De La Salle University- Manila

Gokongwei College of Engineering

LBYCPEI

Object Oriented Programming Laboratory

Final Project Proposal

TechVolt

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I. Introduction

The Energy Consumption Tracker is a project aimed at addressing the pressing need for affordable and clean energy, aligning with the goals of Sustainable Development Goal 7: Affordable and Clean Energy. This application serves as a comprehensive tool to track and manage energy consumption, empowering users to make informed decisions about their energy usage and contribute to a sustainable future.

The primary goal of the Energy Consumption Tracker is to provide users with a user-friendly platform to monitor their energy consumption patterns, set goals, and receive recommendations on reducing energy usage. By facilitating data input, visualization, analysis, and reporting, the application aims to raise awareness and encourage energy-saving practices among individuals and communities.

A. Objectives

1. User Registration and Login: Develop a secure user registration and login system to ensure privacy and authentication for accessing the application.
2. Energy Consumption Data Input: Implement an intuitive user interface that allows users to input their energy consumption data periodically, enabling them to track their usage accurately.
3. Data Visualization and Analysis: Utilize charting libraries such as JFreeChart or Chart.js to generate visual representations of energy consumption data, enabling users to easily interpret and analyze their usage patterns.
4. Goal Setting and Tracking: Provide users with the ability to set energy consumption goals based on their desired targets or recommended guidelines. Enable tracking of their progress and provide notifications to encourage goal attainment.
5. Energy Saving Tips: Incorporate a dedicated section within the application that offers energy-saving tips and best practices, educating users on effective strategies to reduce their energy consumption.

6. Comparative Analysis: Enable users to compare their energy consumption with aggregated data from other users, fostering a sense of competition and motivating them to further reduce their energy usage.
7. Reporting and Recommendations: Generate comprehensive consumption reports for users, highlighting their energy usage trends and offering personalized recommendations on how to optimize energy efficiency.
8. Integration with Smart Meters: Explore the possibility of integrating the application with smart meters or IoT devices to capture real-time energy consumption data, eliminating the need for manual input and enhancing data accuracy.

B. Features

1. User registration and login system with appropriate security measures.
2. A user-friendly interface for inputting energy consumption data periodically.
3. Utilization of charting libraries for generating graphical representations of energy consumption data.
4. Goal setting and tracking system with notifications and progress monitoring.
5. Dedicated section with energy-saving tips and best practices.
6. Comparative analysis functionality to compare users' energy consumption with aggregated data.
7. Generation of consumption reports and personalized recommendations.
8. Investigation and potential integration with smart meters or IoT devices for real-time data capture and synchronization.

II. Methodology

To accomplish this project, we will adopt the Agile methodology, which emphasizes continuous feedback and iteration. Agile ensures adaptability to changes and fosters communication between team members, contributing to effective project management. The Java pillars of encapsulation, inheritance, and polymorphism will be essential in structuring our codebase and maintaining readability, scalability, and performance.

We will break down the project into the following phases:

1. Requirements Gathering and Analysis: Understand the core functionalities and user requirements. Conduct market research to identify potential enhancements and unique selling points.
2. Design: Define the architecture and design of the system, including database schemas, interface designs, and system workflows.
3. Development: Code the functionalities, emphasizing readability, efficiency, and modularity. Implement regular code reviews to ensure code quality.
4. Testing: Test each feature rigorously to ensure correctness, robustness, and usability. Use unit testing, integration testing, and system testing.

Deployment: Deploy the system for public use and continuously monitor its performance.

III. Project Description

The Energy Consumption Tracker will consist of a three-tier architecture: the client, the server, and the database. The client tier comprises the user interface and input mechanisms, while the server processes user requests and communicates with the database.

The client tier utilizes JavaFX for the user interface, giving a responsive and user-friendly experience. The server tier will be built using Java EE, handling requests such as user login, energy data input, and data visualization. It will also contain the logic for goal tracking and recommendations. Finally, the database tier will be managed using MySQL, storing user details, energy consumption data, and user goals.

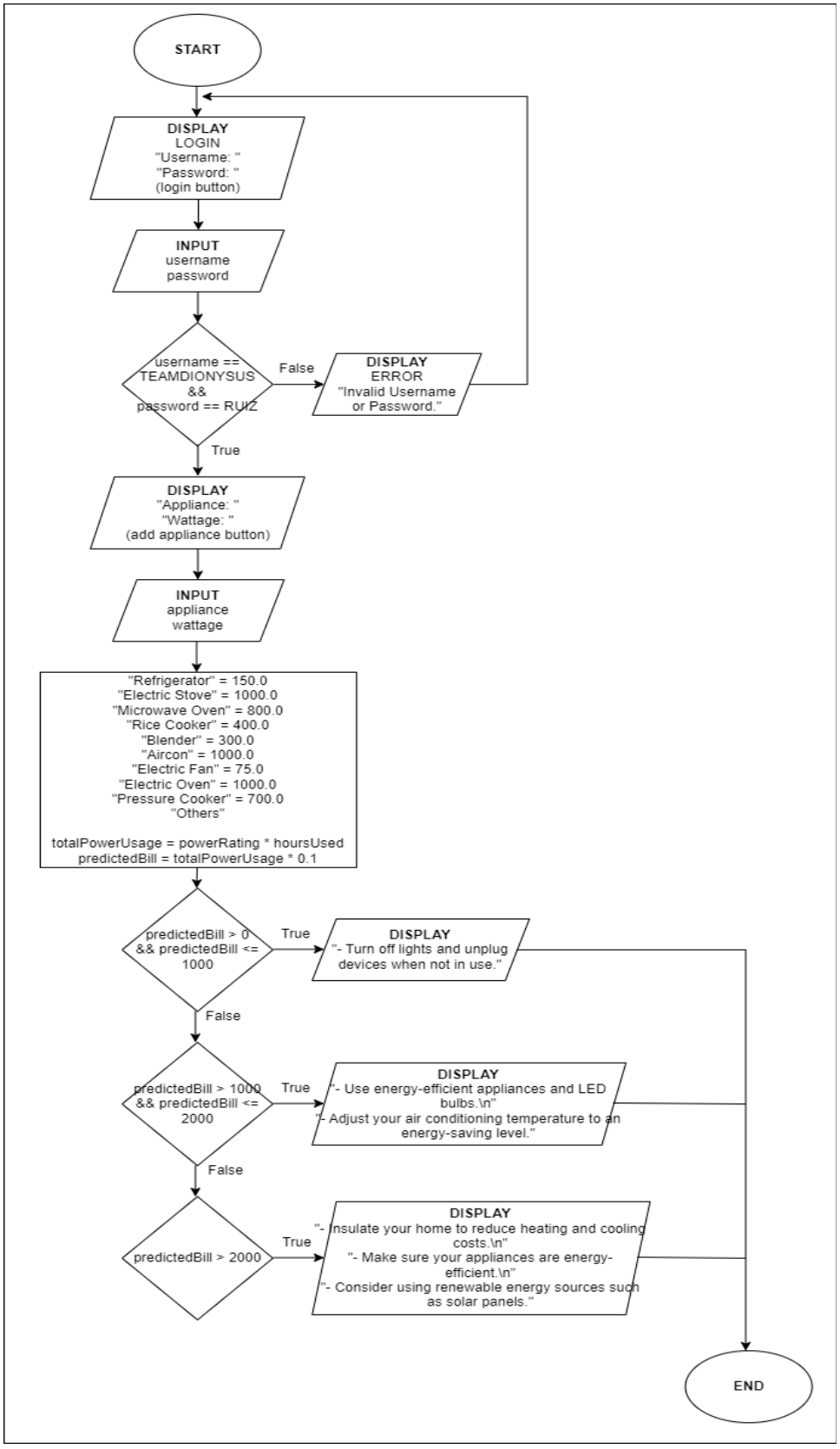
Key classes in our UML diagram include User, EnergyData, Goal, and SmartMeter. The User class has methods for account creation and login. EnergyData class contains the user's energy consumption data and methods for data input and retrieval. The Goal class allows for setting, tracking, and notifying of goals. The SmartMeter class, if applicable, contains methods for retrieving real-time energy data.

IPO

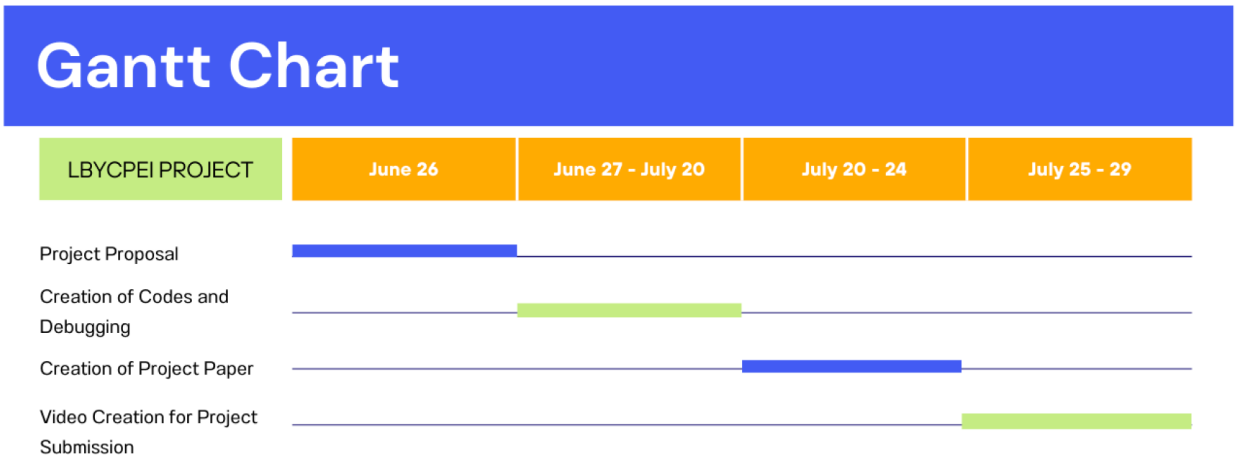
	Input	Process	Output
BillPredictor Class	The predictNextMonthBill method takes a Map<String, Double> named applianceHoursMap as input. This map represents the hours of usage for each appliance. The keys are the names of the appliances, and the values are the hours of usage. The addCustomAppliance method takes an appliance name (as a String) and its powerRating (as a double) as input. This method allows users to add custom appliances with their own power ratings (wattage) to the appliancePowerMap.	The calculateTotalPowerUsage method calculates the total power usage (wattage) based on the applianceHoursMap and the power ratings (wattage) obtained from the appliancePowerMap. The predictNextMonthBill method uses the calculateTotalPowerUsage method to obtain the total power usage (wattage). It then applies a fixed rate to calculate the predicted bill for the next month.	The predictNextMonthBill method returns a double value representing the predicted electricity bill for the next month based on the total power usage and the fixed rate.
ElectricityBillProjection Class	User input from the GUI includes the selected appliance from the ComboBox and the wattage entered in the TextField.	When the user clicks the "Add Appliance" button, it adds the selected appliance and its wattage to the applianceWattageMap. It then uses the BillPredictor class	The GUI displays the predicted bill and tips generated for reducing electricity consumption. Login Class:

		to calculate the predicted bill for the next month based on the applianceWattageMap. The TipsGenerator class is used to generate tips based on the predicted bill.	
Login Class	Username and Password	It checks if the username and password match a predefined username and password.	If the login is successful, the GUI of ElectricityBillProjection is displayed, allowing the user to use the electricity bill predictor. If the login fails, an error message is shown indicating invalid credentials.
TipsGenerator Class	The double value predictedBill, which represents the predicted electricity bill.	The suggestTips method takes the predicted bill as input and generates different tips based on the predicted bill range.	The suggestTips method returns a String containing the generated tips based on the predicted bill.

Flowchart


START
DISPLAY
LOGIN
"Username: "
"Password: "
(login button)
INPUT
username
password
username == TEAMDIONYSUS && password == RUIZ
False
DISPLAY
ERROR
"Invalid Username or Password."
True
DISPLAY
"Appliance: "
"Wattage: "
(add appliance button)
INPUT
appliance
wattage
"Refrigerator" = 150.0
"Electric Stove" = 1000.0
"Microwave Oven" = 800.0
"Rice Cooker" = 400.0
"Blender" = 300.0
"Aircon" = 1000.0
"Electric Fan" = 75.0
"Electric Oven" = 1000.0
"Pressure Cooker" = 700.0
"Others"
totalPowerUsage = powerRating * hoursUsed
predictedBill = totalPowerUsage * 0.1
predictedBill > 0 && predictedBill <= 1000
True
DISPLAY
"- Turn off lights and unplug devices when not in use."
False
predictedBill > 1000 && predictedBill <= 2000
True
DISPLAY
"- Use energy-efficient appliances and LED bulbs.\n"
"- Adjust your air conditioning temperature to an energy-saving level."
False
predictedBill > 2000
True
DISPLAY
"- Insulate your home to reduce heating and cooling costs.\n"
"- Make sure your appliances are energy-efficient.\n"
"- Consider using renewable energy sources such as solar panels."
END

IV. Deliverables



Tasks	Point Person
Project Proposal	Everyone
Creation of Codes	Everyone
Debugging and Finalizing of Codes	Everyone
Creation of Project Paper	Everyone
Creation of Project Video Script and Presentation	Enriquez & Polido
Video Editing	Ramos

The application will include a user manual that will instruct users on how to maximize the tool's potential. It will cover the client, server, and database components of the program's three-tier architecture. The user manual will provide guidance on navigating the user interface, entering energy usage data, setting goals, and accessing data visualization tools. Additionally, it will assist in training new users and resolving common issues. By highlighting advanced features and best practices, the user manual will help users make the most of the application and achieve their energy-saving goals. Overall, it will ensure a consistent and standardized user experience while streamlining energy use tracking and promoting cost reductions.

V. Evaluation

The project's success will be evaluated based on functionality, usability, efficiency, and scalability. We will conduct user testing to assess the system's usability and intuitiveness. Energy data accuracy and the relevance of recommendations will measure efficiency, while scalability will be evaluated by testing the system under high user loads.

VI. Conclusion

The Energy Consumption Tracker project holds significant importance in addressing the need for affordable and clean energy, aligning with Sustainable Development Goal 7. By providing users with a comprehensive platform to monitor, analyze, and optimize their energy consumption, the project aims to foster a more sustainable and environmentally conscious society. The project's key functionalities, such as user registration and login, energy consumption data input, data visualization and analysis, goal setting and tracking, energy-saving tips, comparative analysis, reporting and recommendations, and integration with smart meters or IoT devices, collectively contribute to fulfilling this need. By empowering individuals to track their energy consumption patterns, set goals, and receive personalized recommendations, the Energy Consumption Tracker promotes awareness, behavioral changes, and energy-saving practices. Users can make informed decisions, reduce wastage, and contribute to a cleaner and greener future. Moreover, the project's potential integration with smart meters or IoT devices allows for real-time data capture and eliminates the need for manual input, enhancing convenience and accuracy. This integration further positions the Energy Consumption Tracker as a forward-thinking solution leveraging emerging technologies for efficient energy management. In conclusion, the Energy Consumption Tracker project offers a comprehensive, user-friendly, and technologically advanced solution to address the need for affordable and clean energy. By empowering individuals with knowledge, insights, and tools to optimize their energy consumption, the project encourages a sustainable lifestyle while contributing to the larger global efforts towards a greener and more environmentally conscious world.

VII. References

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