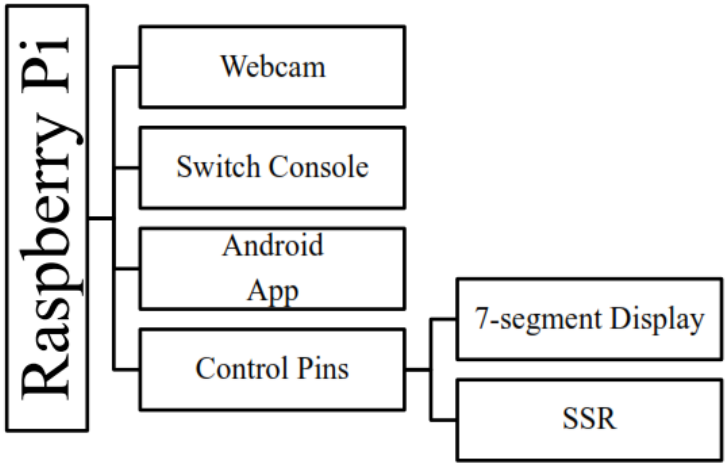
Smart Grid Compatible Control of Appliances Using Internet Protocol

Our project aimed to enable control and monitoring of appliances through the internet and additionally help in energy conservation by means of occupancy detection coupled with automatic switch off of appliances. This was also in compliance with the smart grid initiatives being taken in the country.



An overview of the project is shown in the figure above.

The heart of the project was the Raspberry Pi, through which the various appliances were controlled. Solid-State Relays were used for controlling the power to the appliances as they provided opto-isolation of the control circuit from the power circuit. Simple on/off control was provided for lights while intensity control was provided for fans. A digital wall switch which displayed the current state of the appliance (using 7-segment displays) was designed, as the traditional switches relying on physical contact were not compatible with our requirements.

The main components of the software part of the project included a web camera program (OpenCV and C++), Raspberry Pi Programs (Python) and an Android application.

The web camera program was designed to detect a given predefined subject of interest in the frame of view of the web camera. There were two Python scripts written for the Raspberry Pi processor, namely Web (web_rpi.py) and Server (server_rpi.py). The Web script was an intermediate program to handle all connections and requests from the various other components of the system (such as from the Android app) while the Server script was used to activate the appropriate pins on the Raspberry Pi control pins upon receipt of serial data instruction from the Web script. The Android application was designed to offer a user-friendly, simple and intuitive interface to access the various appliances for both monitoring and control.