Home Group 1 - Project Proposal

Introduction

A plug base that can be controlled over the internet and can be heavily customized in terms of monitoring and scheduling.

Targets

Most modern-day appliances have stand by modes resulting in a large net vampiric current for a household. Smart plug that can be controlled via website or a mobile app can allow features such as power monitoring and scheduling which should reduce the effect of vampiric current.

Methodology

1. Sensors and electronics

Circuits designed for reading the voltage of the live wire and the current through it are implemented in the circuit. The voltage sensor will be connected in parallel with the with the output and the current sensor will be contactless around the live wire with an analog output. Additionally there will be contactless voltage detectors to test if the wire is live before and after the fuse to indicate if the fuse is blown. Additionally a similar circuit will be implemented to notice the absence of the ground connection. Functions will be written in the esp code to read each of these sensors.

2. Data acquisition and communication

The functions developed to read data from the sensors will be utilized to send and save data in the Firestore via the node.js platform. After feasibility checks a direct connection between ESP module and Firestore may be developed in future. Firestore acts as the main database and the node.js platform acts as the main server. Node.js is the most critical part of the project which controls all functions of the product. The stored data in the Firestore has to be accessed inorder to process the data to identify patterns and to display necessary data in the UIs. Functions required to access data from store will be developed in this section. Then the analyzed data obtained after machine learning will be sent to the firestore via the node.js platform. User controls fetched by UIs will be communicated to ESP via node.js platform. Functions required for all these communication aspects will be developed under this section

3. Data retrieval and analytics

Data will be retrieved from the main database using REST API requests and processed. Obtained data will be analyzed to identify general patterns and trends that can be used for the ML model. With predefined periods (preferably 10 days), the obtained data will be analyzed.

Using the processed data general patterns and trends will be identified. Thus, the ML model will be implemented to identify usage patterns accordingly. The Model will be implemented such that it can identify the patterns by comparing the live data received. Furthermore, the predictions obtained through the ML model will be implemented to notify the developers that working on data visualization platforms.

4. Data visualization and control

As the first step, a website will be developed using HTML,CSS and javascript and then a mobile app will be developed with the help of that website as well. The website will allow the user to enter into the main page after sign in or register into their account. Firebase will be used to save the user details and retrieve it. After the successful registration/ sign in, the user will be entered into the home page and that home page will contain the collected data of the sensors and this page will have the taps for analyzed data and control panel as well. This part will be improved in the future along with the improvements of our project. Smart plugs can be added to the same user UI using QR code scanner and they can be individually monitored.

5. Product design and development

In here we were used a standard fuse plug base with sunk box to mount all the modules. PCB will be designed to connect ESP32 microcontroller, voltage and current sensor and relay. Wire gauge for the circuit was calculated using online calculator to tolerate the 240 v and 15 A current. At median temperature of 75 celsius,14 AWG copper wire could handle 16 amps of current. And it could carry 3840 watts for 240 V.

Cost Estimation

Component	Qty	Cost (Rs:)
Voltage sensor	1	600.00
Current sensor (ZMCT103C)	1	550.00
Relay module	1	800.00
ESP32 Module	1	3100.00
BC547	9	90.00
330 ohm	3	10.00
Sunk box	1	150.00
Fused plug base	1	200.00
14 AWG AC wire	20 cm	87.50

Total Cost	**5587.50**

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