BSc (Hons) Artificial Intelligence and Data Science

Module: CM1601

Programming Fundamentals

Individual Coursework Report

Module Leader: Ms. Sachinthani Perera

RGU Student ID :

IIT Student ID :

Student Name :

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1.1 Brief Overview of the Project

TechExpo Management System is a JavaFX developed user interface system tailored for the annual Information Technology fair dubbed TechExpo to be held by Sarah. The details of participants' projects can be well managed through this system and there are many opportunities which can enrich the event. The key features of the application include:The key features of the application include:

- Adding Project Details: Among these are; Project ID, Project Name, Category, Team Members, Brief Description, Country, and the Team Logo.

- Updating Project Details: During independent working time before the selection of project spotlights, participants can make changes to the project information if necessary.

- Deleting Project Details: Indeed, users can remove projects that were created before, and thus having a more updated project list along the time.

- Viewing Project Details: Projects are consequently organized in a clean table with sortable by Project ID and thumbnail images to guarantee convenient identification of the procedures.

- Saving Project Details to Text File: The application has the option of storing all the details about a project to a text file, and this make the application have features of categorising the data.

- Random Spotlight Selection: Random selection is made in order to pick up projects from each category and its presentation in the showcase thereby making the occasion and event fun filled.

- Visualizing Award-Winning Projects: The last one represents the scores that all the projects got by the students with the help of the graph and in this way, we can understand which projects were better.

- Exiting the Program: To conclude, the users can efficiently get out of the application whenever they wish.

In conclusion, the proposed TechExpo Management System improves the course of project for participants and organizers as well as enriches the experience of the annual event by allowing the user to control a number of aspects of the event through the web interface with the fundamental functionalities of the system.

1.2 Key Objectives and Outcomes

Key Objectives

1. Efficient Project Management:
   - Allow the participants to join as well as edit the projects, review or delete as extended to the members.
   - Ensure that the system interface of the project management information is easy to use.

2. Data Persistence:
   - Make sure that all the details entered into the project can be exported into a text file so that you can easily look for and sort through them.

3. Interactive Features:
   - Organize random selection of the spotlight to make the participants more active and to use this as a way of encouraging them during the event.
   - Help in judging by compiling the scores given by several judges so that they don’t conflict with one another.

4. Award Recognition:
   - Rank projects according to the judge’s score and ensure that the three highest scores correspond to thee best projects.
   - Organize places of outstanding projects in comprehensible and easy-to-use visualization.

5. Enhanced User Experience:
   - Implement the GUI design in JavaFX to be attractive and easy to interact with.
   - Make confident the application is stable, flexible and fast responding to numerous operations on it.

6. Comprehensive Showcase Experience:
   - Ensure that all required applications are given and that the entire experience is enjoyable and easy for the TechExpo people.

Expected Outcomes

1. Streamlined Project Workflow:
   - It makes it easy for the participants and the organizers to coordinate in handling out the particularities of the project implementation thus creating order.

2. Organized Data Management:
   - All information concerning the project is saved and labeled properly in a text file; this creates a backup that can be frequently referred to.

3. Engaging Event Experience:
   - These factors portray the event to be dynamic and appealing by having the random choosing of the spotlight and the visualizations.

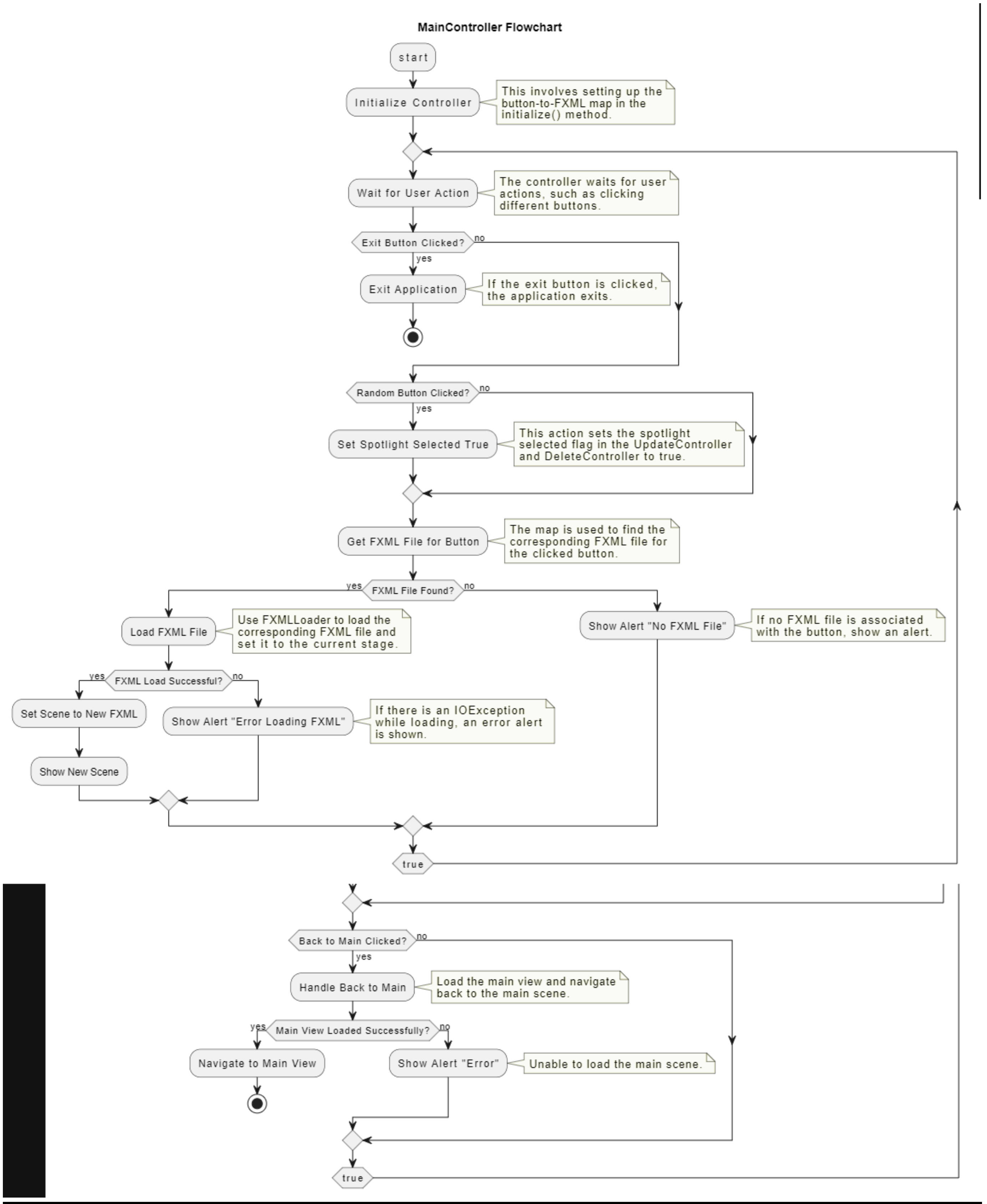
4. Fair and Transparent Judging Process::
   - The application helps to control the score and ranking, and the projects of the students are ranked ideally at the top.

5. Improved Satisfaction:
   - This is made possible by the smooth operational cycle of the application in that users get to engage with the application easily and a result the satisfaction level of the participants and organizers is raised.

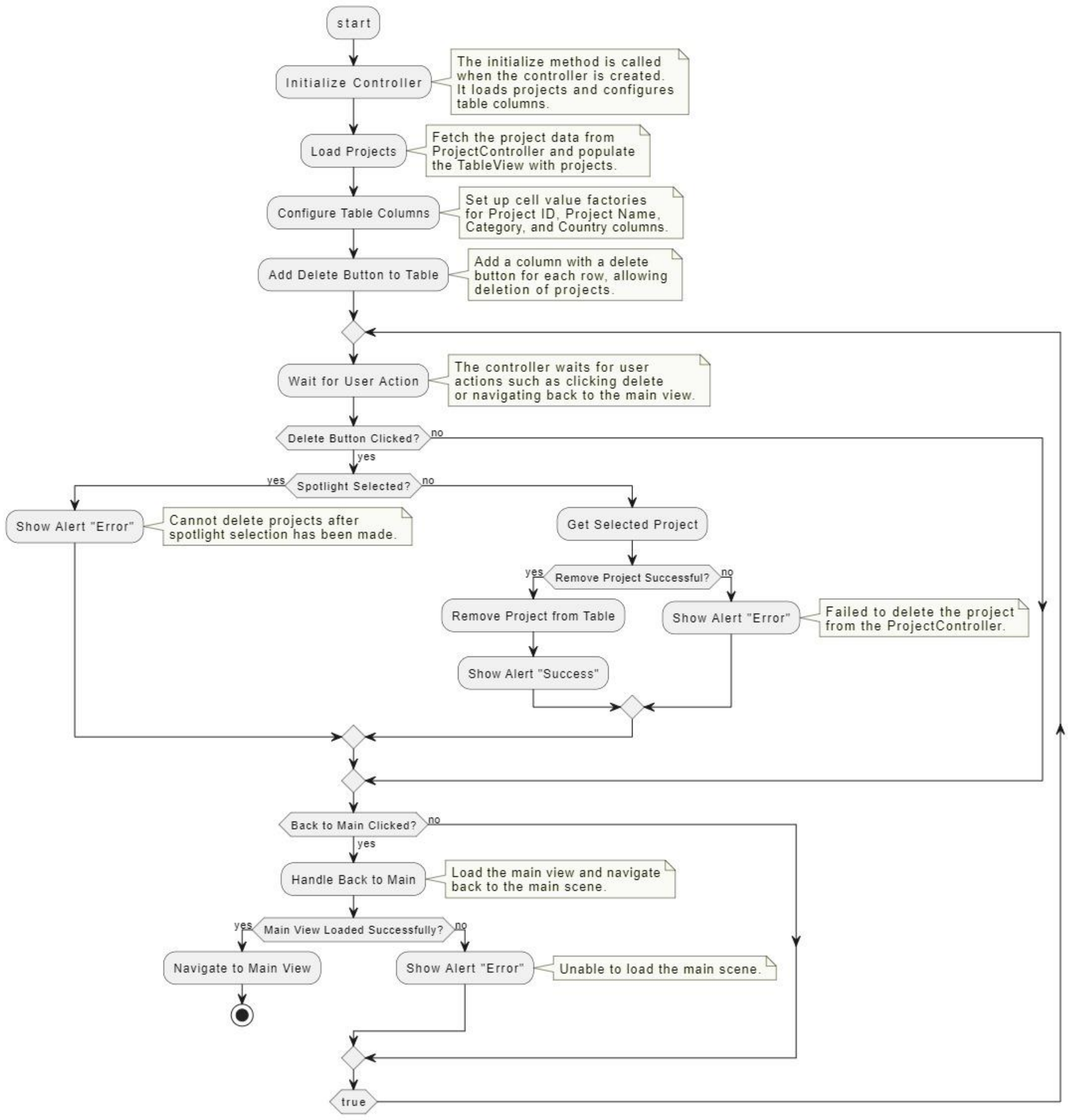
6. Successful Event Execution:

- Altogether the prepared TechExpo event is more organized, engaging and fun to undertale comparing to the previous one and a good example that reflect the efficiency of the management system.

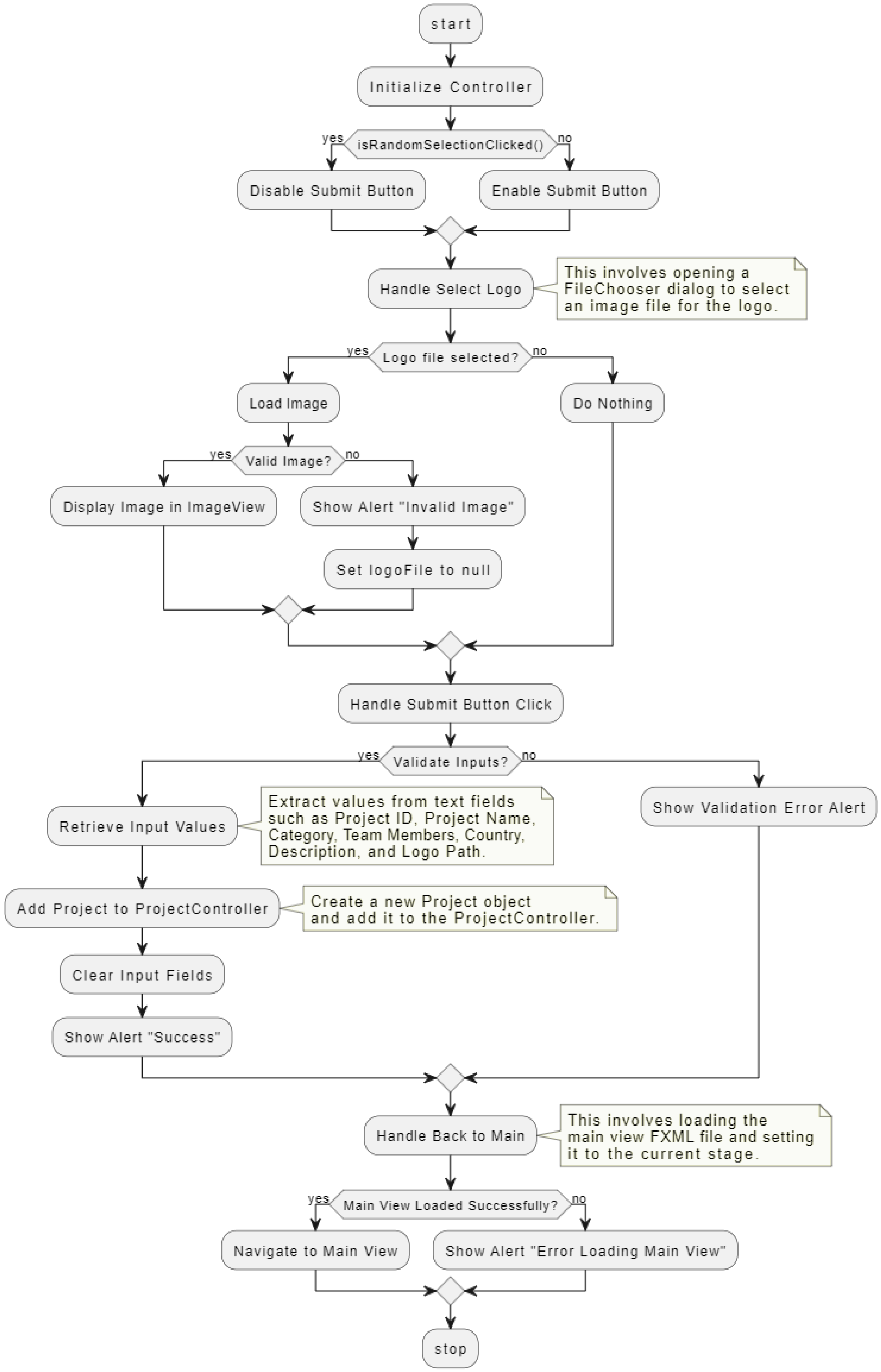
2.2 Flow Chart


MainController Flowchart
start
Initialize Controller
This involves setting up the button-to-FXML map in the initialize() method.
Wait for User Action
The controller waits for user actions, such as clicking different buttons.
Exit Button Clicked?
no
yes
Exit Application
If the exit button is clicked, the application exits.
Random Button Clicked?
no
yes
Set Spotlight Selected True
This action sets the spotlight selected flag in the UpdateController and DeleteController to true.
Get FXML File for Button
The map is used to find the corresponding FXML file for the clicked button.
yes
FXML File Found?
no
Load FXML File
Use FXMLLoader to load the corresponding FXML file and set it to the current stage.
Show Alert "No FXML File"
If no FXML file is associated with the button, show an alert.
yes
FXML Load Successful?
no
Set Scene to New FXML
Show Alert "Error Loading FXML"
If there is an IOException while loading, an error alert is shown.
Show New Scene
true
Back to Main Clicked?
no
yes
Handle Back to Main
Load the main view and navigate back to the main scene.
yes
Main View Loaded Successfully?
no
Navigate to Main View
Show Alert "Error"
Unable to load the main scene.
true

DeleteController Flowchart


start
Initialize Controller
The initialize method is called when the controller is created. It loads projects and configures table columns.
Load Projects
Fetch the project data from ProjectController and populate the TableView with projects.
Configure Table Columns
Set up cell value factories for Project ID, Project Name, Category, and Country columns.
Add Delete Button to Table
Add a column with a delete button for each row, allowing deletion of projects.
Wait for User Action
The controller waits for user actions such as clicking delete or navigating back to the main view.
Delete Button Clicked?
no
yes
Spotlight Selected?
yes
no
Show Alert "Error"
Cannot delete projects after spotlight selection has been made.
Get Selected Project
Remove Project Successful?
yes
no
Remove Project from Table
Show Alert "Error"
Failed to delete the project from the ProjectController.
Show Alert "Success"
Back to Main Clicked?
no
yes
Handle Back to Main
Load the main view and navigate back to the main scene.
Main View Loaded Successfully?
yes
no
Navigate to Main View
Show Alert "Error"
Unable to load the main scene.
true

AddController Flowchart


start
Initialize Controller
isRandomSelectionClicked()
yes
no
Disable Submit Button
Enable Submit Button
Handle Select Logo
This involves opening a FileChooser dialog to select an image file for the logo.
Logo file selected?
yes
no
Load Image
Do Nothing
Valid Image?
yes
no
Display Image in ImageView
Show Alert "Invalid Image"
Set logoFile to null
Handle Submit Button Click
Validate Inputs?
yes
no
Retrieve Input Values
Extract values from text fields such as Project ID, Project Name, Category, Team Members, Country, Description, and Logo Path.
Show Validation Error Alert
Add Project to ProjectController
Create a new Project object and add it to the ProjectController.
Clear Input Fields
Show Alert "Success"
Handle Back to Main
This involves loading the main view FXML file and setting it to the current stage.
Main View Loaded Successfully?
yes
no
Navigate to Main View
Show Alert "Error Loading Main View"
stop

2.2 Code Implementation and Explanation

2.2.1 Adding Project Details

2.2.1 Adding Project Details

```java
package lk.rgu.javafx;

import javafx.fxml.FXML;
import javafx.scene.control.*;
import javafx.scene.image.Image;
import javafx.scene.image.ImageView;
import javafx.stage.FileChooser;
import javafx.scene.Parent;
import javafx.scene.Scene;
import javafx.stage.Stage;
import javafx.fxml.FXMLLoader;
import java.io.File;
import java.io.IOException;

public class AddController {

    @FXML
    TextField projectIdField;
    @FXML
    TextField projectNameField;
    @FXML
    TextField categoryField;
    @FXML
    TextField teamMember1Field;
    @FXML
    TextField teamMember2Field;
    @FXML
    TextField teamMember3Field;
    @FXML
    TextField countryField;

    @FXML
    TextArea descriptionArea;
    @FXML
    private ImageView logoImageView;

    @FXML
    private Button submitButton; // Add a reference to the submit button

    private File logoFile; // To store the selected logo file

    @FXML
    private void initialize() {
        if (ProjectStateController.isRandomSelectionClicked()) {
            submitButton.setDisable(true); // Disable submit button if random
selection clicked
```

```java
        }
    }

    @FXML
    private void handleSelectLogo() {
        FileChooser fileChooser = new FileChooser();
        fileChooser.setTitle("Select Team Logo");
        fileChooser.getExtensionFilters().add(new FileChooser.ExtensionFilter("Image
Files", "*.png", "*.jpg", "*.jpeg"));
        logoFile = fileChooser.showOpenDialog(null);

        if (logoFile != null) {
            try {
                Image image = new Image(logoFile.toURI().toString());
                logoImageView.setImage(image);
            } catch (Exception e) {
                showAlert("Invalid Image", "The selected file is not a valid
image.");
                logoFile = null;
            }
        }
    }

    @FXML
    void handleSubmit() {
        if (validateInputs()) {
            String projectId = projectIdField.getText();
            String projectName = projectNameField.getText();
            String category = categoryField.getText();
            String teamMember1 = teamMember1Field.getText();
            String teamMember2 = teamMember2Field.getText();
            String teamMember3 = teamMember3Field.getText();
            String country = countryField.getText();
            String description = descriptionArea.getText();
            String logoPath = logoFile != null ? logoFile.getAbsolutePath() : null;

            // Add the project to the ProjectController
            ProjectController.addProject(new ProjectController.Project(projectId,
projectName, category, teamMember1, teamMember2, teamMember3, country, description,
logoPath));

            // Clear the fields after submission
            clearFields();

            // Notify the user
            showAlert("Success", "Project details have been successfully
submitted.");
        }
    }

    @FXML
    private void handleBackToMain() {
        try {
            // Load the main view
            FXMLLoader loader = new FXMLLoader(getClass().getResource("main-
view.fxml"));
            Parent root = loader.load();

            // Set up the stage
            Stage stage = (Stage) projectIdField.getScene().getWindow();
            stage.setScene(new Scene(root));
        } catch (IOException e) {
            e.printStackTrace();
            showAlert("Error", "Unable to load main view.");
        }
    }

    boolean validateInputs() {
        // Validate Project ID (must be a 4-digit number)
        String projectId = projectIdField.getText();
        if (projectId.isEmpty() || !projectId.matches("\\d{4}")) {
            showAlert("Invalid Project ID", "Project ID must be a 4-digit number.");
            return false;
        }

        // Validate other fields (similar validation can be applied to other fields)
        if (projectNameField.getText().isEmpty()) {
            showAlert("Invalid Input", "Project Name cannot be empty.");
            return false;
        }

        if (categoryField.getText().isEmpty()) {
            showAlert("Invalid Input", "Category cannot be empty.");
            return false;
        }

        if (teamMember1Field.getText().isEmpty()) {
            showAlert("Invalid Input", "Team Member 01 cannot be empty.");
            return false;
        }

        if (countryField.getText().isEmpty()) {
            showAlert("Invalid Input", "Country cannot be empty.");
            return false;
        }

        if (descriptionArea.getText().isEmpty()) {
            showAlert("Invalid Input", "Brief Description cannot be empty.");
            return false;
        }

        return true;
    }

    private void showAlert(String title, String message) {
        Alert alert = new Alert(Alert.AlertType.INFORMATION);
        alert.setTitle(title);
        alert.setHeaderText(null);
        alert.setContentText(message);
        alert.showAndWait();
    }

    private void clearFields() {
        projectIdField.clear();
        projectNameField.clear();
        categoryField.clear();
        teamMember1Field.clear();
        teamMember2Field.clear();
        teamMember3Field.clear();
        countryField.clear();
        descriptionArea.clear();
        logoImageView.setImage(null);
        logoFile = null;
    }
}
```

1. Key Features of AddController:
   - **Field Definitions:** Blank fields for general project name, project type, project size and other details and a preview section an image of the logo.
   - **Validation:** Make sure that the inputs meet the qualifications before submitting (e. g. Project ID must be of four digits).
   - **Logo Selection:** Apply a FileChooser to make the user able to choose a logo image of their team.
   - **Form Submission:** Insert validated statistic into the project list and blank the fields after submission.
   - **Navigation:** Deal with control of the screen returning to the main view.
   - **State Control:** Suspend some of the features according to the application status
2. **Purpose:** Insight: Input new project details into the database, so that the organization could access the same anytime in the near future if the need arose.
3. **Details to Include:**
   - Project ID, which a number code ranging from 1001 to 9999
   - Project Name
   - Type (for example AI, Web Development)
   - Team Members
   - Brief Description
   - Country
   - Team logo, a bitmap or a picture of the team.

2.2.2 Updating Project Details

```
package lk.rgu.javafx;

import javafx.event.ActionEvent;
import javafx.fxml.FXML;
import javafx.scene.control.*;
import javafx.scene.image.Image;
import javafx.scene.image.ImageView;
import javafx.stage.FileChooser;
import javafx.scene.Parent;
import javafx.scene.Scene;
import javafx.stage.Stage;
import javafx.fxml.FXMLLoader;
import javafx.collections.FXCollections;
import javafx.collections.ObservableList;
import javafx.scene.control.cell.PropertyValueFactory;
import java.io.File;
import java.io.IOException;

public class UpdateController {

    @FXML
    private TableView<ProjectController.Project> projectTable;
    @FXML
    private TableColumn<ProjectController.Project, String> projectIdColumn;
    @FXML
    private TableColumn<ProjectController.Project, String> projectNameColumn;
    @FXML
    private TableColumn<ProjectController.Project, String> categoryColumn;
    @FXML
    private TableColumn<ProjectController.Project, String> countryColumn;

    @FXML
    private TextField projectIdField, projectNameField, categoryField,
teamMembersField, countryField;
    @FXML
    private TextArea descriptionArea;
    @FXML
    private ImageView logoImageView;
    @FXML
    private Button updateButton; // Reference to the update button

    private File logoFile; // To store the selected logo file

    private final ObservableList<ProjectController.Project> projectList =
FXCollections.observableArrayList();

    private static boolean spotlightSelected = false;

    public static void setSpotlightSelected(boolean isSelected) {
        spotlightSelected = isSelected;
    }

    @FXML
    private void initialize() {
        projectIdColumn.setCellValueFactory(new PropertyValueFactory<>("projectId"));
        projectNameColumn.setCellValueFactory(new
PropertyValueFactory<>("projectName"));
        categoryColumn.setCellValueFactory(new PropertyValueFactory<>("category"));
        countryColumn.setCellValueFactory(new PropertyValueFactory<>("country"));

        projectList.addAll(ProjectController.getAllProjects());
        projectTable.setItems(projectList);
        projectTable.getSelectionModel().selectedItemProperty().addListener((obs,
oldSelection, newSelection) -> {
            if (newSelection != null) {
                populateFields(newSelection);
            }
        });

        if (spotlightSelected) {
            updateButton.setDisable(true); // Disable update button if random
selection clicked
        }
    }

    private void populateFields(ProjectController.Project project) {
        projectIdField.setText(project.getProjectId());
        projectNameField.setText(project.getProjectName());
        categoryField.setText(project.getCategory());
        teamMembersField.setText(String.join(", ", project.getTeamMembers())); // Use
the getTeamMembers method
        countryField.setText(project.getCountry());
        descriptionArea.setText(project.getDescription());

        if (project.getLogoPath() != null) {
            File file = new File(project.getLogoPath());
            if (file.exists()) {
                logoImageView.setImage(new Image(file.toURI().toString()));
            } else {
                logoImageView.setImage(null);
            }
        } else {
            logoImageView.setImage(null); // Clear the ImageView if no logo is set
        }
    }

    @FXML
    private void handleSelectLogo() {
        FileChooser fileChooser = new FileChooser();
        fileChooser.setTitle("Select Team Logo");
        fileChooser.getExtensionFilters().add(new FileChooser.ExtensionFilter("Image
Files", "*.png", "*.jpg", "*.jpeg"));
        logoFile = fileChooser.showOpenDialog(null);

        if (logoFile != null) {
            try {
                Image image = new Image(logoFile.toURI().toString());
                logoImageView.setImage(image);
            } catch (Exception e) {
                showAlert("Invalid Image", "The selected file is not a valid
image.");
                logoFile = null;
            }
        }
    }

    @FXML
    private void handleUpdateProject() {
        ProjectController.Project selectedProject =
projectTable.getSelectionModel().getSelectedItem();
        if (selectedProject == null) {
            showAlert("No Selection", "No project selected. Please select a project
to update.");
            return;
        }

        if (validateInputs()) {
            String projectId = projectIdField.getText();
            String projectName = projectNameField.getText();
            String category = categoryField.getText();
            String[] teamMembers = teamMembersField.getText().split(",");
            String country = countryField.getText();
            String description = descriptionArea.getText();

            selectedProject.setProjectId(projectId);
            selectedProject.setProjectName(projectName);
            selectedProject.setCategory(category);
            selectedProject.setTeamMembers(teamMembers); // Use the setTeamMembers
method
            selectedProject.setCountry(country);
            selectedProject.setDescription(description);

            if (logoFile != null) {
                selectedProject.setLogoPath(logoFile.getAbsolutePath());
            }

            projectTable.refresh();

            showAlert("Update Successful", "Project details updated successfully!");
        }
    }

    @FXML
    private void handleBackToMain(ActionEvent event) throws IOException {
        Parent root = FXMLLoader.load(getClass().getResource("main-view.fxml"));
        Stage stage = (Stage) projectTable.getScene().getWindow();
        Scene scene = new Scene(root);
        stage.setScene(scene);
        stage.show();
    }

    private boolean validateInputs() {
        String errorMessage = "";

        if (projectIdField.getText().isEmpty()) {
            errorMessage += "Project ID is required.\n";
        } else {
            try {
                int projectId = Integer.parseInt(projectIdField.getText());
                if (projectId < 1000 || projectId > 9999) {
                    errorMessage += "Project ID must be a 4-digit number.\n";
                }
            } catch (NumberFormatException e) {
                errorMessage += "Project ID must be a number.\n";
            }
        }

        if (projectNameField.getText().isEmpty()) {
            errorMessage += "Project Name is required.\n";
        }
        if (categoryField.getText().isEmpty()) {
            errorMessage += "Category is required.\n";
        }

        if (teamMembersField.getText().isEmpty()) {
            errorMessage += "Team Members are required.\n";
        }

        if (countryField.getText().isEmpty()) {
            errorMessage += "Country is required.\n";
        }

        if (descriptionArea.getText().isEmpty()) {
            errorMessage += "Description is required.\n";
        }

        if (!errorMessage.isEmpty()) {
            showAlert("Invalid Inputs", errorMessage);
            return false;
        }

        return true;
    }

    private void showAlert(String title, String content) {
        Alert alert = new Alert(Alert.AlertType.INFORMATION);
        alert.setTitle(title);
        alert.setHeaderText(null);
        alert.setContentText(content);
        alert.showAndWait();
    }

    public void handleUpdate(ActionEvent actionEvent) {
        // Get the selected project from the table
        ProjectController.Project selectedProject =
projectTable.getSelectionModel().getSelectedItem();

        if (selectedProject == null) {
            // Alert the user if no project is selected
            showAlert("No Selection", "No project selected. Please select a project
to update.");
            return;
        }

        // Validate inputs before proceeding with the update
        if (validateInputs()) {
            // Retrieve updated details from input fields
            String projectId = projectIdField.getText();
            String projectName = projectNameField.getText();
            String category = categoryField.getText();
            String[] teamMembers = teamMembersField.getText().split(","); // Split by
comma
            String country = countryField.getText();
            String description = descriptionArea.getText();

            // Update the selected project's attributes
            selectedProject.setProjectId(projectId);
            selectedProject.setProjectName(projectName);
            selectedProject.setCategory(category);
            selectedProject.setTeamMembers(teamMembers); // Update team members
            selectedProject.setCountry(country);
            selectedProject.setDescription(description);

            // If a new logo is selected, update the project's logo path
            if (logoFile != null) {
                selectedProject.setLogoPath(logoFile.getAbsolutePath());
            }

            // Refresh the table view to reflect the updated project details
            projectTable.refresh();

            // Show success message to the user
            showAlert("Update Successful", "Project details updated successfully!");
        }
    }
}
```

- **Purpose:** Update the data of the projects which have already been introduced.
- **When:** Prior to the selection of its spot on the stage by hitting the button located somewhere on the plane.
- **Functionality:** I coded project selection, modification of specific aspects and confirmation of the change.

- FXML Annotations and UI Components:FXML Annotations and UI Components:

- @FXML annotations are used to link Javafx UI elements defined in FXML with their fields in the Java class.
- TableView: Seen as showing a list of projects.
- TableColumn: These are labels of PROJECT_ID, PROJECT_NAME, CATEGORY and COUNTRY in the TableView for project management.
- TextField: Data entry fields including project identification number and name, project category, team members as well as country of the team members.
- TextArea: This is provided as an input field for a project description.
- ImageView: Shows the logo of the project that is selected by the user.
- Button: Defines the update button for submitting the changes.
- File Handling:

- FileChooser: Enables the users to browse for an image file of the logo for the particular team.

- File: Its is used to store and manage the selected logo file.
- Data Structures:

- ObservableList: A projects list implemented as a model that can notify the UI about its changes. This list is used to retrieve and store the project data which will be used to populate the TableView.
- Spotlight Selection Control:

- Static Boolean: spotlightSelected is used to indicate that a project has been selected to be spotlighted and sets the update button to disabled if so.
- Methods and Functionality
- initialize():

- Executed every time the controller is initiated or drawn up.
- Establishes the cell value factories for the table columns; this makes them capable of showing the correct fields of the project object.
- Adds the projects into the TableView by placing them into the ObservableList.
- Include a listener to update the text fields when a specific project is selected from the table.
- If activity is selected for a spotlight, disables the update button.
- populateFields(ProjectController. Project project):

- Develops the input fields and image view with the details of the selected project.
- Provides for the correct display of the logo or absence if this element is not available.
- handleSelectLogo():

- Calls a dialog to get the logo image file from the user.
- Confirms that selected file is an image and set it to the image view if correct.
- handleUpdateProject():

- Static method that is used to show we alert dialogs with a given title and a message.
- handleUpdate(ActionEvent actionEvent):

- As it is discernible, this method is a mere copy of handleUpdateProject() method.
- It carries out the same process to edit the projected details of the selected project after validation.

2.2.3 Deleting Project Details

```
package lk.rgu.javafx;

import javafx.collections.FXCollections;
import javafx.collections.ObservableList;
import javafx.event.ActionEvent;
import javafx.fxml.FXML;
import javafx.fxml.FXMLLoader;
import javafx.scene.Scene;
import javafx.scene.control.Alert;
import javafx.scene.control.Button;
import javafx.scene.control.TableCell;
import javafx.scene.control.TableColumn;
import javafx.scene.control.TableView;
import javafx.scene.control.cell.PropertyValueFactory;
import javafx.scene.layout.AnchorPane;
import javafx.scene.Node;
import javafx.stage.Stage;
import javafx.util.Callback;

import java.io.IOException;
import java.util.List;

public class DeleteController {
    @FXML
    private TableView<ProjectController.Project> projectTable;
    @FXML
    private TableColumn<ProjectController.Project, String> projectIdColumn;
    @FXML
    private TableColumn<ProjectController.Project, String> projectNameColumn;
    @FXML
    private TableColumn<ProjectController.Project, String> categoryColumn;
    @FXML
    private TableColumn<ProjectController.Project, String> countryColumn;
    @FXML
    private TableColumn<ProjectController.Project, Void> deleteColumn;

    private ObservableList<ProjectController.Project> projects;

    // To track whether the spotlight selection has been made
    private static boolean spotlightSelected = false;

    public static void setSpotlightSelected(boolean selected) {
        spotlightSelected = selected;
    }

    @FXML
    private void initialize() {
        loadProjects();
        configureTableColumns();
    }

    private void loadProjects() {
        // Fetch the project data from ProjectController
        List<ProjectController.Project> projectList =
ProjectController.getAllProjects();
        projects = FXCollections.observableArrayList(projectList);
        projectTable.setItems(projects);
    }

    private void configureTableColumns() {
        projectIdColumn.setCellValueFactory(new PropertyValueFactory<>("projectId"));
        projectNameColumn.setCellValueFactory(new
PropertyValueFactory<>("projectName"));
        categoryColumn.setCellValueFactory(new PropertyValueFactory<>("category"));
        countryColumn.setCellValueFactory(new PropertyValueFactory<>("country"));

        // Add delete button column
        addDeleteButtonToTable();
    }

    private void addDeleteButtonToTable() {
        Callback<TableColumn<ProjectController.Project, Void>,
TableCell<ProjectController.Project, Void>> cellFactory = new Callback<>() {
            @Override
            public TableCell<ProjectController.Project, Void> call(final
TableColumn<ProjectController.Project, Void> param) {
                return new TableCell<>() {
                    private final Button deleteButton = new Button("Delete");

                    {
                        deleteButton.setOnAction((ActionEvent event) -> {
                            ProjectController.Project project =
getTableView().getItems().get(getIndex());
                            if (spotlightSelected) {
                                showAlert("Error", "Cannot delete projects after
spotlight selection.");
                                return;
                            }
                            deleteProject(project);
                        });
                    }

                    @Override
                    public void updateItem(Void item, boolean empty) {
                        super.updateItem(item, empty);
                        if (empty) {
                            setGraphic(null);
                        } else {
                            setGraphic(deleteButton);
                        }
                    }
                };
            }
        };

        deleteColumn.setCellFactory(cellFactory);
    }

    private void deleteProject(ProjectController.Project project) {
        if (ProjectController.removeProject(project.getProjectId())) {
            projects.remove(project);
            showAlert("Success", "Project deleted successfully.");
        } else {
            showAlert("Error", "Failed to delete project.");
        }
    }

    private void showAlert(String title, String message) {
        Alert alert = new Alert(Alert.AlertType.INFORMATION);
        alert.setTitle(title);
        alert.setHeaderText(null);
        alert.setContentText(message);
        alert.showAndWait();
    }

    @FXML
    private void handleBackToMain(ActionEvent event) {
        try {
            FXMLLoader loader = new FXMLLoader(Main.class.getResource("main-
view.fxml"));
            AnchorPane pane = loader.load();
            Scene scene = new Scene(pane);
            Stage stage = (Stage) ((Node) event.getSource()).getScene().getWindow();
            stage.setScene(scene);
            stage.show();
        } catch (IOException e) {
            showAlert("Error", "Unable to load main scene.");
        }
    }
}
```

Imports:

- The required JavaFX packages and utilities are imported; classes for the user interface components (TableView, TableColumn, Button and many more), event handling classes, and Java collections classes.
- Class Declaration:

- There is an essence of the class DeleteController, responsible for the deletion of projects from a certain table.

- FXML Annotations:

- @FXML tags are used to refer Java components in the FXML document to the controller's Java code.
- TableView and TableColumn components are specified to show details of the selected project.
- Project Table Columns:

- projectIdColumn, projectNameColumn, categoryColumn, countryColumn, deleteColumn:projectIdColumn, projectNameColumn, categoryColumn, countryColumn, deleteColumn:
- These TableColumns are used to show desired attributes of the Project objects.
- ObservableList:

- projects:
- An ObservableList is used to store and effectively manage the list of projects shown in the table.
- Spotlight Selection Flag:

- spotlightSelected:
- A simple variable of type boolean to indicate that a spotlight selection has been made in order to protect a project from deletion.
- setSpotlightSelected Method:

- Purpose:
- Static method to set or unset the reference for spotlightSelected.
- initialize Method:

- Purpose:
- Executed by default after the FXML components have been created and are ready to be used. It sets up the project list and defines the tables' field.

- loadProjects Method:

- Purpose:
- Pulls project data from ProjectController and fills data to the ObservableList.
- configureTableColumns Method:

- Purpose:
- Establishes the TableColumns to have the capability to show project data by the PropertyValueFactory.
- Details:
- Associates each of them with a property belonging to the Project class.
- Arguments for the addDeleteButtonToTable function to add a delete button to each row.
- addDeleteButtonToTable Method:

- Purpose:
- This assigns a delete button to the TableView so the users can delete certain projects.
- Details:
- Deploys the Callback to generate user-defined TableCell with the Button inside.
- Processes clicks to remove the project, which informs the user if spotlight selection is done.
- deleteProject Method:

- Purpose:
- Removes the selected project from the list and refreshes User Interface with an updated list.
- Details:
- Uses ProjectController. removeProject to remove the project.
- Updates the ObservableList and shows successfully added message or incorrect data error message.
- showAlert Method:

- Purpose:
- Shows an alert dialog with the title and the message that is passed to it.
- Details:
- Makes use of the JavaFX Alert type of alert that provides information dialog to the user.
- handleBackToMain Method:

- Purpose:
- Controls the process of going back to the view.
- Details:
- Employess FXMLLoader to begin the main scene, and change the current stage for the new one.
- Catches potential IOException with an error alert.

2.2.4 Viewing Project Details

```
package lk.rgu.javafx;

import javafx.beans.property.SimpleObjectProperty;
import javafx.collections.FXCollections;
import javafx.fxml.FXML;
import javafx.fxml.FXMLLoader;
import javafx.scene.Parent;
import javafx.scene.Scene;
import javafx.scene.control.Alert;
import javafx.scene.control.Button;
import javafx.scene.control.TableColumn;
import javafx.scene.control.TableView;
import javafx.scene.control.cell.PropertyValueFactory;
import javafx.scene.image.Image;
import javafx.scene.image.ImageView;
import javafx.stage.Stage;

import java.io.IOException;

public class ViewingProjectController {

    @FXML
    private TableView<ProjectController.Project> projectTableView;
    @FXML
    private TableColumn<ProjectController.Project, String> projectIdColumn;
    @FXML
    private TableColumn<ProjectController.Project, String> projectNameColumn;
    @FXML
    private TableColumn<ProjectController.Project, String> categoryColumn;
    @FXML
```

```java
    private TableColumn<ProjectController.Project, String> teamMember1Column;
    @FXML
    private TableColumn<ProjectController.Project, String> teamMember2Column;
    @FXML
    private TableColumn<ProjectController.Project, String> teamMember3Column;
    @FXML
    private TableColumn<ProjectController.Project, String> countryColumn;
    @FXML
    private TableColumn<ProjectController.Project, ImageView> logoColumn;
    @FXML
    private Button backButton;

    @FXML
    public void initialize() {
        // Set cell value factories for each column
        projectIdColumn.setCellValueFactory(new PropertyValueFactory<>("projectId"));
        projectNameColumn.setCellValueFactory(new
PropertyValueFactory<>("projectName"));
        categoryColumn.setCellValueFactory(new PropertyValueFactory<>("category"));
        teamMember1Column.setCellValueFactory(new
PropertyValueFactory<>("teamMember1"));
        teamMember2Column.setCellValueFactory(new
PropertyValueFactory<>("teamMember2"));
        teamMember3Column.setCellValueFactory(new
PropertyValueFactory<>("teamMember3"));
        countryColumn.setCellValueFactory(new PropertyValueFactory<>("country"));

        // Setup cell factory for logoColumn with fixed size
        logoColumn.setCellValueFactory(cellData -> {
            String logoPath = cellData.getValue().getLogoPath();
            ImageView imageView = new ImageView();
            if (logoPath != null && !logoPath.isEmpty()) {
                try {
                    Image image = new Image("file:" + logoPath);
                    imageView.setImage(image);
                    imageView.setFitWidth(50); // Set fixed width
                    imageView.setFitHeight(50); // Set fixed height
                    imageView.setPreserveRatio(true); // Maintain aspect ratio
                } catch (Exception e) {
                    // Handle invalid image path
                    System.err.println("Error loading image: " + e.getMessage());
                }
            }
            return new SimpleObjectProperty<>(imageView);
        });

        // Populate the table with project data

projectTableView.setItems(FXCollections.observableArrayList(ProjectController.getAllP
rojects()));
    }

    @FXML
    private void handleBackButtonAction() {
        try {
            FXMLLoader loader = new FXMLLoader(getClass().getResource("main-
view.fxml"));
            Parent mainView = loader.load();
            Stage stage = (Stage) backButton.getScene().getWindow();
            stage.setScene(new Scene(mainView));
            stage.show();
        } catch (IOException e) {
            e.printStackTrace();
            showAlert("Error", "Could not load the main view.");
        }
    }

    private void showAlert(String title, String message) {
        Alert alert = new Alert(Alert.AlertType.ERROR);
        alert.setTitle(title);
        alert.setContentText(message);
        alert.showAndWait();
    }
}
```

- Imports:
- JavaFX Libraries:
- Include some important classes from JavaFX package for the implementation of the user interface like `TableView`, `TableColumn`, `Button`, `ImageView` and `Scene`.
- Additional Libraries:
- Import classes of the utility which are required in the application such as `FXML`, `FXMLLoader`, ‘FXCollections ‘, ‘SimpleObjectProperty’, and ‘Image’.

- Class Declaration:
- Next, the `ViewingProjectController` class is defined to render project information in the form of a table for the user interface.

- FXML Annotations:
- `@FXML` Annotations:
- Map JavaFX UI controls of the application created in the FXML file to the Java code fields and methods.
- Other components include `TableView` that displays the projects while the other is a `Button` for navigation.

- TableView and TableColumns:
- `TableView<ProjectController. Project> projectTableView`:
- It presents the entire information about the project the main table view.

- TableColumns:
- Columns for each project attribute: `, `projectIdColumn`, `projectNameColumn`, `categoryColumn`, `teamMember1Column`, `teamMember2Column`, `teamMember3Column`, `countryColumn`, `logoColumn`.

- Button:
- `backButton`:
- Option which directs the user back to the primary screen/overview.

- Logo Column Setup:
- Cell Factory for `logoColumn`:
- Uses a lambda expression to create the `ImageView` of each project's logo.
- Reads the image from the file path saved in the project data.
- This one sets the image size to 50 by 50 pixels and retains the aspect ratio to avoid distortion of the object.

- Populating the Table:
- `projectTableView. setItems`:
- Puts a loaded 'ObservableList' from `ProjectController` in the `TableView`.

- `handleBackButtonAction` Method:
- Purpose:
- Responsible for the functionality of going back to the main view on emitting the back button.
- Details:
- Attempts to load the main view from the FXML file main-view. fxml`.
- Changes the current stage to the new scene and shows it.
- Catches potential `IOException' from the function call with an error message.

- `showAlert` Method:
- Purpose:

- To show an alert dialog for the error notifications in the application.
- Details:
- The `Alert` class is used to display messages with the desired titles and the contents of the last two parameters.

2.2.5 Saving Project Details to Text File

```
package lk.rgu.javafx;

import javafx.fxml.FXML;
import javafx.fxml.FXMLLoader;
import javafx.scene.Scene;
import javafx.scene.control.Alert;
import javafx.scene.control.Button;
import javafx.scene.control.Label;
import javafx.scene.layout.AnchorPane;
import javafx.stage.Stage;

import java.io.File;
import java.io.FileWriter;
import java.io.IOException;
import java.util.List;

public class SavingProjectController {

    @FXML
    private AnchorPane rootPane;

    @FXML
    private Button yesButton;

    @FXML
    private Button noButton;

    @FXML
    private Button spotlightButton; // New button for navigation

    @FXML
    private Label messageLabel;

    @FXML
    public void initialize() {
        setupEventHandlers();
    }

    private void setupEventHandlers() {
        yesButton.setOnAction(event -> saveProjectDetails());
        noButton.setOnAction(event -> navigateBackToMain());
        spotlightButton.setOnAction(event -> navigateToSpotlight()); // Handle
spotlight navigation
    }

    @FXML
    private void saveProjectDetails() {
        // Use the correct method name to get the list of projects
        List<ProjectController.Project> projects =
ProjectController.getAllProjects(); // Corrected method call

        if (projects.isEmpty()) {
            showAlert(Alert.AlertType.INFORMATION, "No Projects", "No project details
to save.");
            return;
        }

        File file = new File("projects.txt");
        try (FileWriter writer = new FileWriter(file)) {
            for (ProjectController.Project project : projects) {
                writer.write(project.toString() + "\n");
            }
            showAlert(Alert.AlertType.INFORMATION, "Success", "Project details saved
successfully!");
        } catch (IOException e) {
            showAlert(Alert.AlertType.ERROR, "Error", "Failed to save project
details.");
        }
    }

    @FXML
    private void navigateBackToMain() {
        try {
            FXMLLoader loader = new FXMLLoader(getClass().getResource("main-
view.fxml"));
            AnchorPane mainPane = loader.load();
            Stage stage = (Stage) rootPane.getScene().getWindow();
            Scene scene = new Scene(mainPane, 380, 470); // Adjust size as needed
            stage.setScene(scene);
        } catch (IOException e) {
            showAlert(Alert.AlertType.ERROR, "Error", "Failed to load the main
view.");
        }
    }

    // Method to navigate to the Random Spotlight view
    @FXML
    private void navigateToSpotlight() {
        try {
            FXMLLoader loader = new FXMLLoader(getClass().getResource("random-
spotlight.fxml"));
            AnchorPane spotlightPane = loader.load();
            Stage stage = (Stage) rootPane.getScene().getWindow();
            Scene scene = new Scene(spotlightPane, 820, 580); // Adjust size as
needed
            stage.setScene(scene);
        } catch (IOException e) {
            showAlert(Alert.AlertType.ERROR, "Error", "Failed to load the spotlight
view.");
        }
    }

    private void showAlert(Alert.AlertType type, String title, String message) {
        Alert alert = new Alert(type);
        alert.setTitle(title);
        alert.setHeaderText(null);
        alert.setContentText(message);
        alert.showAndWait();
    }
}
```

- `initialize` Method:
- Purpose:
- Executed when the FXML components start loading and each time they are to be created on the screen automatically. Establishes OnClick events for the buttons.

- `setupEventHandlers` Method:
- Purpose:
- Links action events to the buttons to perform the user interaction tasks.
- Details:
- `yesButton`: Asking `saveProjectDetails()` to write projects to a file.
- `noButton`: Invokes the `navigateBackToMain()` to get back to the main screen.
- `spotlightButton`: Use of the campaign object to call `navigateToSpotlight()` to go to the spotlight feature.

- `saveProjectDetails` Method:
- Purpose:
- Stores the details relating to the project to a text file it creates under the name of “projects. ” txt`.
- Details:
- Calls the `getAllProjects()` function of `ProjectController` to get the list of projects.
- Verifies if the provided array of projects is empty to inform the user if there’s no project to save.
- Writes each project’s string representation to the file immediately using a `FileWriter`.
- If the file is written successfully, shows a success alert message to the users; otherwise, displays an error exception alert message.

- `navigateBackToMain` Method:
- Purpose:
- Responsible for handling the finite state of the activity which is to go back to the main view when the NO button is clicked.
- Details:
- Incorporates `FromFile` resource to load the main view from `main-view. fxml`.
- Cuts to the new scene on the current stage and brings in the change of scene size to (380 X 470).
- Catches the possible `IOException` and displays an error message.

- Navigation Logic:
- The controller also has a provision of moving to different parts of the application by use of buttons' action.

- Data Management:
- Verifies that project information is stored and processed the right way without being lost by checking if a project by a given path exists before 'writing' data to it.

- Input Validation:
- When entering data in a project, it could be necessary to check the values to be saved to prevent the entry of incorrect data or file entries missing several fields.

2.2.6 Random Spotlight Selection

```
package lk.rgu.javafx;

import javafx.fxml.FXML;
import javafx.fxml.FXMLLoader;
import javafx.scene.Scene;
import javafx.scene.control.Alert;
```

```java
import javafx.scene.control.Button;
import javafx.scene.control.Label;
import javafx.scene.control.TextField;
import javafx.scene.image.Image;
import javafx.scene.image.ImageView;
import javafx.scene.layout.AnchorPane;
import javafx.stage.Stage;

import java.io.File;
import java.io.IOException;
import java.util.*;

public class RandomSpotlightController {

    @FXML
    private Button backToMainButton;

    @FXML
    private Button nextProjectButton;

    @FXML
    private Button previousProjectButton;

    @FXML
    private ImageView projectLogo;

    @FXML
    private Label projectIdLabel;

    @FXML
    private Label projectNameLabel;

    @FXML
    private Label categoryLabel;

    @FXML
    private Label teamMember1Label;

    @FXML
    private Label teamMember2Label;

    @FXML
    private Label teamMember3Label;

    @FXML
    private Label countryLabel;

    @FXML
    private Label descriptionLabel;

    @FXML
    private TextField judge1TextField;

    @FXML
    private TextField judge2TextField;

    @FXML
    private TextField judge3TextField;
    @FXML
    private TextField judge4TextField;

    @FXML
    private Button submitScoresButton;

    private List<ProjectController.Project> projects = new ArrayList<>();
    private final List<ProjectController.Project> selectedProjects = new
ArrayList<>();
    private final Map<String, List<ProjectController.Project>> projectsByCategory =
new HashMap<>();
    private static final Map<ProjectController.Project, Integer> projectScores = new
HashMap<>(); // Made static
    private int currentIndex = 0;
    private final Random random = new Random();

    @FXML
    public void initialize() {
        loadProjects();
        setupEventHandlers();
    }

    private void setupEventHandlers() {
        backToMainButton.setOnAction(event -> handleBackToMain());
        nextProjectButton.setOnAction(event -> showNextProject());
        previousProjectButton.setOnAction(event -> showPreviousProject());
        submitScoresButton.setOnAction(event -> submitScores());
    }

    private void loadProjects() {
        // Load projects from ProjectController
        projects = ProjectController.getAllProjects(); // Correct method name

        categorizeProjects();
        selectRandomProjects();
        displayProject();
    }

    private void categorizeProjects() {
        for (ProjectController.Project project : projects) {
            String category = project.getCategory();
            projectsByCategory.computeIfAbsent(category, k -> new
ArrayList<>()).add(project);
        }
    }

    private void selectRandomProjects() {
        for (List<ProjectController.Project> categoryProjects :
projectsByCategory.values()) {
            if (!categoryProjects.isEmpty()) {
                int index = random.nextInt(categoryProjects.size());
                selectedProjects.add(categoryProjects.get(index));
                projectScores.put(categoryProjects.get(index), 0); // Initialize
score for each selected project
            }
        }
    }

    private void displayProject() {
        if (selectedProjects.isEmpty() || currentIndex < 0 || currentIndex >=
selectedProjects.size()) {
            showAlert(Alert.AlertType.INFORMATION, "No Project", "No project
available for display.");
            return;
        }

        ProjectController.Project project = selectedProjects.get(currentIndex);
        projectIdLabel.setText(project.getProjectId());
        projectNameLabel.setText(project.getProjectName());
        categoryLabel.setText(project.getCategory());
        teamMember1Label.setText(project.getTeamMember1());
        teamMember2Label.setText(project.getTeamMember2());
        teamMember3Label.setText(project.getTeamMember3());
        countryLabel.setText(project.getCountry());
        descriptionLabel.setText(project.getDescription());

        Image logo = new Image(new File(project.getLogoPath()).toURI().toString());
        projectLogo.setImage(logo);
    }

    private void showNextProject() {
        if (selectedProjects.isEmpty()) return;

        currentIndex = (currentIndex + 1) % selectedProjects.size();
        displayProject();
    }

    private void showPreviousProject() {
        if (selectedProjects.isEmpty()) return;

        currentIndex = (currentIndex - 1 + selectedProjects.size()) %
selectedProjects.size();
        displayProject();
    }

    private void submitScores() {
        try {
            int[] scores = new int[4];
            scores[0] = Integer.parseInt(judge1TextField.getText());
            scores[1] = Integer.parseInt(judge2TextField.getText());
            scores[2] = Integer.parseInt(judge3TextField.getText());
            scores[3] = Integer.parseInt(judge4TextField.getText());

            for (int score : scores) {
                if (score < 1 || score > 5) {
                    showAlert(Alert.AlertType.WARNING, "Invalid Score", "Scores must
be between 1 and 5.");
                    return;
                }
            }

            int totalPoints = scores[0] + scores[1] + scores[2] + scores[3];
            ProjectController.Project currentProject =
selectedProjects.get(currentIndex);
            projectScores.put(currentProject, totalPoints);

            // Optional: You can rank the projects and display the ranking here
            rankProjects();
```

```java
            // Clear the text fields after successful submission
            clearJudgeTextFields();

            showAlert(Alert.AlertType.INFORMATION, "Scores Submitted", "Scores have
been submitted successfully!");

        } catch (NumberFormatException e) {
            showAlert(Alert.AlertType.ERROR, "Input Error", "Please enter valid
integer scores.");
        }
    }

    private void clearJudgeTextFields() {
        judge1TextField.clear();
        judge2TextField.clear();
        judge3TextField.clear();
        judge4TextField.clear();
    }

    private void rankProjects() {
        List<Map.Entry<ProjectController.Project, Integer>> sortedProjects = new
ArrayList<>(projectScores.entrySet());
        sortedProjects.sort((entry1, entry2) -> Integer.compare(entry2.getValue(),
entry1.getValue())); // Descending order

        StringBuilder ranking = new StringBuilder("Project Rankings:\n");
        for (int i = 0; i < sortedProjects.size(); i++) {
            ProjectController.Project project = sortedProjects.get(i).getKey();
            int score = sortedProjects.get(i).getValue();
            ranking.append(String.format("%d. Project ID: %s, Score: %d\n", i + 1,
project.getProjectId(), score));
        }
        showAlert(Alert.AlertType.INFORMATION, "Ranking", ranking.toString());
    }

    @FXML
    private void handleBackToMain() {
        try {
            FXMLLoader loader = new FXMLLoader(getClass().getResource("main-
view.fxml"));
            AnchorPane mainPane = loader.load();
            Stage stage = (Stage) backToMainButton.getScene().getWindow();
            Scene scene = new Scene(mainPane, 380, 470); // Adjust size as needed
            stage.setScene(scene);
        } catch (IOException e) {
            showAlert(Alert.AlertType.ERROR, "Error", "Failed to load the main
view.");
        }
    }

    private void showAlert(Alert.AlertType type, String title, String message) {
        Alert alert = new Alert(type);
        alert.setTitle(title);
        alert.setHeaderText(null);
        alert.setContentText(message);
        alert.showAndWait();
    }
    // Add this static method to access project scores
    public static Map<ProjectController.Project, Integer> getProjectScores() {
        return new HashMap<>(projectScores); // Return a copy of the map
    }
}
```

- This is invoked after loading FXML components.
- The controller's initialization is done with the projects' loading and establishment of event listeners.
- setupEventHandlers:

- Designates buttons for the movement and score entry.
- loadProjects:

- Loads projects from ProjectController.
- Now the calls are categorized as categorizeProjects, selectRandomProjects, and displayProject.
- categorizeProjects:

- Categorizes projects using a map.
- selectRandomProjects:

- Cycles through each field and picks one project from the field for featuring.
- Resets the score of each of the projects to an initial value.
- displayProject:

- Shows of the details of the project on the UI using the current index data.
- To load and to display images, that are associated with a certain project, one has to perform such operations.
- showNextProject:

- Several will work on the next project on the list, if all the list is exhausted then, working on the first project again.

- showPreviousProject:

- Switches to the prior project, wraps if at the beginning.
- submitScores:

- Transcribes and confirms scores by the judges.
- Brings new calculations and clears the input fields of the project.
- Shina displays the rankings that are accumulated from the total scores only.
- clearJudgeTextFields:

- Key void to clear judge scores to remove previous scores entered in input fields.
- rankProjects:

- Arranges projects according to their scores derived from the allocation of the weights and show the ranks.
- handleBackToMain:

- Moves a lot and goes back to the view controller.
- showAlert:

- The method presents alert messages to users.
- Static Method: getProjectScores:

- Interface for getting project scores as a copy of the map.

2.2.7 Recording Awards and Recognitions

-Purpose: It is recommended to score the projects selected for the spotlight.
-Details:
- Every project is evaluated by 4 different people/judges.

- What is very important, the scores are given as points from 1 to 5, although in the form of stars.
- Thus, identify 1st, second and the third place depending on the scores recorded.

2.2.8 Visualizing Award-Winning Projects

```
package lk.rgu.javafx;

import javafx.fxml.FXML;
import javafx.fxml.FXMLLoader;
import javafx.scene.Parent;
import javafx.scene.Scene;
import javafx.scene.chart.BarChart;
import javafx.scene.chart.CategoryAxis;
import javafx.scene.chart.NumberAxis;
import javafx.scene.chart.XYChart;
import javafx.scene.control.Alert;
import javafx.scene.control.Button;
import javafx.scene.Node;
import javafx.stage.Stage;
import java.io.IOException;
import java.util.List;
import java.util.Map;

public class VisualizingAwardWinningController {

    @FXML
    private BarChart<String, Number> awardBarChart;

    @FXML
    private CategoryAxis categoryAxis;

    @FXML
    private NumberAxis numberAxis;

    @FXML
    private Button backToMainButton;

    @FXML
    public void initialize() {
        displayAwardWinningProjects();
    }

    private void displayAwardWinningProjects() {
        // Fetch projects with their scores
        Map<ProjectController.Project, Integer> projectScores =
RandomSpotlightController.getProjectScores();

        if (projectScores.isEmpty()) {
            showAlert(Alert.AlertType.INFORMATION, "No Data", "No award-winning
projects to display.");
            return;
        }

        // Create a series for the chart
        XYChart.Series<String, Number> series = new XYChart.Series<>();
        series.setName("Total Points");

        // Add data to the series
        for (Map.Entry<ProjectController.Project, Integer> entry :
projectScores.entrySet()) {
            ProjectController.Project project = entry.getKey();
            int totalPoints = entry.getValue();
            series.getData().add(new XYChart.Data<>(project.getProjectName(),
totalPoints));
        }

        // Set the axis labels
        categoryAxis.setLabel("Projects");
        numberAxis.setLabel("Total Points");

        // Clear previous data and add new series to the chart
        awardBarChart.getData().clear();
        awardBarChart.getData().add(series);
    }

    @FXML
    public void backToMainButton(javafx.event.ActionEvent actionEvent) {
        // Navigate back to the main scene
        try {
            Node source = (Node) actionEvent.getSource();
            Stage stage = (Stage) source.getScene().getWindow();

            Parent root = FXMLLoader.load(getClass().getResource("main-view.fxml"));
            Scene scene = new Scene(root, 380, 470); // Adjust dimensions as needed
            stage.setScene(scene);
            stage.show();
        } catch (IOException e) {
            e.printStackTrace();
            showAlert(Alert.AlertType.ERROR, "Error", "Failed to load the main
view.");
        }
    }

    private void showAlert(Alert.AlertType type, String title, String message) {
        Alert alert = new Alert(type);
        alert.setTitle(title);
        alert.setHeaderText(null);
        alert.setContentText(message);
        alert.showAndWait();
    }
}
```

- Purpose: The graph of a total of points received in each project should be shown.
- Details: This implies that an appropriate chart for the representation of the scores should be used.

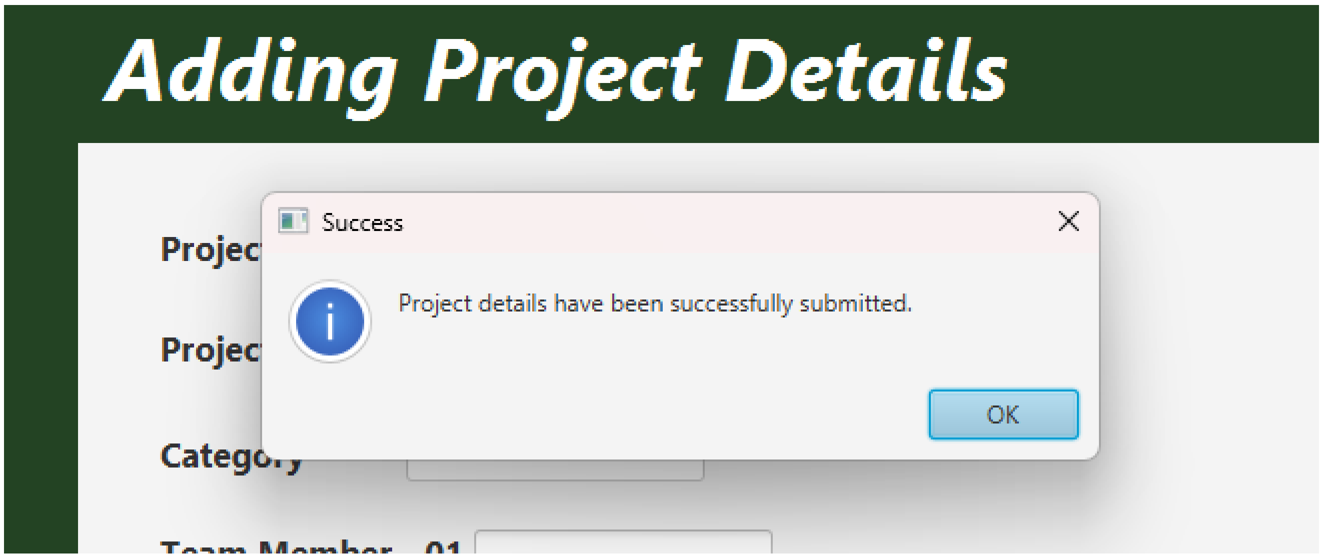
2.2.9 Exit Projects

```
private void handleButtonAction(ActionEvent event) {
    if (event.getSource() == exitButton) {
        Platform.exit();
        return;
    }
```

- Purpose: With this terminate the application in a proper manner.
- Functionality: Include a way of allowing the user to quit the program and manage any loss of unsaved data.

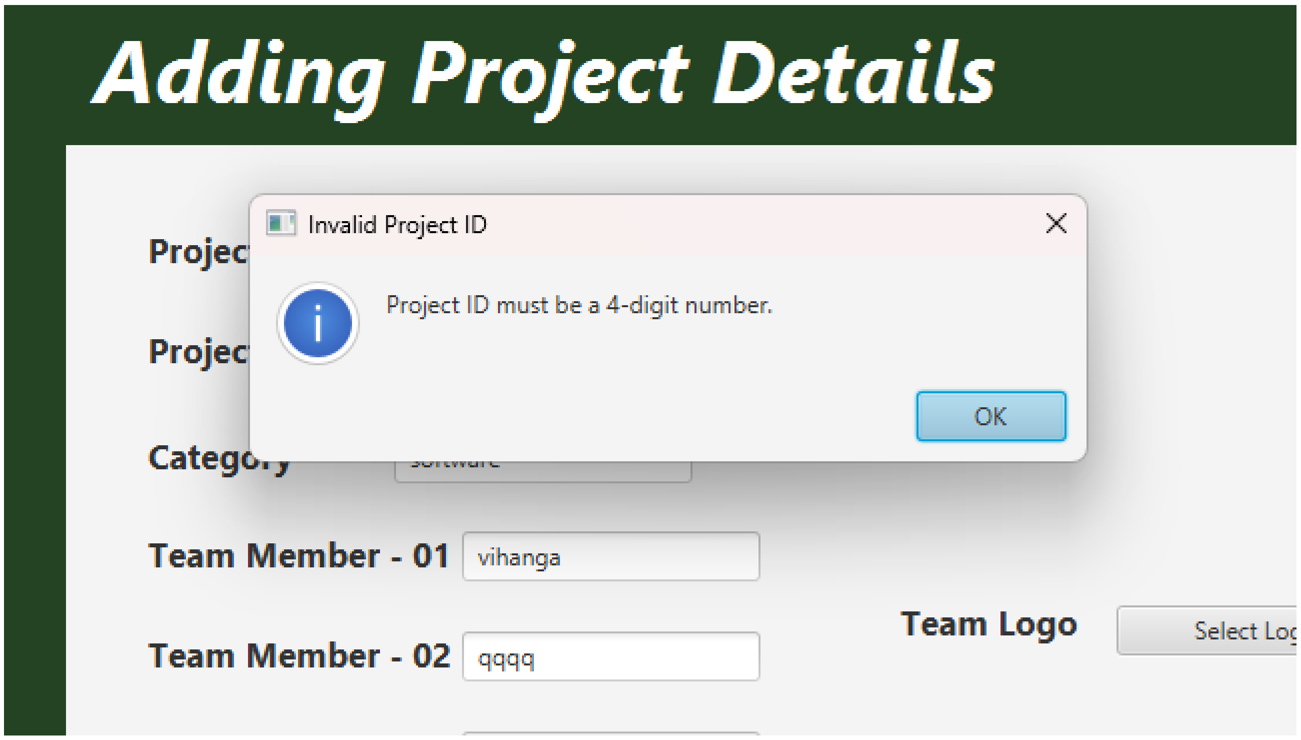
3.1 Test Plan Overview

- **If I successfully submit project details**



Project details have been successfully submitted.

- **If I entered invalid input in add project**



Adding Project Details

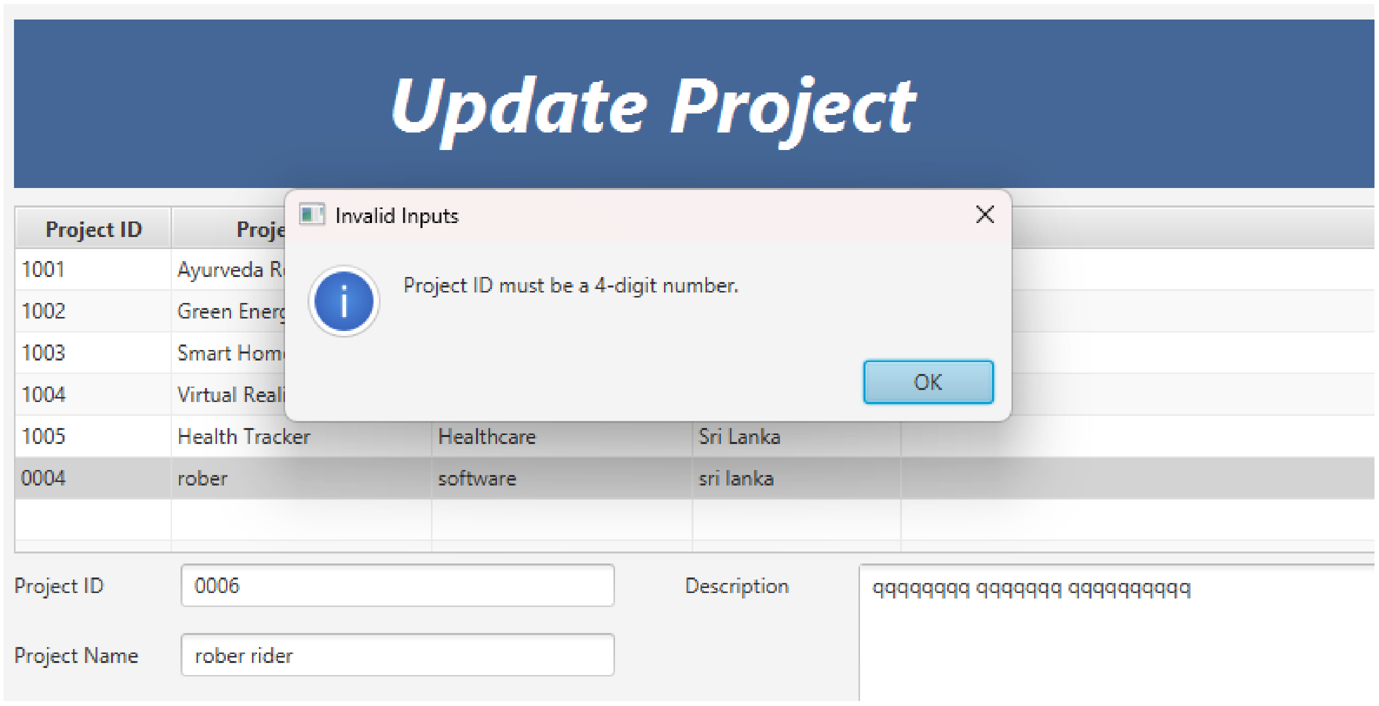
Invalid Project ID

Project ID must be a 4-digit number.

OK

Team Member - 01	vihanga
Team Member - 02	qqqq

- **If I entered invalid input in update project**



Update Project

Invalid Inputs

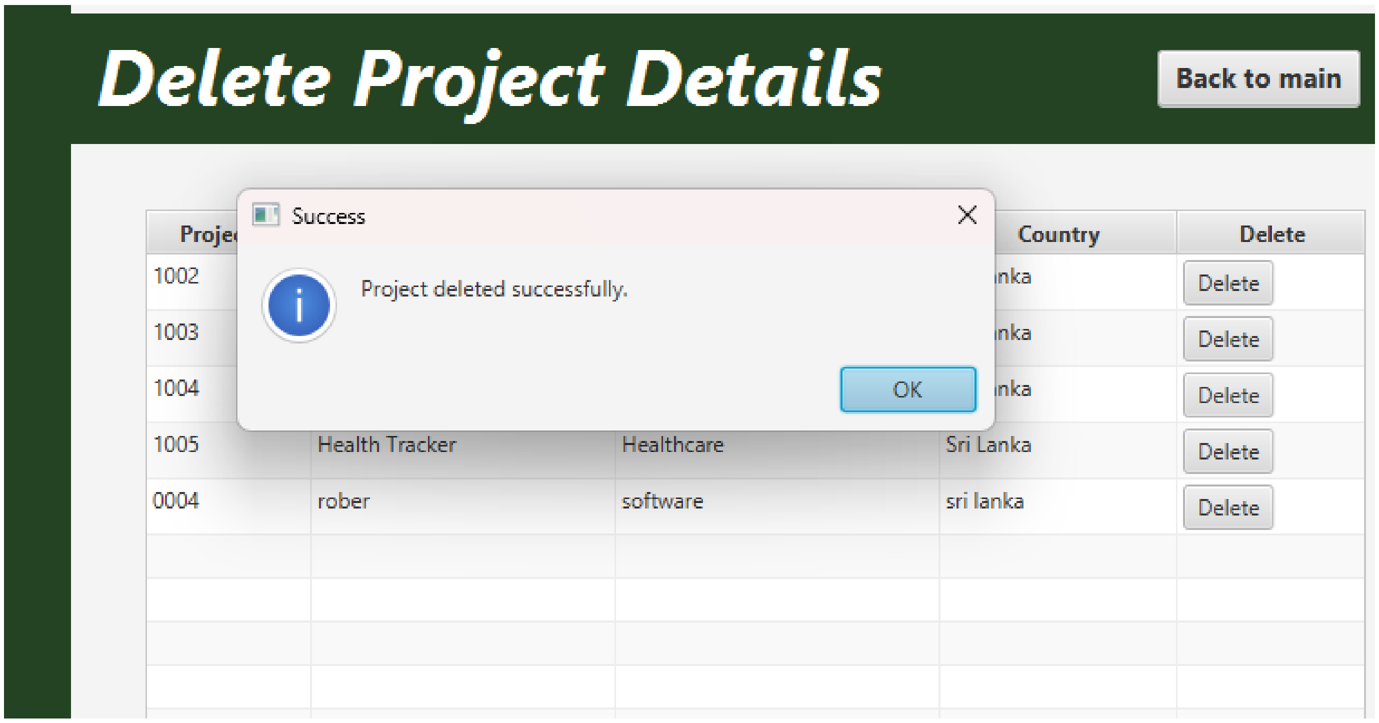
Project ID must be a 4-digit number.

OK

Project ID	Proje			
1001	Ayurveda R			
1002	Green Energ			
1003	Smart Hom			
1004	Virtual Reali			
1005	Health Tracker	Healthcare	Sri Lanka	
0004	rober	software	sri lanka	

Project ID	0006
Project Name	rober rider
Description	qqqqqqqq qqqqqqq qqqqqqqqqq

- **If I successfully delete the project delete**

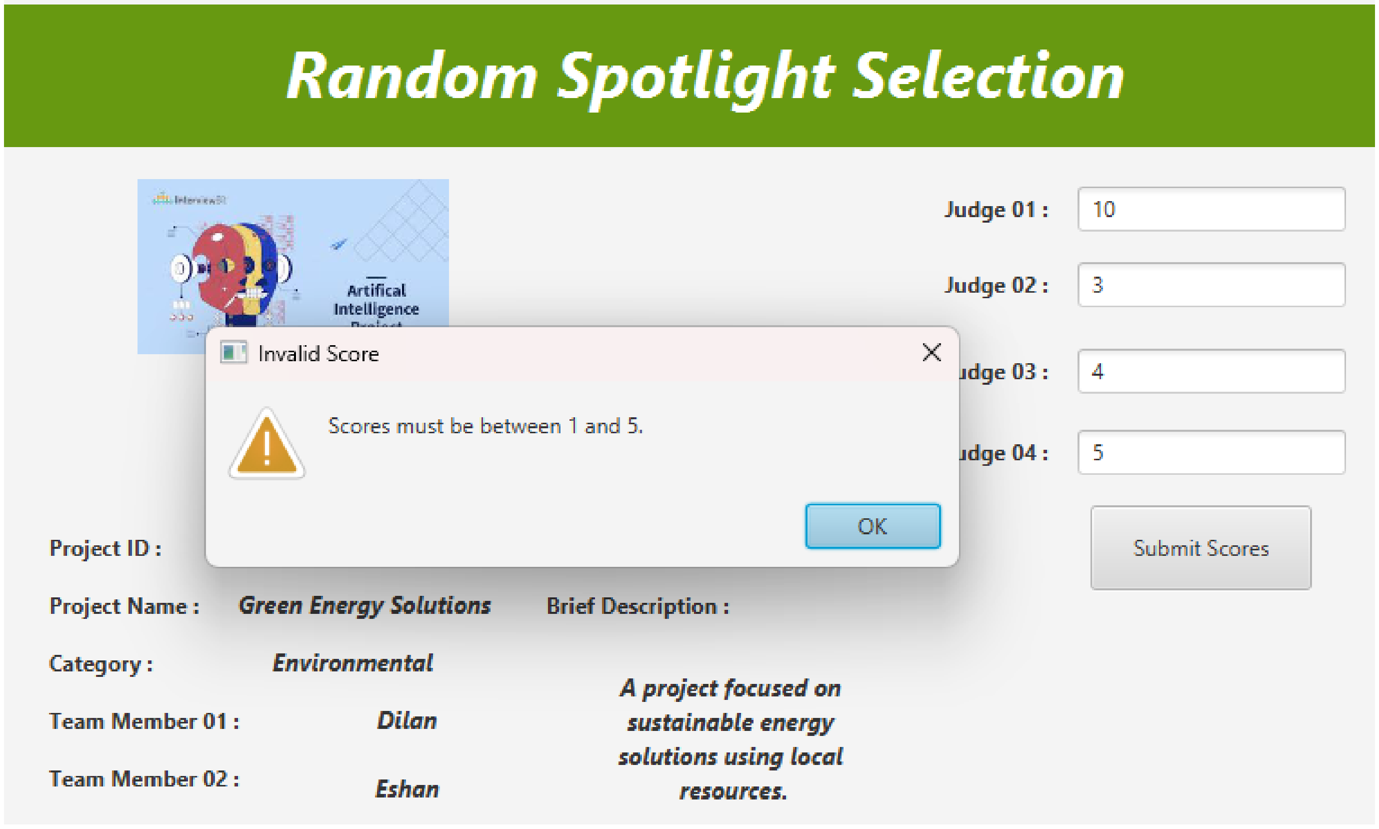

Delete Project Details

Success

Project deleted successfully.

Proje			Country	Delete
1002			nka	Delete
1003			nka	Delete
1004			nka	Delete
1005	Health Tracker	Healthcare	Sri Lanka	Delete
0004	rober	software	sri lanka	Delete

- **If I entered outside number 1-5**



Random Spotlight Selection

Judge 01 : 10

Judge 02 : 3

Judge 03 : 4

Judge 04 : 5

Invalid Score

Scores must be between 1 and 5.

OK

Submit Scores

Project ID :

Project Name : Green Energy Solutions

Brief Description :

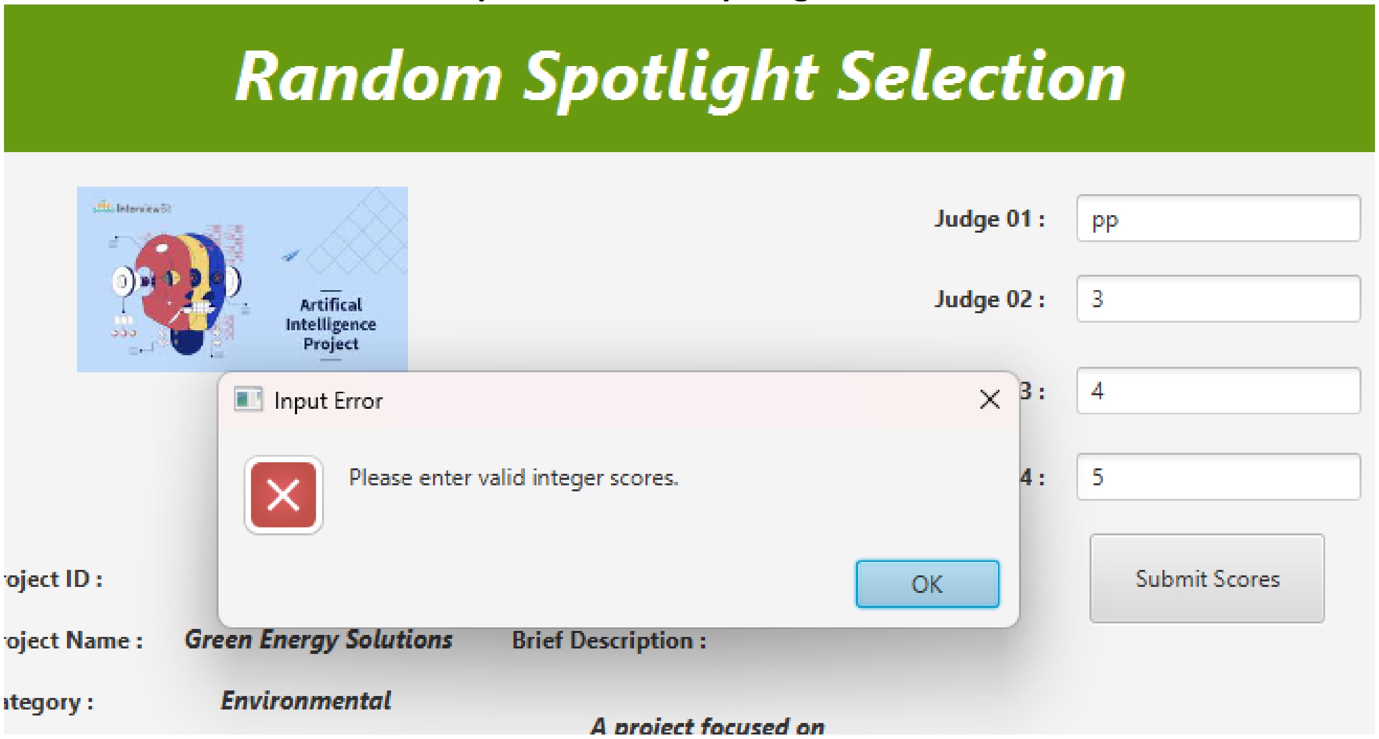
Category : Environmental

A project focused on sustainable energy solutions using local resources.

Team Member 01 : Dilan

Team Member 02 : Eshan

- **If I entered invalid input in random spotlight**



Random Spotlight Selection

Judge 01 : pp

Judge 02 : 3

3 : 4

4 : 5

Input Error

Please enter valid integer scores.

OK

Submit Scores

oject ID :

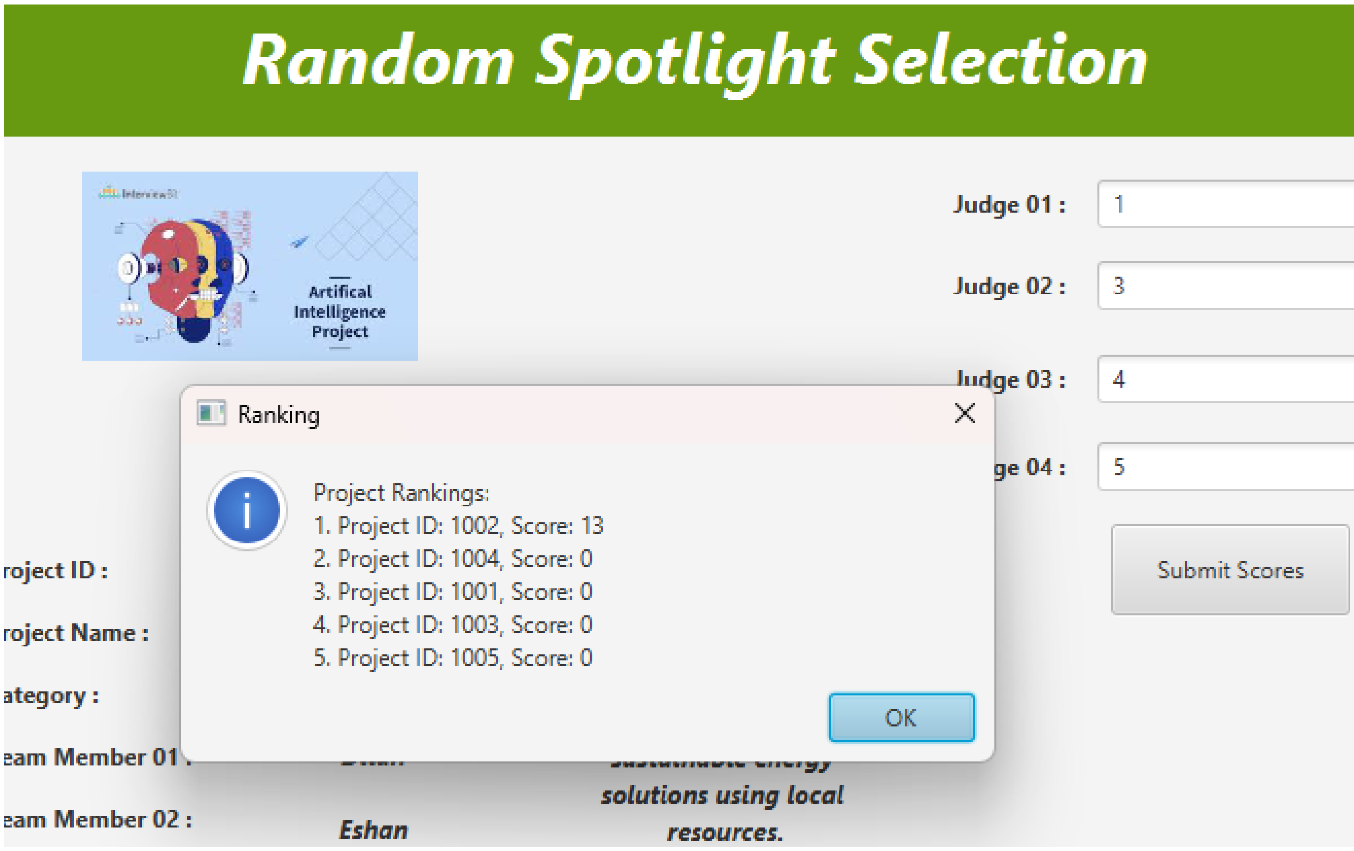
oject Name : Green Energy Solutions

Brief Description :

tegory : Environmental

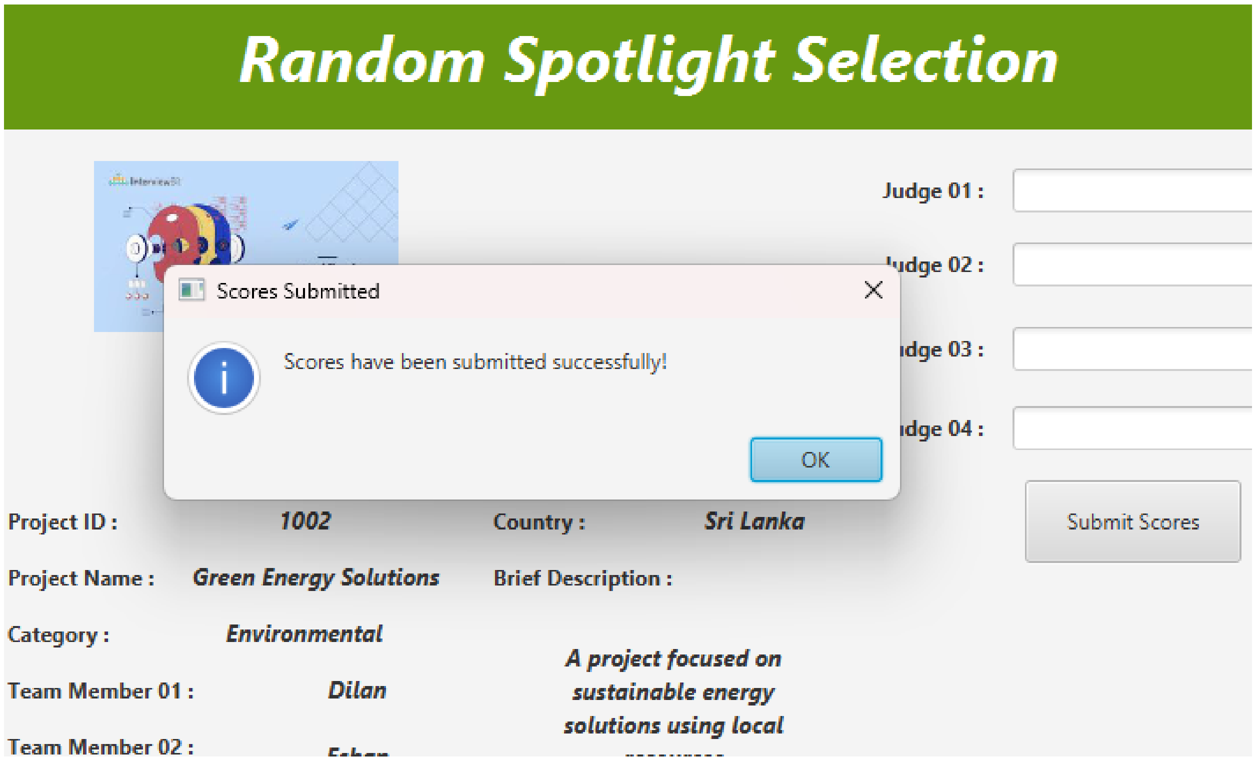
A project focused on

- **If I successfully entered marks in random spotlight**



```
Project Rankings:
1. Project ID: 1002, Score: 13
2. Project ID: 1004, Score: 0
3. Project ID: 1001, Score: 0
4. Project ID: 1003, Score: 0
5. Project ID: 1005, Score: 0
```

- **If I successfully submits marks**


Random Spotlight Selection

Judge 01 :

Judge 02 :

Judge 03 :

Judge 04 :

Submit Scores

Scores Submitted

Scores have been submitted successfully!

OK

Project ID : 1002

Country : Sri Lanka

Project Name : Green Energy Solutions

Brief Description :

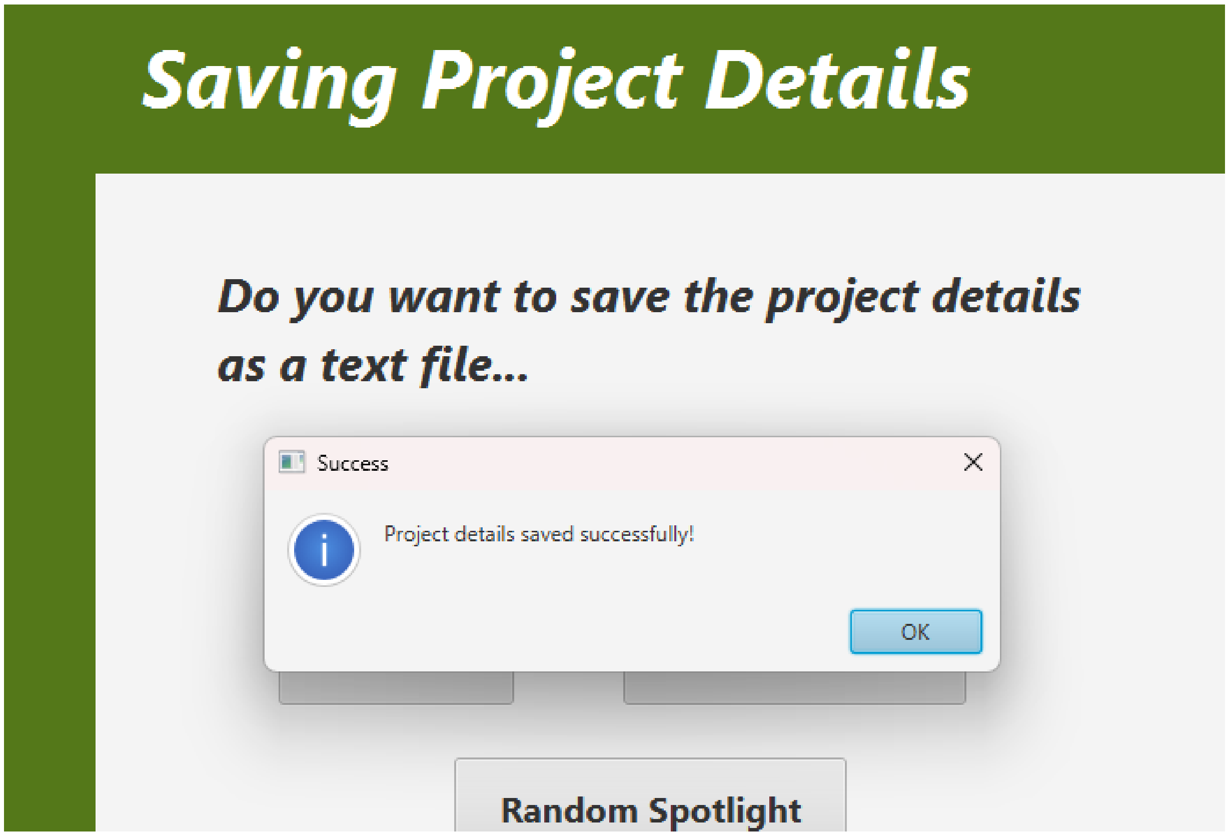
Category : Environmental

A project focused on sustainable energy solutions using local

Team Member 01 : Dilan

Team Member 02 :

- **If I successfully saved text files**


Saving Project Details

Do you want to save the project details as a text file...

Success

Project details saved successfully!

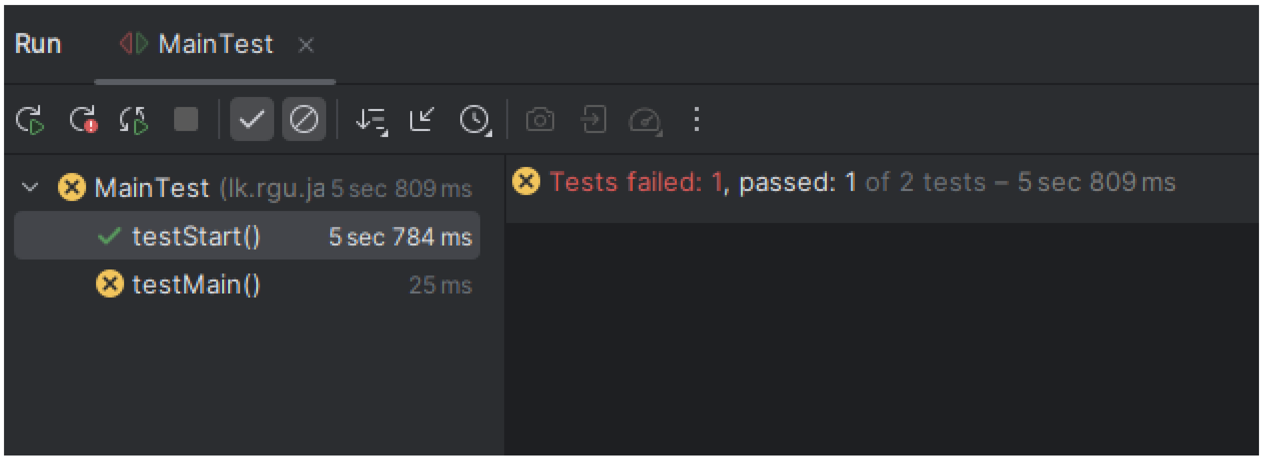
OK

Random Spotlight

3.2 JUnit Test Suite

3.2.1 Test Case for MainText Project Details

Display



```
MainTest (lk.rgu.ja 5 sec 809 ms
  ✓ testStart()      5 sec 784 ms
  ⊗ testMain()           25 ms

Tests failed: 1, passed: 1 of 2 tests – 5 sec 809 ms
```

code

```java
package lk.rgu.javafx;

import javafx.application.Application;
import javafx.application.Platform;
import javafx.fxml.FXMLLoader;
import javafx.scene.Scene;
import javafx.stage.Stage;
import org.junit.jupiter.api.AfterAll;
import org.junit.jupiter.api.BeforeAll;
import org.junit.jupiter.api.Test;

import java.io.IOException;

import static org.junit.jupiter.api.Assertions.*;

class MainTest {



    @AfterAll
    static void tearDownClass() {
        Platform.exit(); // Clean up JavaFX resources
    }

    @Test
    void testStart() throws IOException {
        Application.launch(TestApplication.class); // Launch the app in a test
context
    }
    @Test
    void testMain() {
        // Simply check if the main method can be invoked
        // We don't need to test the `launch` method itself since it's tested
indirectly in testStart
        assertDoesNotThrow(() -> Main.main(new String[]{}));
    }

    // Inner class to test JavaFX application start
    public static class TestApplication extends Application {
        @Override
        public void start(Stage primaryStage) throws IOException {
            FXMLLoader fxmlLoader = new FXMLLoader(Main.class.getResource("main-
view.fxml"));
            Scene scene = new Scene(fxmlLoader.load(), 380, 470);
            primaryStage.setScene(scene);
            primaryStage.show();
        }
    }
}
```

- **Description:**

The given code is Java code of a unit testing class for a JavaFX application. Therefore, it employs java org. junit. Test to test whether the application is able to start and run. Here's what each part does:Here's what each part does:

- **Imports and Class Definition:**

The code above initiates the import of essentials JavaFX as well as the JUnit classes.
Thus, the test class MainTest includes methods to check various features of the created JavaFX application.

- **tearDownClass Method:**

This scenario is tagged with @AfterAll, which in essence indicates that the method will run only once, and this will be after all the tests have been executed.
It calls Platform. The return statement of exit() is used after the tests to release any JavaFX resources that might have been used.

- **testStart Method:**

This method is tagged with @Test, meaning it is a test method.

Next, it creates a developmental version of the JavaFX application using the TestApplication inner class to confirm that there is no problem starting the application.

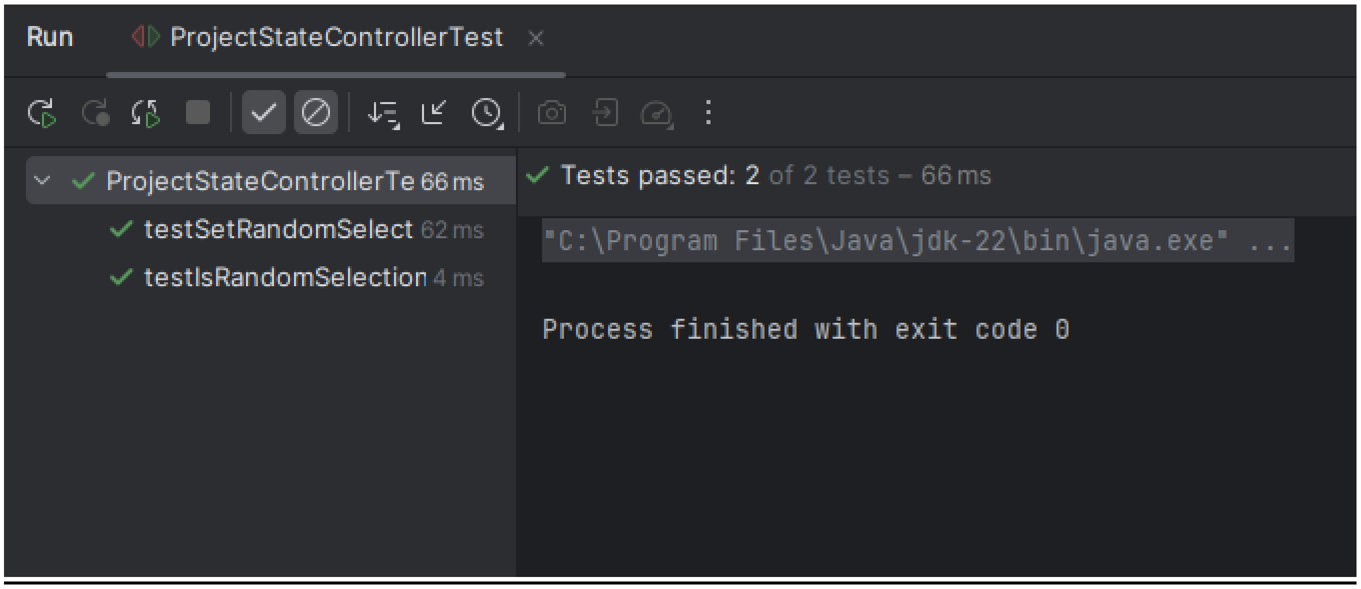
- **testMain Method:**

The second basic test method that verifies if the primary method of the Main class is executable and does not produce any exceptions.

- **TestApplication Inner Class:**

This inner class of Application is the testing version of the main application.
Extends the start method and loads the main FXML file (main-view. fxml), its associated scene and the primary stage.

3.2.1 Test Case for ProjectStateControllerTest Project Details Display



```
ProjectStateControllerTe 66 ms
  testSetRandomSelect 62 ms
  testIsRandomSelection 4 ms
```

```
Tests passed: 2 of 2 tests – 66 ms
"C:\Program Files\Java\jdk-22\bin\java.exe" ...

Process finished with exit code 0
```

Code

```
package lk.rgu.javafx;

import org.junit.jupiter.api.Test;
import static org.junit.jupiter.api.Assertions.*;

class ProjectStateControllerTest {

    @Test
    void testIsRandomSelectionClickedInitialState() {
        // Verify that the initial state is false
        assertFalse(ProjectStateController.isRandomSelectionClicked(), "Initial state
should be false");
    }

    @Test
    void testSetRandomSelectionClicked() {
        // Set the state to true
        ProjectStateController.setRandomSelectionClicked(true);
        assertTrue(ProjectStateController.isRandomSelectionClicked(), "State should
be true after setting it to true");

        // Set the state back to false
        ProjectStateController.setRandomSelectionClicked(false);
        assertFalse(ProjectStateController.isRandomSelectionClicked(), "State should
be false after setting it to false");
    }
}
```

Description:

The given code is a JUnit 4. 0 unit test class aimed at testing the functionality of ProjectStateController class. It tests state management methods using a JUnit framework that enables the identification of a dysfunctional method. Here's what each part does:Here's what each part does:

Imports and Class Definition:

The code at the beginning of the class imports other classes used in JUnit testing.
State management in the ProjectStateController class is tested with help of methods in the test class ProjectStateControllerTest.

testIsRandomSelectionClickedInitialState Method:

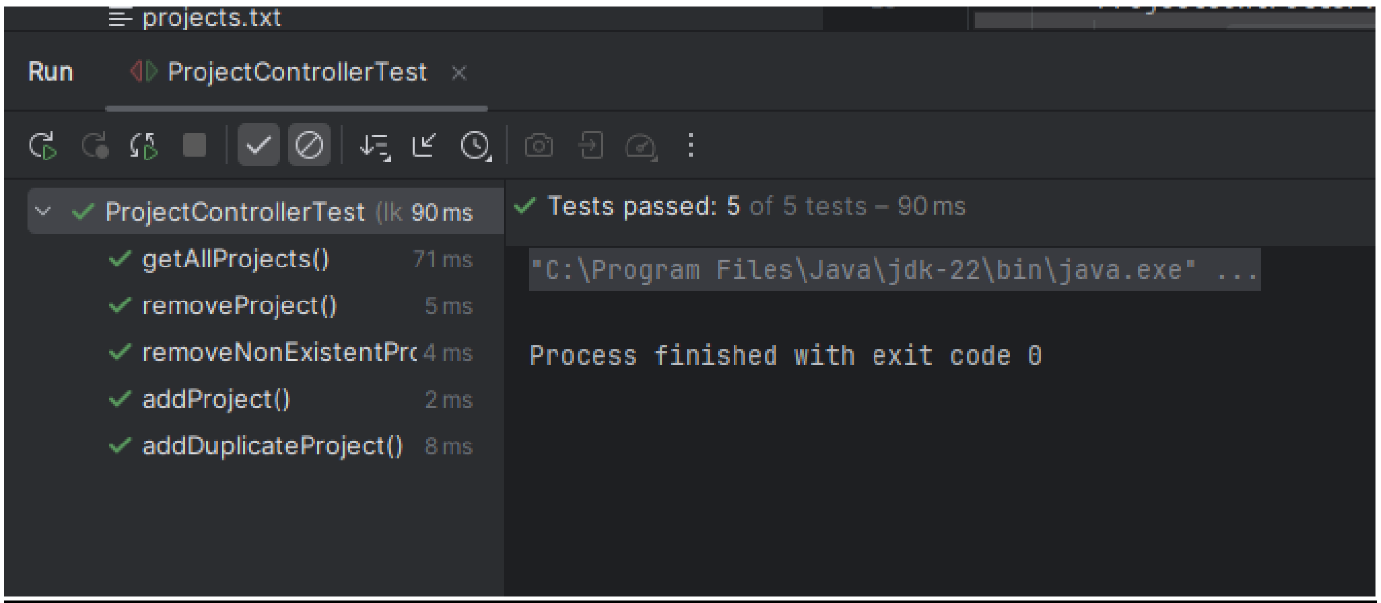
This test method ensures that the isRandomSelectionClicked method is false in the

beginning before it is clicked.
Besides, it applies assertFalse to ensure that the state is false at the time of the statement.

testSetRandomSelectionClicked Method:

This test method verifies if the correct state is set when the setRandomSelectionClicked method is invoked.
It sets the state to true and check it using assertTrue.
Then it sets the state back to false and asserts this change using false assert.

3.2.1 Test Case for ProjectControllerTest Project Details



```
ProjectControllerTest (lk 90 ms
    getAllProjects()          71 ms
    removeProject()            5 ms
    removeNonExistentPrc       4 ms
    addProject()               2 ms
    addDuplicateProject()      8 ms
```

```
Tests passed: 5 of 5 tests – 90 ms
"C:\Program Files\Java\jdk-22\bin\java.exe" ...

Process finished with exit code 0
```

```
package lk.rgu.javafx;

import org.junit.jupiter.api.BeforeEach;
import org.junit.jupiter.api.Test;

import java.util.List;

import static org.junit.jupiter.api.Assertions.*;

class ProjectControllerTest {
    @BeforeEach
    void setUp() {
        // Clear existing projects to avoid test interference
        ProjectController.getAllProjects().clear();

        // Add some sample projects to work with
        ProjectController.addProject(new ProjectController.Project("1001", "Ayurveda
Robot", "Robotics",
                "Anuja", "Bhanuka", "Chamira",
                "Sri Lanka", "A robot powered by Ayurveda principles for household
chores.",

"C:\\Users\\94766\\Desktop\\javaFx\\src\\main\\java\\lk\\rgu\\javafx\\img\\img1.jpg.j
peg"));

        ProjectController.addProject(new ProjectController.Project("1002", "Green
Energy Solutions", "Environmental",
                "Dilan", "Eshan", "Farah",
                "Sri Lanka", "A project focused on sustainable energy solutions using
local resources.",

"C:\\Users\\94766\\Desktop\\javaFx\\src\\main\\java\\lk\\rgu\\javafx\\img\\img2.jpg.j
peg"));
    }

    @Test
    void getAllProjects() {
        // Retrieve the list of projects
        List<ProjectController.Project> projects =
ProjectController.getAllProjects();

        // Assert the size of the list
        assertEquals(2, projects.size(), "Project list should contain 2 projects");

        // Optionally, check the details of the first project
        ProjectController.Project project = projects.get(0);
        assertEquals("1001", project.getProjectId(), "Project ID should be 1001");
        assertEquals("Ayurveda Robot", project.getProjectName(), "Project Name should
be Ayurveda Robot");
    }

    @Test
    void addProject() {
        // Create a new project
        ProjectController.Project newProject = new ProjectController.Project(
                "1003", "Smart Home", "IoT",
                "Gayan", "Himali", "Isuru",
                "Sri Lanka", "An IoT-based smart home automation system tailored for
Sri Lankan homes.",

"C:\\Users\\94766\\Desktop\\javaFx\\src\\main\\java\\lk\\rgu\\javafx\\img\\img3.jpg.j
peg"
        );

        // Add the project
        boolean added = ProjectController.addProject(newProject);

        // Assert the project was added
        assertTrue(added, "New project should be added successfully");
        // Verify the project is in the list
        List<ProjectController.Project> projects =
ProjectController.getAllProjects();
        assertTrue(projects.contains(newProject), "New project should be in the
list");
    }

    @Test
    void removeProject() {
        // Remove a project
        boolean removed = ProjectController.removeProject("1001");

        // Assert the project was removed
        assertTrue(removed, "Project with ID 1001 should be removed successfully");

        // Verify the project is no longer in the list
        List<ProjectController.Project> projects =
ProjectController.getAllProjects();
        assertFalse(projects.stream().anyMatch(p -> "1001".equals(p.getProjectId())),
"Project with ID 1001 should not be in the list");
    }

    @Test
    void removeNonExistentProject() {
        // Attempt to remove a project that does not exist
        boolean removed = ProjectController.removeProject("9999");

        // Assert the project was not removed (should return false)
        assertFalse(removed, "Removing a non-existent project should return false");
    }

    @Test
    void addDuplicateProject() {
        // Add a duplicate project
        ProjectController.Project duplicateProject = new ProjectController.Project(
                "1002", "Duplicate Project", "Test",
                "Alice", "Bob", "Charlie",
                "Sri Lanka", "A project with the same ID as an existing one.",

"C:\\Users\\94766\\Desktop\\javaFx\\src\\main\\java\\lk\\rgu\\javafx\\img\\img2.jpg.j
peg"
        );

        // Add the project
        boolean added = ProjectController.addProject(duplicateProject);

        // Assert the project was added (assuming duplicates are allowed)
        assertTrue(added, "Duplicate project should be added successfully");

        // Verify the project is in the list
        List<ProjectController.Project> projects =
ProjectController.getAllProjects();
        assertTrue(projects.stream().anyMatch(p -> "1002".equals(p.getProjectId())),
"Duplicate project should be in the list");
    }
}
```

Description:

This piece of code is a unit test class which tests the functionality of ProjectStateController class. For asserting the functionality of state management methods it employs the JUnit testing framework. Here's what each part does:Here's what each part does:

Imports and Class Definition:

The code shows the import declaration to import necessary classes of JUnit.
Specifically, the test class identified as ProjectStateControllerTest has methods that test state management inside the ProjectStateController class.

testIsRandomSelectionClickedInitialState Method:

This test method checks if the flag in the isRandomSelectionClicked method is initially false.
It uses assertFalse to confirm that state is false at the start.

testSetRandomSelectionClicked Method:

This test method verifies if the setRandomSelectionClicked method is properly changing the state.
This line sets the state of the object to true, and uses assertTrue to check that this has occurred.
Then, it sets the state back to false, then asserts that this change is false using the assertFalse command.

4.1 Code Quality Guidelines Followed

- **Readable Code :** The code is documented well, and thus there is the ability to share the code with other people who will easily understand it. This includes naming classes and methods descriptively and including comments when they are required.

- **Consistent Formatting:** The code has structured format including indentation and spaces so when the programmer looks at it, he is able to comprehend it easily.

- **Modular Design:** The code is arranged into smaller and more easily manageable chunks or functions. This way it is easier to test and develop an individual section of the application without prejudicing other sections.

- **Error Handling:** It also addressed probable error cases instead of the application stopping mid-process, this was done to provide elegance to the code base.

4.2 Application of SOLID Principles

- **Single Responsibility Principle (SRP**): These classes or modules are supposed to have one responsibility or have only one task they are supposed to accomplish. For example, a class should contain only one concrete operation, which will facilitate the disorder of the application and its usefulness.

- **Open/Closed Principle (OCP):** It implies that the code is open for addition on to new requirements which is good practice but closed to alteration which is a safer practice. This means that one can be able to incorporate new features of an application without touching the original code, thereby reducing on new faults.

- **Liskov Substitution Principle (LSP**): The subclasses can be substituted for the parent classes and vice versa without getting in the way of program correctness. This helps in making sure that derived classes will add onto the functionality that has already been provided and not complicate the situation.

- **Interface Segregation Principle (ISP):** Courses to be taught are stipulated to adopt only the required techniques. This helps to prevent other classes from depending on those methods they do not need, thus keeping the methods or classes in question more concise and thereby more easily micro-managed or controlled.

- **Dependency Inversion Principle (DIP):** High-level module has no dependencies on the low-level modules. They are both based on abstraction (interfaces). This makes the code even easier to change and more flexible as compared with the sequence of elementary steps.

4.3 Strategies for Ensuring Robustness

- **Unit Testing:** ,write test for each sub-component in order to ascertain that they operate correctly. This allows problem to be spotted before they get out of hand and it also prevents the change from affecting other areas.

- **Error Handling**: Be sure you have good error control which helps to avoid any issues compromise the entire project. This includes the use of try and catch blocks as well as the checking of the input data.

- **Code Reviews:** Check the code with other developers to identify some of these flaws and enhance the quality needs in the code. Another advantage of peer editing is that different people may notice things that the other does not.

- **Automated Testing:** A test should be frequently and consistently run for it to execute checks often and in the right manner hence opting for automated tests. These can be unit testings, integration testings, and regression testings among others.

4.4 Strategies for Maintaining Code Quality

- **Regular Refactoring:** Refactor the code – rearrange the code in a better way so that the functionality does not change but the code is less cluttered. This is useful to clear any confusion and helps in maintaining a neat and optimized code.

- **Documentation**: It is necessary to leave comments and external documentation for the code and follow the use of meaningful variable names. This makes it convenient for other people (and your future self) to comprehend and apply the code.

- **Adhere to Coding Standards:** Ensure that the code is compliant with relevant coding conventions thus making the code easier to read and mange through the long scope of the project.

- **Continuous Integration (CI):** Integration- CI, should be used to run automatically and build plus test the code each time there is a change. This is useful in early identification of problems and keeps the code base steady.

Thus, such guidelines and strategies assist in writing correct, concise, and comprehensible code that is easy to understand and modify.

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THE END.