IoT Based Home Automation System

CS 578 IoT Hardware Project
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I. Main Objective

Internet of Things (IoT) has been ever growing industry in the current times. It provides solutions to modern day problems. One such solution is Home Automation. It is used to control home appliances, thus automating the modern homes through the internet. The system uses a smart phone as a medium to control the connected devices such as light bulbs and fans. Also depending on external factors such as temperature and light intensity, the power consumption of these devices varies. The objective of the project is to control the light bulbs depending on the external light intensity, and control the speed of the fan depending on the temperature of the environment. Thus we could save electric power and human energy by employing this system.

II. Implemented attributes

The important features and attributes of this project are:

- The system has three loads to demonstrate the house lighting and a fan.
- IR sensors is used so that the lights will automatically turn on and off according to the intensity of light. Temperature sensors will detect the room temperature and turn on and off fans.
- Built a mobile app to control the devices. E.g. On/off, increase or decrease speed.
- For this system, an AVR family micro-controller - ATmega328P which is embedded in Arduino Uno board has been used.
- A 2X16 LCD Display displays the status of the system.
- Micro-controller is interfaced with a WIFI modem to get user commands over the internet.
- Relays are used to switch loads.
- The entire system is powered by a 12 V transformer.

III. Configuration Diagram

The physical components of the system are IR sensors, temperature sensor, NodeMCU ESP8266 module, LCD Display, 3 channel relay, the devices to be operated such as lights and fan and the operating device - smart phone. In the system, the sensors such as IR sensors senses the light intensity and temperature sensor records temperature. Using these values, the micro-controller operates the lights and fan. Also the micro-controller is connected to Internet via a WiFi module in the NodeMCU board. Thus, using a smart phone we can also operate these devices over internet. Also in the developed app, there is an option to select on the mode of operation of these devices - Automatic or Manual. If automatic is chosen, the devices work depending upon the external factors such as light intensity and temperature. If manual is selected, the devices are controlled by the user via his smart phone. This makes the system more user-friendly and also saves the power consumption. Finally the status of the devices are displayed in a LCD Display.

The configuration block diagram and state diagram of the system has been given below.

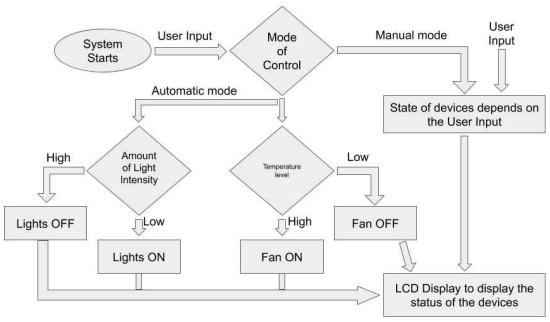

Fig. 1. Configuration Block Diagram of Home Automation System

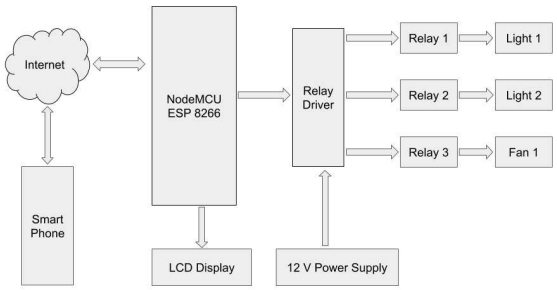

Fig. 2. State Diagram of Home Automation System

IV. Sample Outputs

The user can see the status of the devices in the app using a smart phone. Also the current state of the lights and fan will be displayed on the LCD Display. The sample display of both the app and the LCD Display has been shown below along with the output at Serial monitor.

V. Codes

The source code of the entire project is available in the author's Git repository. The link for the mentioned repository is given below.

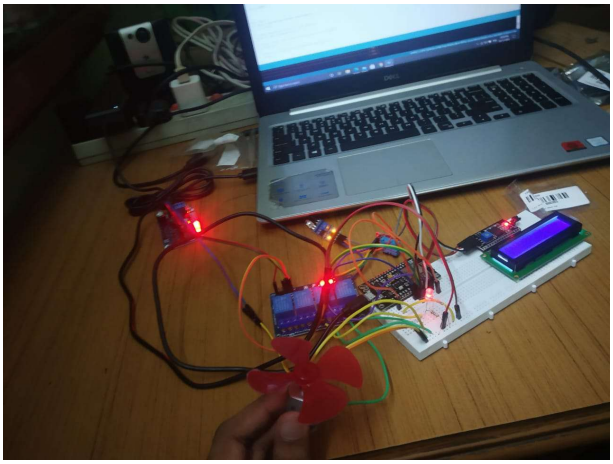

Fig. 3. Circuit Diagram of Home Automation System

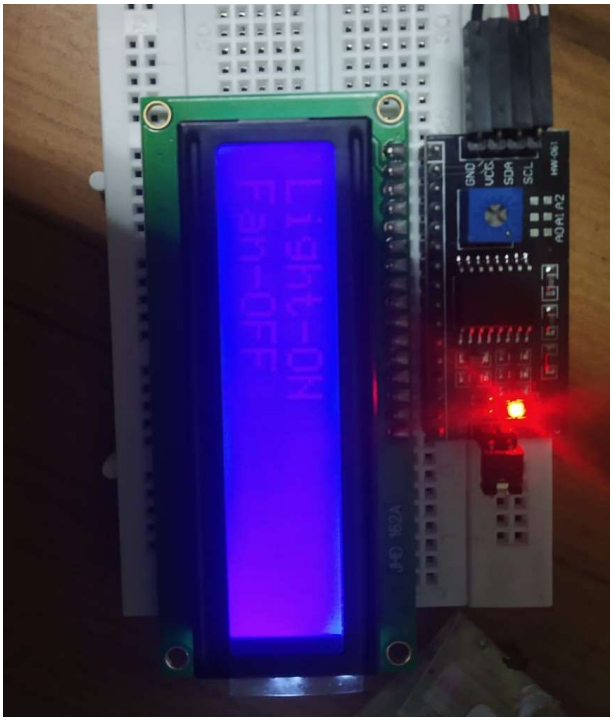

Fig. 4. LCD Display to display the Status of the Devices

Source Code: *Github : https://git.io/JTpJ9*

VI. User Manual

To use this project follow the instructions given below:

- Download the source code from the given link.
- Make the connections as shown by the block diagrams.
- Enter WiFi SSID and password of the network to which you want to connect the system.
- Download the Blynk app to operate the system over the WiFi network.
- Switch to Automatic mode in the app to control the devices automatically. This allows the devices to ON/OFF depending on the measurement recorded by the sensors.

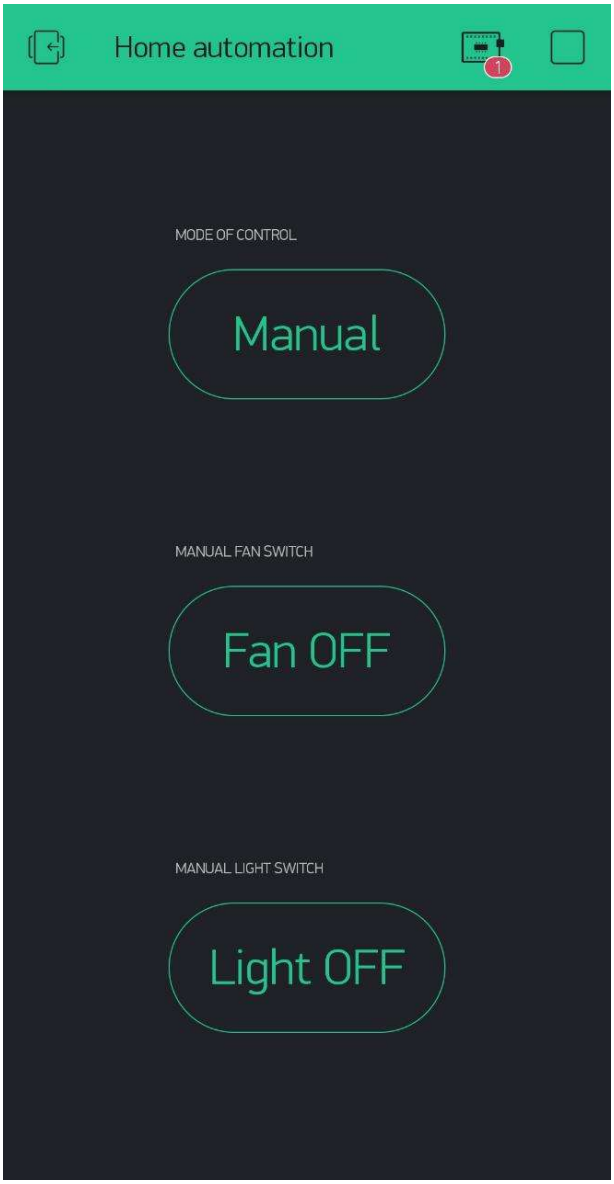

Fig. 5. Blynk App for User interface of Home Automation System

- Switch to Manual mode in the app to control the devices manually. The devices would be controlled by the switch in the app which is controlled by the user.
- The LCD Display shows the status of the connected devices.
- We could also check in the app and Serial monitor for the state of the connected devices.

VII. Video Demo

The link for the video demonstration of the project is given below. In the demonstration, the project is explained with a real world prototype for better understanding.

Source Code: *video link : https://bit.ly/3le1PaQ*