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Demo Model in Smart Home Application Design

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Abstract- This page introduces a demo model in designing an application for a smart home. In the smart home, appliances and amenities can be remotely controlled through mobile devices and computers connected to the Internet. The authors' team used the ESP32 module, gas sensors, fire sensors, sound sensors, light sensors, temperature and humidity sensors, and the Arduino development tool to create the demo model. The model includes steps of program installation, smart home model design, installation, and testing of the demo model. The smart home model is connected with the Blynk application, allowing users to control the system through a smartphone. Various sensor systems are used to control security, monitoring, alerts, temperature adjustment, lighting system control, and surveillance camera systems. The model has been tested and works with full functions, collecting environmental information thanks to sensors and then processed before being sent to Blynk's server before being transferred to the user's handheld device.

Keywords- IoT, smart home, Blynk, sensors, PTIT, DNU.

I. INTRODUCTION

A smart home refers to the establishment of a home with more amenities, where appliances and devices can be remotely controlled (users can control and monitor from anywhere in the world with an Internet connection) using mobile devices, computers. The devices in the smart home are connected through LAN, WAN, and Internet environments. Hence, the user can control functions such as building security access, apartments, temperature, humidity, light, and entertainment, etc... In this paper, the authors' team uses an ESP32 module, gas sensors, flame sensors [1], sound sensors, light sensors, temperature and humidity sensors, etc., and uses the Arduino development tool [4] to create a demo model for the application design and development of a smart home.

II. PROGRAM SETUP

1. Implementation Steps

Step 1. Program declaration
- Connect to Blynk via connection code
- Declare ESP32 libraries, declare connection pins, sensor input values

Step 2. Void setup function
- Initialize GPIO pins: Set up GPIO pins to work as input or output

Step 3. Void loop function
- Execute Blynk's running commands
- Execute loop commands when not receiving and receiving sensor signals

Step 4. Receive signals from the app for control

Step 5. Security, surveillance, and warning system
- Warning, sound and light alarm system
- A camera surveillance system that collects images sent back to the user's machine.

Step 6: Ventilation system, temperature control unit
- Adjust temperature and ventilation according to the settings in the program

Step 7. Lighting system
- Control the lighting system through the light sensor

Step 8. Smartphone control software

- Control the system through the application on the phone

2. Smart Home Model Design

For all homes, before starting to design and install

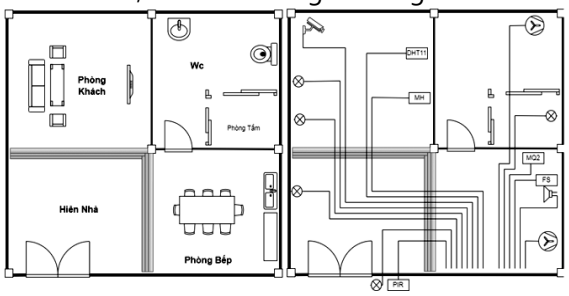

Figure 1. Diagram of connecting smart devices

smart devices for the home, we need to have a technical design drawing, the same goes for the smart home model. Here are two examples for the model of installing smart devices.

This drawing shows the connections of the smart device system with other electrical devices such as light bulbs, fans, etc., in the apartment.

3 Installation and Testing of the Demo Model

Control Center

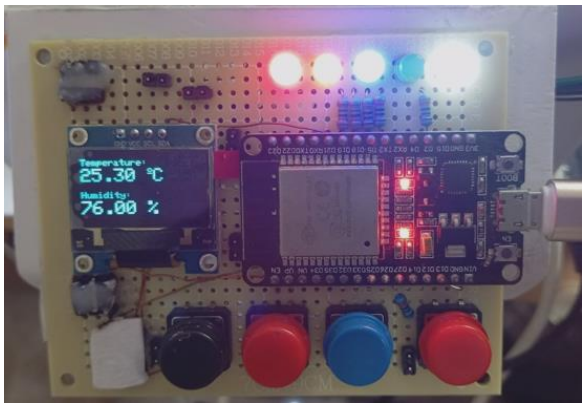

Figure 2. Central control unit

Figure 3. Control on the Blynk website

Gas and Motion Alarm

This sensor system is often integrated with various types of gas sensors such as MQ2, MQ5, MQ7, etc., body heat sensors that help detect human movement and detect gas [1], [2].

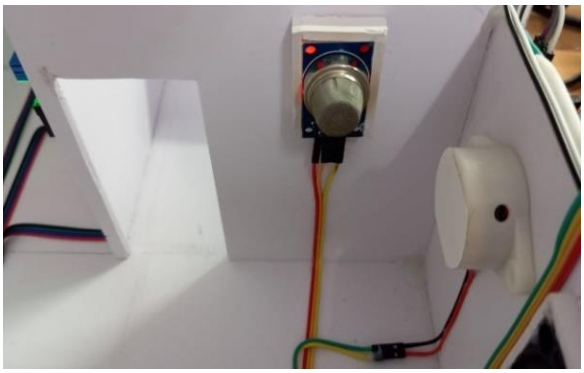

Figure 4. Gas leak alarm system

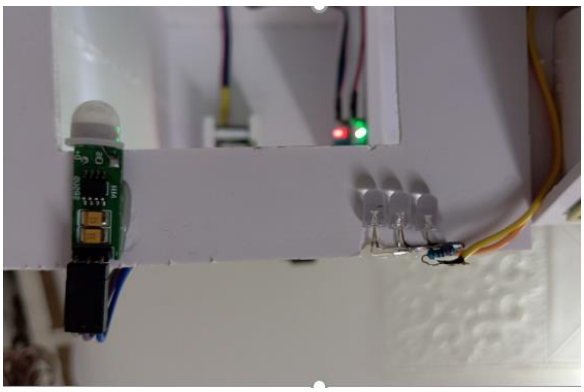

Figure 5. Motion alarm sensor system

Surveillance Camera

The surveillance camera module allows capturing images around the surveillance area and sending

them to the cloud, allowing users to monitor and detect intrusions by thieves [2], [3].

Figure 6. Surveillance camera system

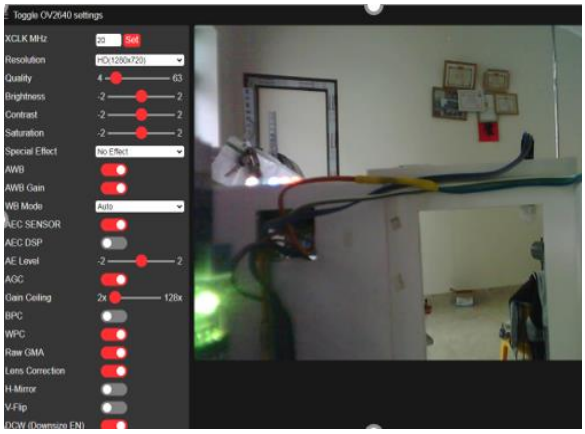

Figure 6. Surveillance camera system

Ventilation, Room Temperature Stabilization

This system helps the air in the entire house always be in a good state for health, not letting the phenomenon of too cold or too hot wich can harm the user. The Max-Min temperature can be set on the control device. In this paper, the following mode is being implemented:

- If the temperature is higher than 31 degrees, the ventilation fan, air conditioner will auto turn on.
- If the temperature is less than 25 degrees, the ventilation fan, air conditioner will auto turn off.
- If the temperature is less than 31 degrees, the fan can be turned off by the hard switch

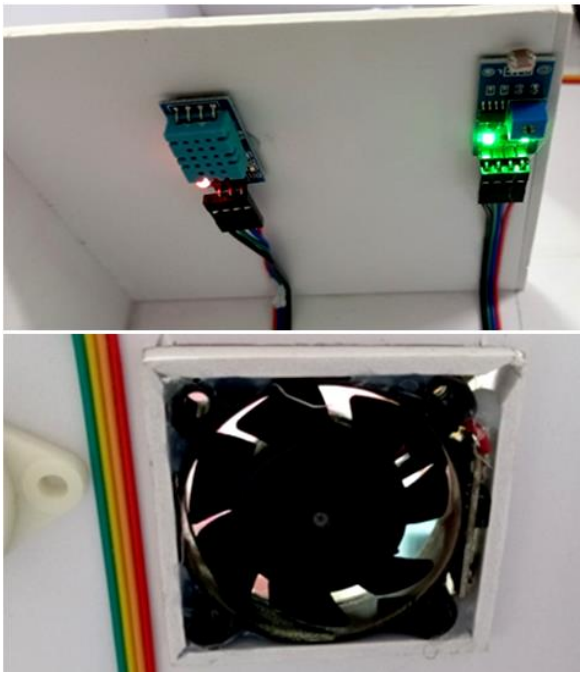

Figure 8. Temperature sensor

When the temperature is in the range from 25 degrees to 31 degrees, the user can turn on the ventilation fan, air conditioner according to their own wishes through the smartphone or the hard switch integrated into the electrical system.

Lighting System

The lighting system in the house is very important, here the authors' team uses LED lights and light sensors, when it gets dark, the lights in the garden or in the house will automatically turn on, when it gets light then these light systems will automatically turn off to save electricity. Data is sent to the cloud for the convenience of users to monitor and control the system.

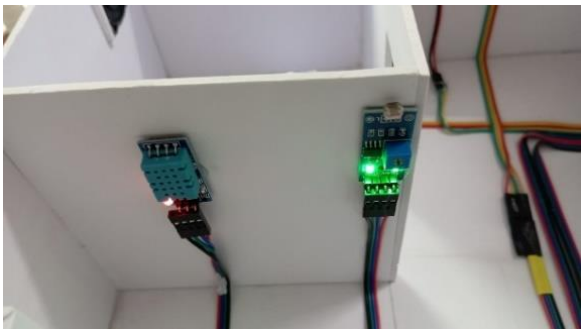

Figure 9. Light sensor

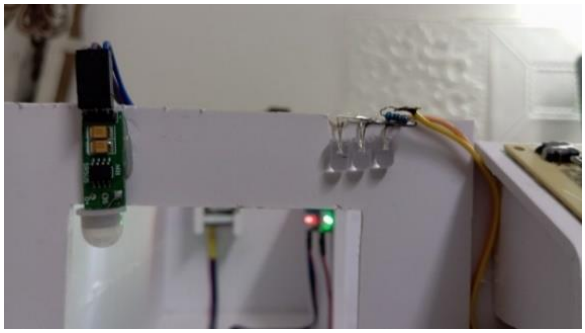

Figure 10. Motion sensor system

Blynk connection

The control program is connected to the blynk cloud and uses the blynk app for smart devices. The smartphone control software has an interface similar to the web interface, making it convenient for users to control, manage, and interact with their home.

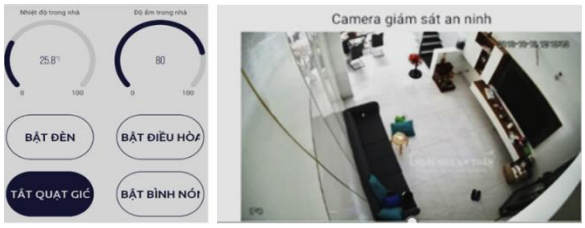

Figure 11. Control system using app on mobile phone

Figure 12. Watch surveillance camera use web

III. CONCLUSION

The smart home demo model proposed and tested by the authors' team has operated with full functions, which can be controlled via a smartphone app or on a personal computer. The sensors collect information around the environment and then report back to the software. The control is a combination of virtual keys with physical buttons (hard buttons) that have controlled the turning on and off of devices in the apartment. The camera system has recorded and stored images on the cloud and sent them back to smartphones and personal devices when connected.

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