Designing a smart phone Appcessory using Bluetooth Low Energy - Household Appliance Controller

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Project Overview
After decades of development on computing devices, the 21st century smart phone has plentiful of functions and can perform complex computation quickly. Although there are rapid development in handheld devices, it is observed that the technologies have limited advances in controlling conventional household electronic devices such as lights, fans, air-conditioners and others. The controlling of the household electronic devices are still mostly rely on physical switches or infrared controllers. As each switch and remote controller can control one and only one household electronic appliance, family members are easily confused if there are many switches.

This project would use an Android application to control household appliances such as light bulb to turn on and off. This project also includes a re-design household light switches. The new switches would have a Bluetooth Low Energy module installed in order to be controlled by smart phone wirelessly.

Aim and Objective
The objective of the project is to solve the major problem of the existing household appliance control method, which only controls only one appliance and require user walk to the switch. It is also inconvenient for person with disability.

The goal of the project is to provide a simpler method to control household appliance. By using smartphone’s touch screen, the switches can organized neatly. Users no longer required to walk to the switch. It also introduce more functions, for example, users can set timer on appliance so that the appliance would turn on/off or being set to specific orientation at specific time.

Methodology
The application required a smart phone with Android 4.3 or above. It categorise appliance into different type then before displaying them. Different category of appliance can have different user interface. The application uses a navigation bar on the left to let users to switch between different rooms easily. It also allow users to set event for household appliance to turn on/off at specific time. The user interface is designed to look as similar to Google Calendar as users are familiar to the calendar.

Switches box are re-designed so that it is able to communicate with smart phone via Bluetooth. A fail-safe mechanism is also included as there may be an occasion that remote controlling is not feasible. Such as when smart phone has used up its battery or a person does not have the application installed. The data and information of the switch and appliance is stored on EEPROM of Arduino Nano Board, which can be downloaded to users’ smart phone.

Block Diagram

Result
The final product are an Android application and a switch box controls one appliance. In fact, one Arduino Nano board can connect up to 7 different appliance if more relay and buttons were installed. The testing shows that users are able to switch on/off light bulb with their smart phone in 10 meters distance. There are short delays between users’ clicks and light turns on/off.

In the photo on the right, the green is a Bluetooth LE module, beside it is a 220V to 5V converter, Arduino Nano located at the top and relay located at the bottom.