PLUGSi
Smart Modular Power Outlet

Project Proposal

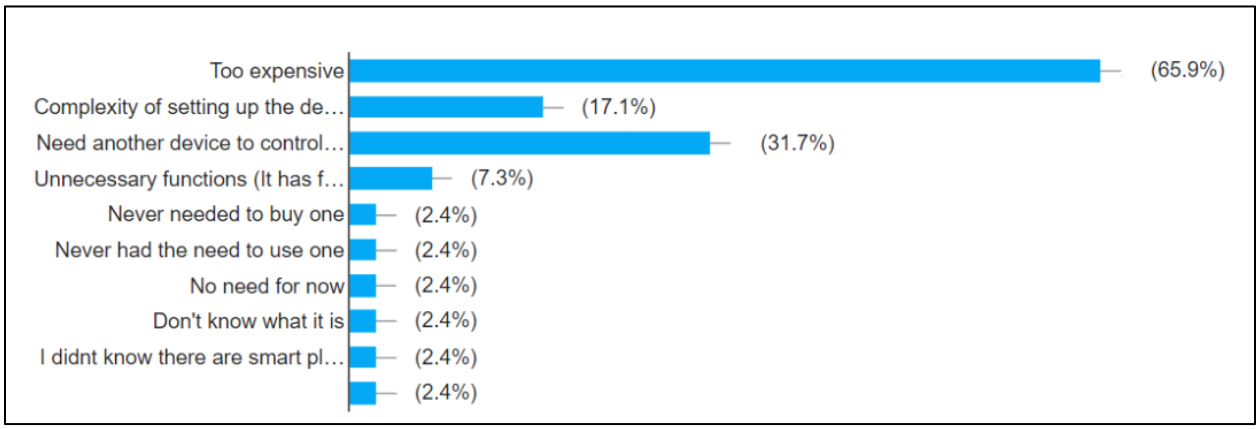
Team Name	**PLUGSi**
Category	**UNDERGRADUATE**
Theme	**INDUSTRY 4.0**

Problem Definition

Introduction

Our team noticed that the existing power outlets are not advanced enough to match the level of technological advancement in the current world. Although there are many smart appliances, power outlets that can actually be called smart are not available on the market. The problem we identified is that the existing power outlets do not have customizable add-ons such as Bluetooth, Wi-Fi, Reprogrammable Timers, Set Timers, etc. nor intelligent decision-making abilities. They either cater to only their core function or have add-ons that come with it originally eliminating the ability to customize them according to the needs of the user making them highly expensive. Therefore, we conducted a survey to get detailed user inputs and what follows are the reasons for the existing options to be disliked by users. We aim to resolve the following concerns by addressing our main identified problem emphasized above.

We conducted a survey and following are the results.



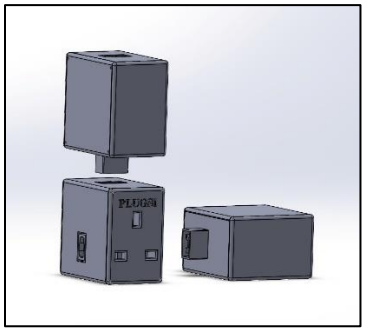
Problem Analysis

In the rapidly advancing landscape of smart technologies, where IoT and automation are transforming daily life, the stagnation in smart power outlets is a bottleneck. The identified problem holds implications across various sectors: both domestic and industrial. Domestic consumers are increasingly adopting smart home technologies, yet the current limitations in smart power outlets hinder their full potential. In industrial settings, the lack of advanced power outlets results in missed opportunities for automation and optimization. By incorporating IoT through a mobile application into smart power outlets, we can enable dynamic communication, allowing for advanced

automation and intelligent decision-making based on real-time data. Our proposed solution aligns with the paradigm of Industry 4.0 as we look into Integrating IoT, AI, and automation into the development of customizable smart power outlets. AI algorithms can learn user behavior, optimize energy usage, and adapt to changing patterns.

Proposed Solution

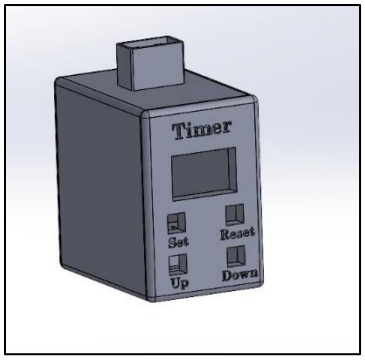
Proposed Product

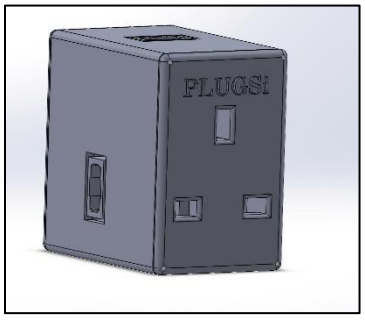


The product consists of two main parts.

- Power Base
- Modules

Modules can be attached to and detached from the Power Base. Modules control the state of the power base. They can have a variety of abilities based on their design. Multiple modules can be connected to the same Power Base. Bluetooth Module, Reprogrammable Timer Module, Set Timer Module, and Wireless Switch are some examples for Modules.





Power Base is connected to a power outlet and any utility (device) can be connected to the Power Base. It controls the AC supply to the device and provide power to modules. Power Base has ports(interfaces) to communicate with the modules.

Uniqueness of the Solution

In our solution, users can choose the modules that they need rather than paying for all the unnecessary functions. We can provide instructions as to how the Power Base

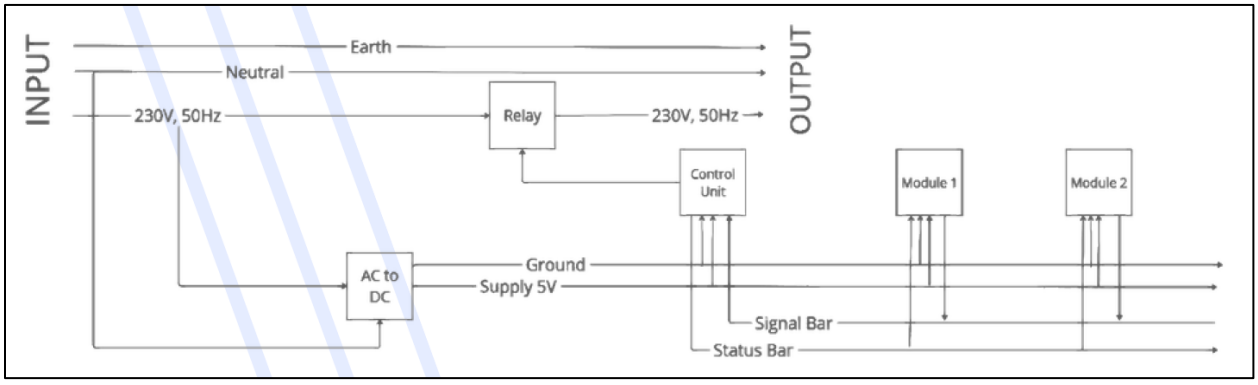
works and the requirements that a module needs so that anyone can make their own modules. Further, it uses a standardized communication protocol, ensuring seamless integration. Its affordable power base provides a cost-effective entry point, while allowing third parties to develop modules. Its unique modular design enables users to swap modules based on their interests or changing needs, promoting adaptability. This is an eco-friendly solution as this minimizes electronic waste. In essence, the Smart Modular Power Outlet redefines user experience with affordability, adaptability, modularity, and customizability.

Technical Overview and Implementation

Technical Details

The module is designed to issue a command using a pulse signal, and it performs a status check prior to generating the pulse signal. In the event that the power base has reserved a pulse, the base modifies the current state of the relay. This functionality is achieved through the implementation of a pulse-based communication protocol and the integration of status monitoring and relay control mechanisms within the module's architecture.

Module's hardware will be based on their own designs to achieve the required outcome. All of them would share a mechanism to check the base status and generate the pulse.



User Scenario

Scenario 1

Industrial facilities often require control over the power supply to numerous machines for maintenance, energy management, and process optimization. Currently, existing options fall short:

- They have to rely on existing smart plug which comes with load of unnecessary features with a high price
- They have to build a power outlet from the scratch

Solution: PLUGSi, the modular smart plug, revolutionizes industrial machine control with its flexible and scalable approach with low cost. They just have to use PLUGSi base with the Bluetooth module. Even it is possible to upgrade PLUGSi when needed with such as IoT features, timers etc.

Scenario 2

Thaveesha wants to control his water pump by a remote control and turn it off automatically after 10 minutes. There is no popular solution for him in current market. He has to buy something which can be very expensive and not suitable to the scenario.

Solution: Thaveesha only has to get the PLUGSi base, Timer module, And IR module with Remote controller. And now he has achieved his goal. Hooray. He has the possibility of upgrading to or use PLUGSi with a completely different use case.

Scenario 3

The power outlet modules can be equipped with energy monitoring capabilities. Residents can track and analyze the energy consumption of individual devices plugged into these outlets through a dedicated mobile app or a centralized smart home hub using digital twin technology.

Scenario 4

Some power outlet modules can include built-in occupancy sensors. If no motion is detected in a room for a specified period, the outlets can automatically cut power to connected devices to prevent unnecessary energy consumption and reduce the risk of electrical fires. Smart outlets can be integrated with home security systems. For example, when the security system is armed, the outlets can automatically cut power to non-essential devices, creating the appearance that nobody is home.

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