EE496B Spring 2020

Power-Trip

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Background

Rising power consumption may be attributed to the large number of home electronics the average person owns. Residential power consumers generally lack a clear concept of their power usage. This can result in wasted power, unnecessary load on the grid, and wasted money for the consumer. Anyone paying a power bill could make use of consumption analytics and the ability to remotely control their usage.

Project Description

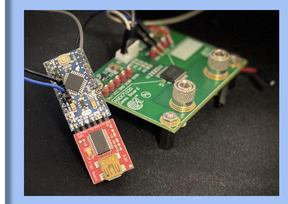
The Power-Trip module monitors the load of each circuit at the breaker box within each residence. The measurements are sent to a web server via a raspberry pi microcontroller for consumers to access via both smartphones and personal computers. The data is displayed visually for usage history and current power usage. Consumers can remotely view power consumption on a per circuit basis to determine where power is being wasted in order to reduce wasted electricity and money.

Power-Trip also allows consumers to control their usage remotely by using solid state relays and toggleable buttons. Users can remotely turn circuits on or off when desired. Circuits supplying essential power to devices such as the refrigerator and router—with which the system is communicating to the web app—are locked to prevent user from turning them off.

Power-Trip Residential Breaker

Hardware / Key Components

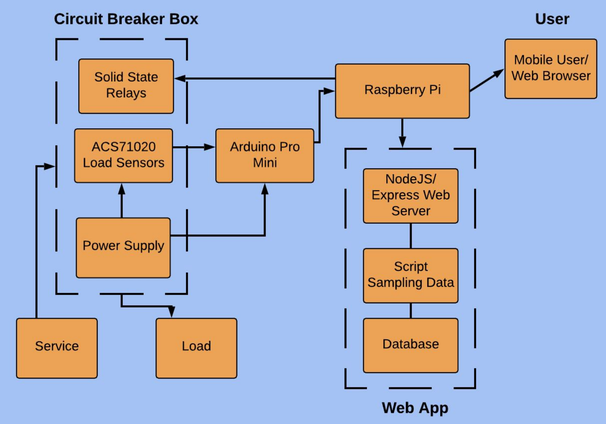
Raspberry Pi 4
Host web server for web application (Node JS)



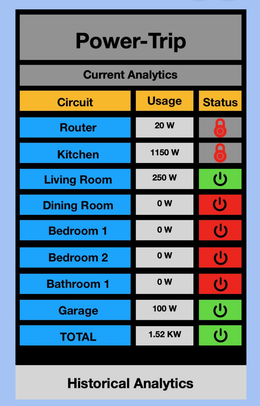
ACS71020 Evaluation Board and Arduino Pro Mini
Power monitoring IC and communication relay

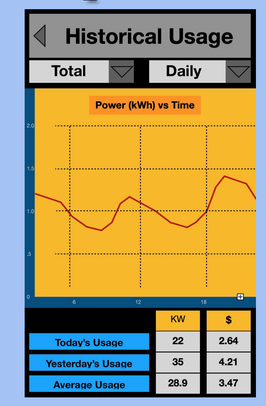
Solid State Relays
To toggle breakers

System Block Diagram

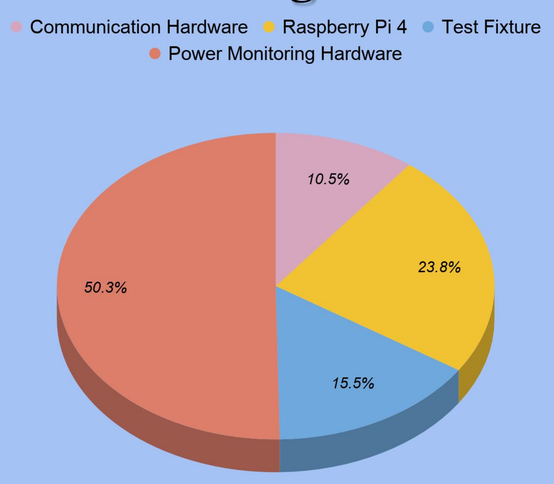


Web App Concept Art





Budget



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