



DEVELOPMENT OF SMART SYSTEM FOR REMOTE CONTROL OF FAN COIL DEVICES OF HEATING AND COOLING SYSTEMS

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One of the key components of a smart city is the smart home system. The smart home system includes the functions of lighting, ventilation, heating and cooling, security and control systems, and etc. The uninterrupted performance of these tasks creates a comfortable living environment allowing you to save energy, ensure safety and protection [1, 2].

To develop a control system, it is required first to define its components. As a general rule, the power supply must be turned on or off from the circuit as needed to turn the equipment on or off. In usual systems, this is done by pressing a controller button on the device itself. The electric current in the circuit is controlled by the transmitted radio signal, using relays or semiconductor transistors, i.e. thyristors [3].

In the “smart” system for remote control of heating and cooling device developed at Oguz Han Engineering and Technology University of Turkmenistan, the BTA 600V thyristor was used due to its small dimensions, low power consumption, a fairly large electric current amplification factor and the ability to transmit a large amount of electricity [4-7]. An Optron MOC3063 [8] triac was used to prevent the branching of the electrical current. (Figure-1).

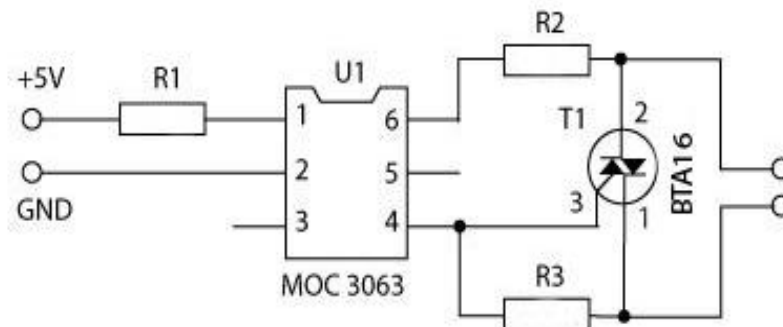


Figure 1. Connecting method of thyristor BTA 600V and triac MOC3063 to an electrical circuit

To assemble a “smart” remote control system for fan coils, an electrical circuit (figure 2 a)) was designed using the software EasyEDA [9] and its PCB was developed with dimensions of 10×11.5 cm. The developed intelligent control system for heating and cooling devices for use in smart homes is illustrated in figure 2 b).

In the Arduino program (figure 3), there are two necessary functions which are called `setup()` and `loop()`. These functions need to be called or declared first; each function usually has a unique name that allows parts of the computer program to run specific commands. Similarly, we can declare variables before we get into the main part of the program. By giving the name of variables we want, the value is stored into the NodeMCU’s memory to inspect some changes when the variable changes depending on our program instructions. For example, a variable with an int will hold an integer value or whole number without a decimal point. Every statement of

code usually ends with a semicolon (;). The setup function will run when the NodeMCU LoLin ESP8266 board is powered on followed by the loop function right after the setup function has been completed [10].

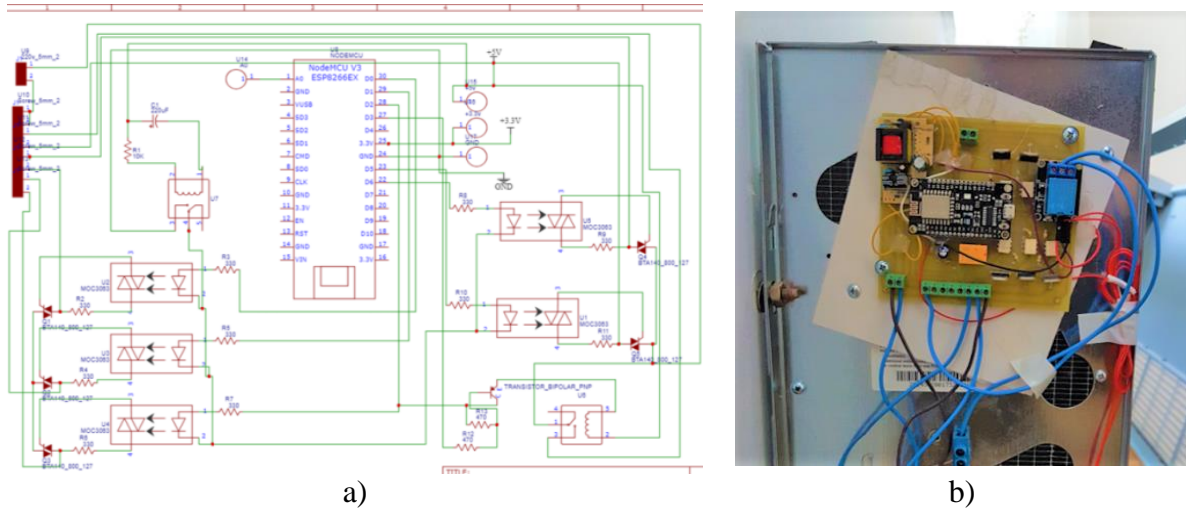


Figure 2. a) – circuit diagram of the “smart” system for the fan coil controlling, b) – developed PCB board of the “smart” system for the fan coil controlling

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Test_ar_conditioner | Arduino 1.8.16
File Edit Sketch Tools Help
Test_ar_conditioner3
37
38 const char* ssid = "Your_network_name";
39 const char* password = "Your_network_password";
40 const char* deviceName = "some_magic_word";
41 String serverUrl = "Your_network_ip_adress";
42 String payload;
43 String device_key = "some_magic_word";
44
45 ESP8266WebServer server(80);
46
47 void handleConditioner() {
48   String mode_low = server.arg("mode_low_esp");
49   String mode_med = server.arg("mode_med_esp");
50   String mode_high = server.arg("mode_high_esp");
51   String auto_manual_switch = server.arg("switch_esp");
52   String temperature = server.arg("temperature_esp");
53
54   mode_low.trim();
55   mode_med.trim();
56   mode_high.trim();
57   auto_manual_switch.trim();
58   temperature.trim();
59
60   if (mode_high == "1"){
61     digitalWrite(high,1);
62     digitalWrite(temp,0);
63     digitalWrite(low,0);
64     digitalWrite(med,0);
65     Serial.println("high");
66   }
67   else if (mode_high == "0"){
68     digitalWrite(high,0);
69   }
70
71   if (mode_med == "1"){
72     digitalWrite(med,1);
73     digitalWrite(temp,0);
74     digitalWrite(low,0);
75     digitalWrite(high,0);

```

Figure 3. Setup function and pinMode function to declare the output pins in Arduino program for ESP8266

The main purpose of the proposed home automation system is to be able to read values from sensors in a smart home and send commands to adjust these values, adapting them to the specific needs of the end user. Thus, this system will help to improve the living conditions for the user and help the user to make his stay in his home more comfortable.

The developed intelligent control system for heating and cooling devices based on "smart" technologies, which is a main part of the digital economy, has been successfully tested in various conditions. The developed system can be used as a cheap alternative to smart home control systems.

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