



Voice Control Home Automation System

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Home Use

## Introduction

With the pandemic still ongoing, more variants have emerged with varying level of threat. As the number cases started to decline again after the emergence of the omicron it is still not guaranteed that the pandemic is ending. It is still important to follow safety protocol such as social distancing, regular disinfection and avoid direct contact from the environment to mitigate its widespread infection and minimize its casualty or damages. Automation and voice activation are one of the features to be implemented in order to achieve this goal. Hence, the idea behind this project, this way we can avoid interaction preventing infection and spreading of viruses as touch will no longer be needed to turn lights and outlet on or off. Which is among the most touch surface at our home.

## Objective

The objective of this project is the following:

- Connect Outlet and Lighting to the prototypes
- Integrate I/O for manual control and display of activity
- Integrate Google Assistant into the prototype
- Developed a Graphic User Interface for the system

## Project Description

The project aims to make used automation and voice activated features with the goal to minimize touching commonly interacted surfaces, such as plugs and lights switch and the likes, which could potentially hold virus and infect others. Furthermore, it is designed be implemented in homes given that most COVID-19 Cases are mild where home isolation protocol are mostly followed.

## Block Diagram

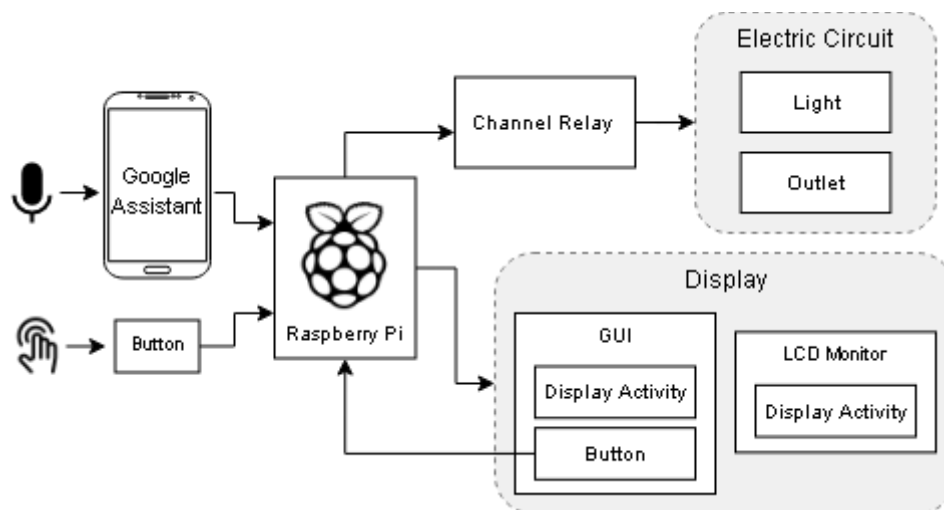


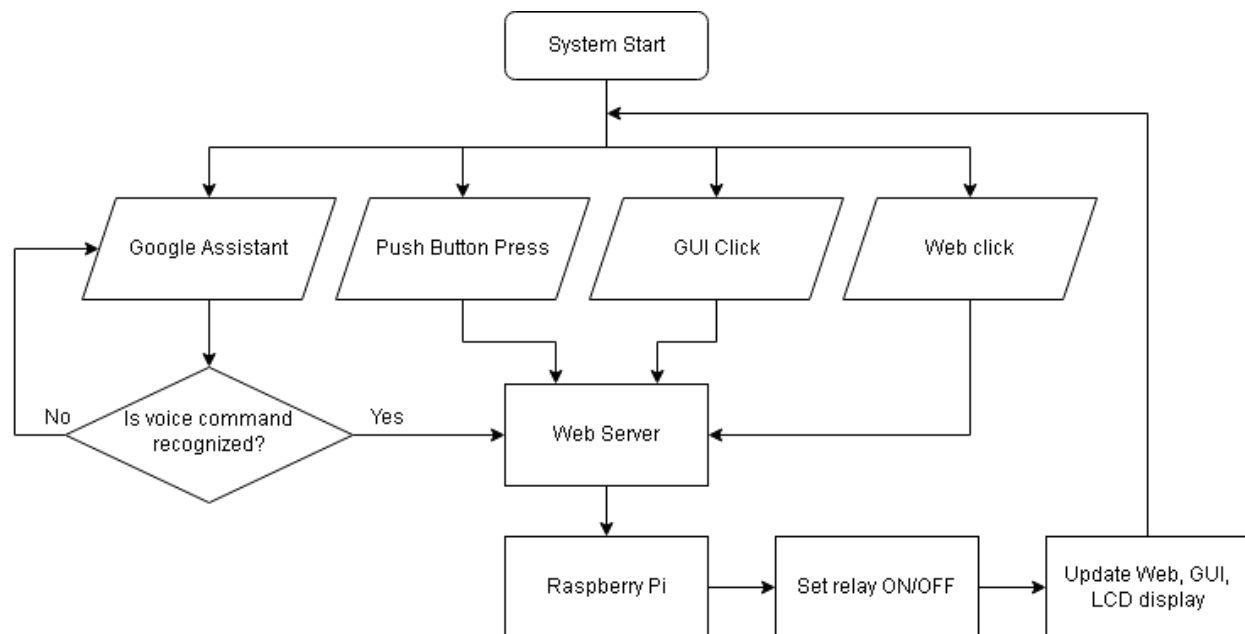
Figure 1. Block Diagram

The system is voice activated through the smartphone with Google Assistant integration. The connection between the raspberry pi module and the phone is established online. The google assistant will be responsible for determining the voice command given by the user and send a signal to the Raspberry Pi module. Aside from the voice command there are also three other ways of interacting with the device. First, push buttons are also integrated in the event the user would

want to manually set which switch to turn. Second, GUI buttons function similarly with the push buttons with the additional visual feature of displaying whether a specific switch is turned on or off. Lastly, the Web UI which can be accessed on any internet browser that function similarly with GUI buttons.

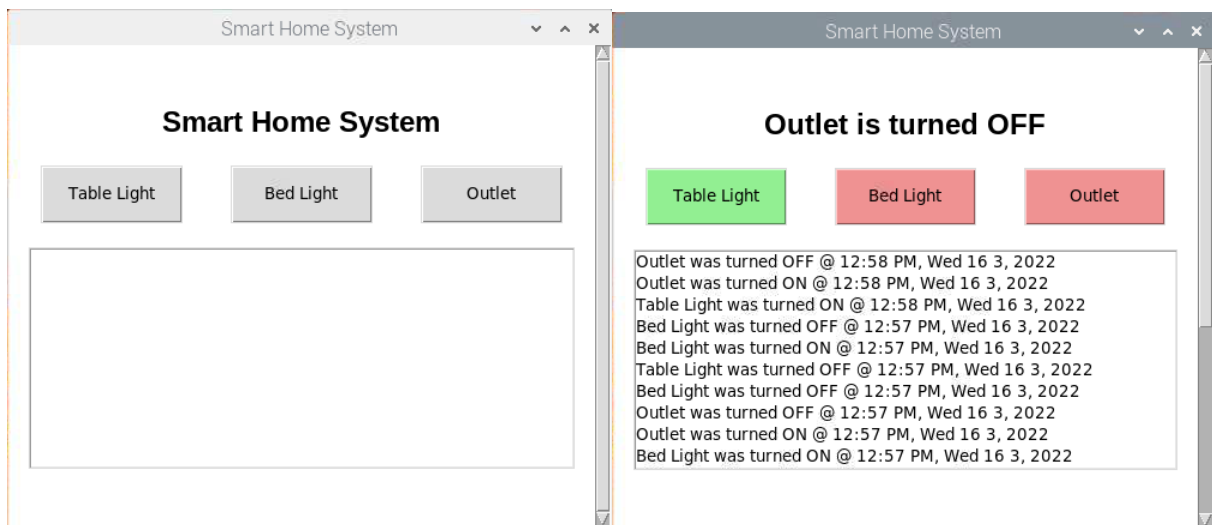
In addition, there will be two displays, the first display will be an LCD monitor to display activities done by the system. The other display will be a GUI seen in the desktop of the raspberry pi, it will display the recent activities and the activity history along with the date and time the activity happened.

### Program Flowchart

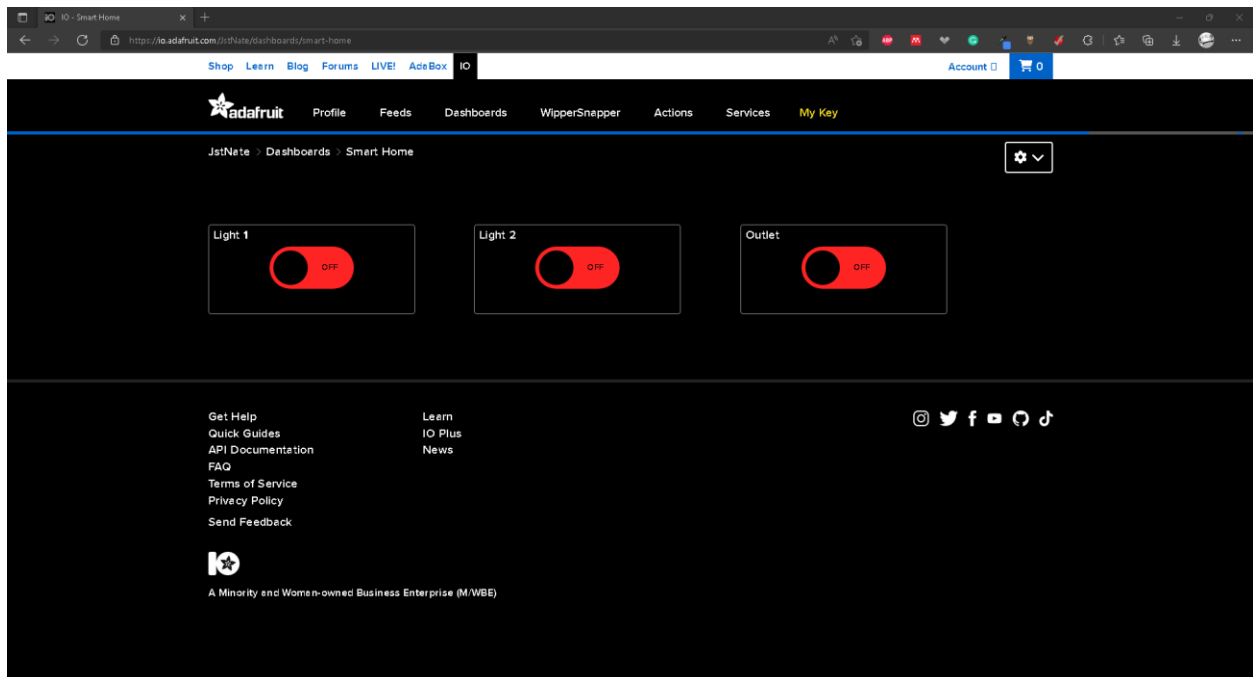


As mentioned in the Block Diagram section, the system has 4 inputs, which work simultaneously throughout the system. For the google assistant block, a phrase is spoken after the google assistant is activated in the smartphone, if the phrase or command is recognized it will send a signal to the webserver where the RPi is connected otherwise default google assistant response will be given and will wait for another voice command. Similarly, with the push button is pressed or the GUI or web dashboard is clicked it will also send signals to the web server. Once a signal is received by the RPi from the web it will then proceed to set the which relay to turn off or on, then afterwards, the display will be updated. The display process will temporarily display the most recent activity whereas for the GUI, it will remain on top of the button interface while the previous activity will be recorded at the scrollable list box of the interface. Furthermore, both the GUI and web button/switch will change its color depending on the status of the relay. Once the display has been updated, it will then again wait for the input given on the system looping the entire system unless the program is exited.

## Monitoring & Control System



### 2.1. Tkinter GUI



### 2.2 Adafruit IO web

As mentioned earlier the system can be controlled through the GUI and the web, both UI has button assigned with specific color depending on the status of the current relay or switch. Green button imply that the relay is turned on while red implies otherwise. Furthermore, as seen in Figure 2.1 the current activity is displayed on top of the buttons and while the activity log is displayed below the button along with the date and the time of the activity.

## Scope and Limitation

The system only holds 3 electrical components specifically, one outlet and two light receptacles for the light bulb. Furthermore, the voice activation will only be implemented on the light due to limited support of the free API.

## Findings

The findings to this project are the following: Connecting the electrical wire to the channel relay require safety precaution to prevent risk and injury; the Raspberry Pi server can be used as server for multiple devices to connect via MQTT Protocol to perform or assign specific task on each microcontroller task using different APIs and Services; lastly, the implementation of GUI provide additional visual features for the system.

## Recommendations

The project can be further improved by using module that support more relays to connect more electrical components, pay the API services for larger support and better customizability or utilize alternative services that can provide more features, utilize graph and other widget to provide better monitoring and visual representation of data; Lastly, integrating other sensor into the system can provide a more in-depth data and better monitoring system.

## Conclusion

The availability of different APIs, services and support provide more options for developers to create projects and technologies particularly in home automation and monitoring which can be used to strengthen safety protocol amidst the pandemic. This project is a basic implementation of IoT which can be further developed and improved not only in our home but also in other establishment especially in public enclosed areas. The addition of other sensors can provide better monitoring of a specific areas. In conclusion, automation and voice command feature can not only be used to prevent contact but as well as provide easier access of other devices.

## References

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