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# Envision, Enable and Empower Smarter and Resilient Societies

# DEVELOPMENT OF AN ANDROID APPLICATION FOR POWER CONSUMPTION MANAGEMENT SYSTEM USING PROGRAMMABLE TOGGLE SWITCH

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## ABSTRACT

Constant increase in power rate in the Philippines is attributed to the lack of supply to meet the consumer's demand. As a result, high consumption cost is added to the household budget especially when measures on conserving power are neglected. Such scenario inspired the researcher in creating a home automation technology to manage household power consumption applying current technology trends like the massive usage of internet and smart phones, at a minimal and reasonable cost. In order to attain the objectives of the study, affordable and quality technologies were considered. The android application was developed using MIT App Inventor. The android smart phone serves as the graphical user interface. The Arduino WiFi shield and the code written in C Language programmed in the Gizduino microcontroller make the wireless data communication between smart phone and the Programmable Toggle Switch (PTS). The device with patent title Programmable Toggle Switch and patent number PH/1/2009/272 is a smart device capable of automatic or manual control of connected electrical loads. The PTS is where the home appliances are connected that interprets the command from the microcontroller and executes possible action to the command executed in the android application. As a result, control to the home devices or appliances such as lights, TV and aircon, and power consumption management in the household were made possible at a minimal cost.

**Keywords:** Programmable Toggle Switch (PTS), Android, Smart phone, Microcontroller, and Power Consumption Management.

## Introduction

In the Philippines, one of the prevailing problems in every household today is the continuous raise of power rates. This is believed to be one of the consequences of the fact that the country's power supply is not sufficient to meet the consumers' demand. The worst thing is that, the situation may carry on for a long period of time despite the efforts of the government to resolve the matter. Aside from the increase of power rates, electrical power consumption is also highly dependable on the household usage. The scenario in every household today is the propensity to neglect the fundamental nature of conserving energy especially now that variety of electrical appliances, machines, lightings, gadgets, and the like which believed to provide numerous advantages and comfort in every individual or household. The tendency is that at the end of the billing period the household is faced with a relatively high electrical bill which takes away a big part on the family income.

There have been several strategies considered by consumers to help cut off high power consumption such as home automation technology, also known as intelligent house technology or smart home system which automatically, manually, or remotely control the lighting, and other electrical appliances. However, several situations, reasons and behaviors deter the effectual utilization of such strategies like resources constraint considering the cost of installation of available home automation technology in the country and the unwillingness of consumers to sacrifice the comfort derive from utilizing electrical appliances, machines, lightings, gadgets, and the like over saving electrical power [1]. With these limitations, the development of a localized and low cost technology for home automation is a challenge that motivated this research that even a low-income individual or household can avail.

Hence, localized and low cost technology for home automation through the design and development of an android interface for a Programmable Toggle Switch or PTS. The device with patent title Programmable Toggle Switch and Patent number PH/1/2009/272 is a smart device capable of automatic or manual control of connected electrical loads that can easily be integrated into existing electrical wiring in the household.

## Methodology

The research study involved three phases namely, software development, developed android application and PTS integration, and testing which include simulated and actual testing.
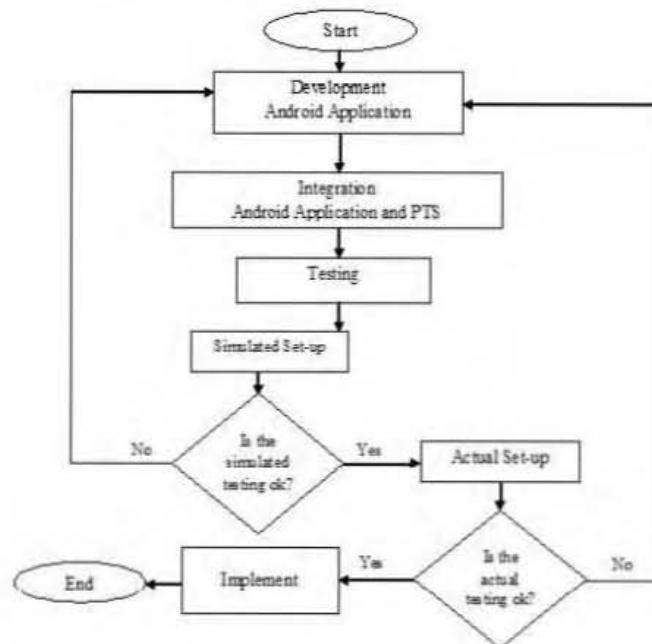


**Figure 1.** Developmental Procedure Flowchart

## Result and Discussion

System Architecture

The architecture of the system exhibits the relationship of each component and how the different components work together to control home appliances and manage household energy consumption as shown in figure 2.
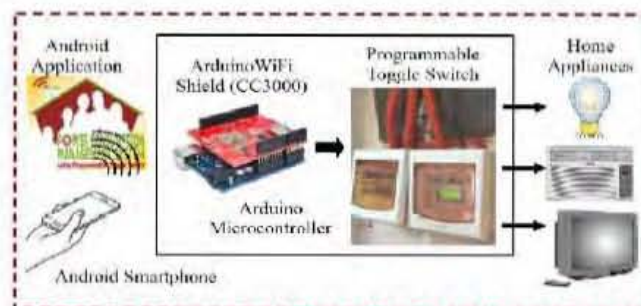


**Figure 2.** System Architecture

The android smart phone is where the developed application is being installed that will serves as the Graphical User Interface (GUI). The code written in C Language programmed in the Gizduino microcontroller will make the wireless data communication between smart phone and ArduinoWiFi shield and serial communication between the Gizduino microcontroller and the ArduinoWifi shield.

The programmable toggle switch is where the home appliances are connected. It interprets the command from the microcontroller and executes possible action to the command.

This makes possible the ability of the android application to queue in task to control and determine and active or inactive report status of home appliances and manage household energy consumption.

## Conclusion

Based on the results and testing and analysis that have been done on the research study it can be concluded that the successful realization of the study proves the possibility of utilizing new technologies in conserving household consumption at a very minimal mechanism cost.

Furthermore, the android application is user-friendly and easy to use, valuable in terms of functionality and the success rate of the study is favorable. It is also effective and efficient in power consumption management in the household with the aid of PTS and provides ease in terms of the capacity to control the switches of home devices or appliances, worry-free in the household in terms of the ability of the application to read actual power consumption, plan desired power consumption for a certain period, and provides updates and warnings on power consumption, so current bills for the household can be constantly monitored and controlled.

## Acknowledgement

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