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HOME ENERGY MONITOR WEBAPP

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Abstract*:* The abstract introduces the Home Energy Monitor Web Application (HEMWA), designed to enable users to monitor, analyze, and optimize household energy usage. It offers a user-friendly interface for real-time and historical energy data visualization, personalized insights, and comparative analysis. HEMWA integrates modern web technologies like React.js and Node.js for frontend and backend development, emphasizing energy awareness and sustainable practices. Future enhancements may include machine learning for predictive analysis and increased customization based on user feedback and energy efficiency standards.

INTRODUCTION:

- Introducing our Home Energy Monitor WebApp – your all-in-one solution for tracking and managing household energy consumption.
- Real-time monitoring of electricity, gas, and water usage empowers users to identify trends and set goals for optimization.
- Personalized energy-saving tips and customizable alerts help reduce waste and save money.
- Tailored for homeowners, renters, and business owners alike, our intuitive interface makes it easy to take control of energy consumption.
- Connect smart meters or monitoring devices to our platform for seamless integration.
- Key features include historical usage analysis, goal setting, and progress tracking.

MOTIVATION:

A home energy monitor web app empowers users to take control of their energy consumption, leading to informed decisions, cost savings, and environmental benefits. By tracking usage in real-time, users can identify areas for improvement, contributing to reduced carbon footprints and sustainability efforts. The convenience of accessing data anywhere fosters community impact and education, promoting responsible habits. Embracing innovation, such tools future-proof against fluctuating energy prices and environmental concerns. By fostering supportive communities and personal satisfaction, users can take pride in their contributions towards a more sustainable future.

PROBLEM STATEMENT & OBJECTIVES:

- **Problem Statement:**

Design and develop a web application for monitoring home energy usage to help homeowners track, analyze, and optimize their energy consumption. The application should allow users to view real-time and historical data of electricity, water, and gas usage, providing insights into usage patterns, trends, and potential areas for improvement.

- **Objectives:**

- Real-time Monitoring.
- Set energy usage goals.
- Energy Saving Tips and Recommendations.
- Historical Data Analysis.

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RESEARCH METHODOLGY:

1. Project Setup:

2. Define scope, objectives, and identify stakeholders and the problem being addressed. Gather user and technical requirements through interviews and surveys.
3. Design and Development:
4.
5. Outline the system architecture, including database and user interface design. Develop detailed designs for each component.
6. Implementation and Monitoring:
7.
8. Deploy monitoring tools for performance tracking and report generation. Regularly review system performance for improvement opportunities.
9. Evaluation and Enhancement:
10.
11. Assess project outcomes against objectives and collect stakeholder feedback. Optimize and update the system based on evaluations and feedback.

LITERATURE SURVEY:

SURVEY OF EXISTING SYSTEM

Current Tools and Platforms: Review of existing web and mobile applications aimed at monitoring and promoting energy efficiency. These tools often provide insights into ene
rgy consumption patterns, offer tips for reducing energy use, and sometimes integrate with smart home devices.Energy Efficiency Guides: Exploration of various online resources, blogs, and forums that share best practices for energy conservation, including the use of energy-efficient appliances and behavioral changes to reduce power consumption.
Smart Home Technology: Analysis of the penetration and effectiveness of smart home devices like smart thermostats, lights, and plugs in managing and reducing energy consumption.

Survey of Limitation in the Existing System or Research Gap:

User Engagement: Many existing systems lack engaging, user-friendly interfaces, reducing their effectiveness in encouraging long-term energy-saving behaviors.
Customization and Personalization: A gap exists in the personalization of energy-saving recommendations based on individual user habits, location, type of dwelling, and specific appliances

used.
Integration Capabilities: Limited integration with a wide range of smart home devices and appliances, hindering comprehensive energy management solutions.
Real-Time Feedback and Gamification: Lack of real-time feedback mechanisms and gamification elements that can motivate users to actively participate in energy-saving activities.
Accessibility and Education: Insufficient emphasis on educating users about the importance of energy efficiency and how small changes can lead to significant savings.

PROPOSED SYSTEM:

Introduction:

This project was developed to help out students in need of the hour by providing them with different learning materials like Syllabus, E-Books and PYQs.
We have also provided quizzes for the students to test their knowledge and skills.
Discussions section helps students to access information registered by their seniors with a scope to learn how to tackle common academic issues.

For the above applications, the website was developed by using technology as:

- **HTML (HyperText Markup Language):**

Provides the basic structure of the website. Using this, we define the *skeleton* of the website and add elements to it.

- **CSS (Cascading Style Sheet):**

Helps us style the *defined skeleton* of the website. With varieties of styling options, we can make the website as attractive as possible.

- **JS (JavaScript):**

JavaScript is a client-side scripting language which is used to dynamically modify and style elements based on the user interaction.

- **FIREBASE**:

Firebase is a comprehensive app development platform offered by Google that provides a variety of tools and services to help developers build, improve, and grow their apps

The above tools have helped us design the website to its fullest. We have also used:

- **VSCode (Visual Studio Code)**:

VSCode is a code editor using which we've wrote the entire code for the website.

Architecture / Framework:

We have defined the architecture of the website as follows:

1. User Interface: -

1) Intuitive design for user self-service and admin dashboards.

2) User-friendly interface.

2. Database Management: -

a. Centralized database for secure storage of user data.

b. Database management system for efficient data retrieval.

3. Technologies Used: -

a. Frontend: HTML, CSS, JS

b. Database: Firebase

Flowchart

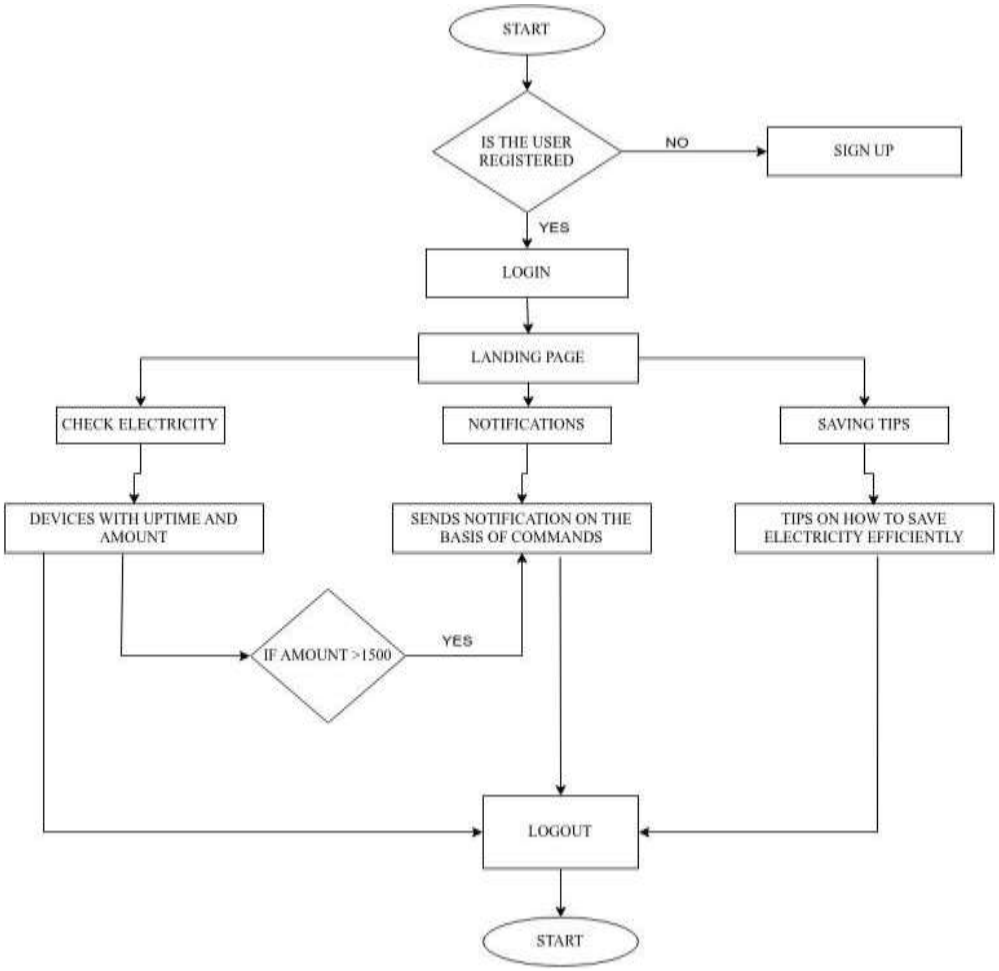

Fig. 1. Flow Chart On Home Energy Monitor Webapp

Main Home Page:

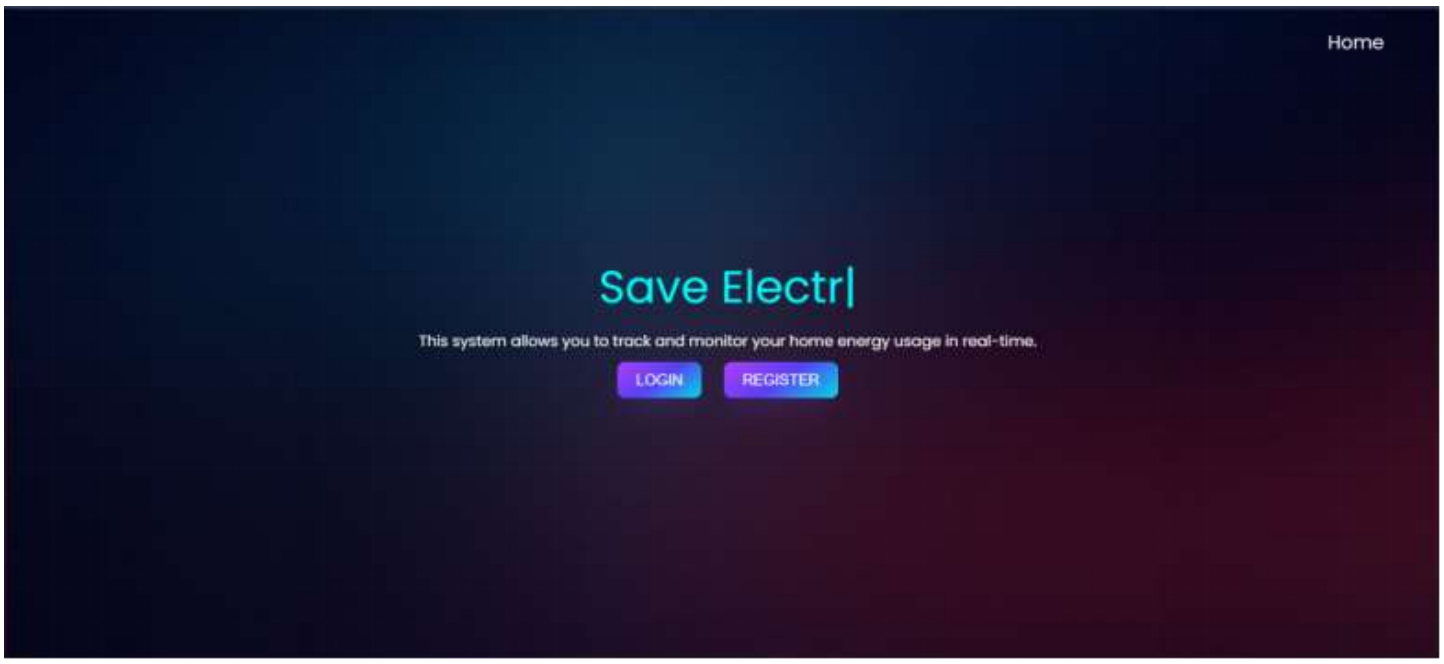

Figure 2

Figure 2: The first page presented to the user upon opening the application, this page gives the input boxes to create a new registration or login an existing account.

Register dialog box and screen:

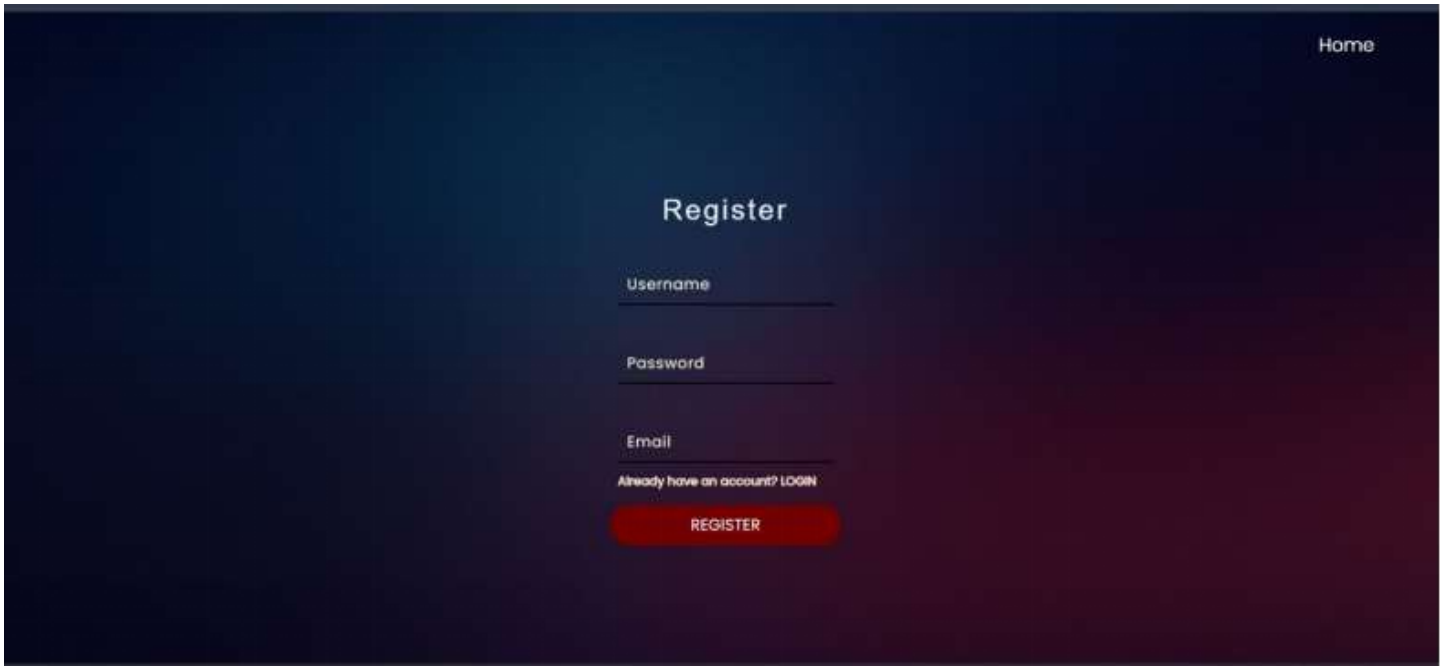

Figure 3

Figure 3- The Register dialog box allows the user to fill credentials with username, password, and email username for backup purposes. It also provides an option to jump on the login page if the user already has an account.

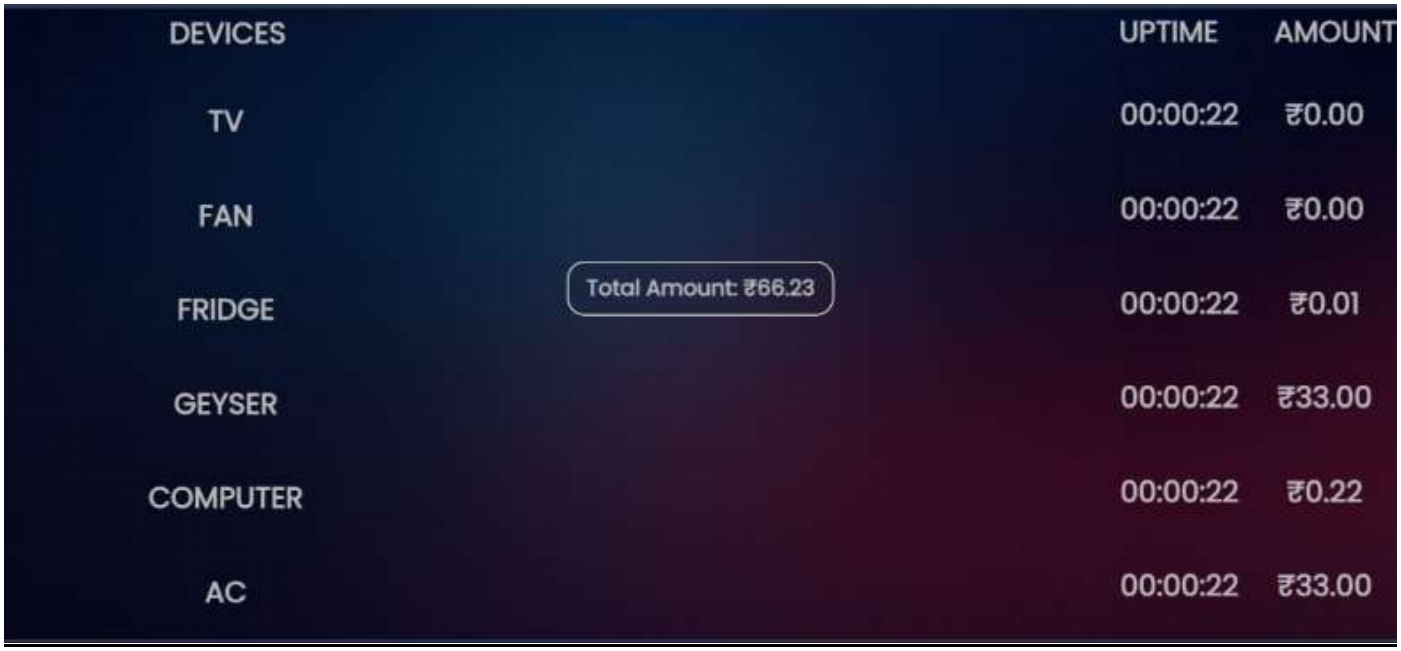

Figure 4

Figure 4 - This page shows the devices along with their uptime and amount which constantly updates every second.

FUTURE SCOPE:

- Enable tracking of energy from renewables like solar or wind, highlighting environmental benefits and cost savings.
- Use machine learning to forecast energy usage and offer optimization tips for reducing costs during peak times.
- Facilitate integration with smart grids for demand response, allowing users incentives for lowering consumption at peak periods.
- Improve analytics and reporting for detailed energy consumption insights, helping users identify efficiency opportunities.

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REFERENCES:

1. Chatgpt: Helped in bug fixing along with some help for developing new ideas.

2. Stackoverflow: Used in solving bugs and getting methods to solve certain issues.

3. Youtube: Helped in getting new ideas for the project and ways to implement them.

4. Geekforgeeks: Wording for creating documentation and ppt.