
import javafx.scene.layout.StackPane;
import javafx.scene.paint.Color;
import javafx.scene.shape.Circle;
import javafx.scene.layout.VBox;
import javafx.stage.Stage;
import javafx.util.Duration;

import java.io.IOException;


public class HelloApplication extends Application {
    @Override
    public void start(Stage primaryStage) {
        Circle redLight = new Circle(50, Color.RED);
        Circle yellowLight = new Circle(50, Color.GRAY);
        Circle greenLight = new Circle(50, Color.GRAY);
        VBox root = new VBox(10);
        root.getChildren().addAll(redLight, yellowLight, greenLight);
        Scene scene = new Scene(root, 200, 600);
        primaryStage.setTitle("Traffic Signal Animation");
        primaryStage.setScene(scene);
        primaryStage.show();
}

    Timeline timeline = new Timeline(
            new KeyFrame(Duration.seconds(0), e -> {
                redLight.setFill(Color.RED);
                yellowLight.setFill(Color.GRAY);
                greenLight.setFill(Color.GRAY);
            }),
            new KeyFrame(Duration.seconds(3), e -> {
                redLight.setFill(Color.GRAY);
                yellowLight.setFill(Color.YELLOW);
                greenLight.setFill(Color.GRAY);
            }),
            new KeyFrame(Duration.seconds(6), e -> {
                redLight.setFill(Color.GRAY);
                yellowLight.setFill(Color.GRAY);
                greenLight.setFill(Color.GREEN);
            }),
            new KeyFrame(Duration.seconds(9), e -> {
                redLight.setFill(Color.RED);
                yellowLight.setFill(Color.GRAY);
                greenLight.setFill(Color.GRAY);
            })
    );
    timeline.setCycleCount(Timeline.INDEFINITE);
    timeline.play();
}
```

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

5.User Interaction:


Traffic Signal Animation