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Home Automation Using Ultrasonic Sensors

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***Abstract*: The aim of the project is energy conservation across homes automatic systems. It is found that there is an 18.70% decrease in energy consumption when the home automation system acts to manage the power consumption of the devices in the home yet intelligent automation typically result in cost saving of 40 % to 75 %, with the payback ranging from several years. The key is to understand the different types of software automation. Sensors are used to detect the motion of an object. The sensors used in home automation are ultra-sonic sensors.**

***Keywords*: NodeMCU, Transformer, Ultrasonic sensors, LCD, LED.**

1. Introduction

Node Microcontroller Unit is named as Node MCU which is open-source software and firmware that is built around System-on-Chip (So C) called the ESP8266. The ESP8266 is designed and manufactured by Express. It contains the crucial elements like CPU, RAM, networking (Wi-Fi), modern operating system and SDK. The Node MCU aims to simplify ESP8266 development. It has an operating voltage of 3.3v. It has an operating temperature range of 40˚c~125˚c. Figure 3.1: Node MCU Board ESP8266 Wi-Fi So C is embedded with the memory controller, including SRAM and ROM. Micro Controller Unit can enter the memory units through I Bus, d Bus, and AHB interfaces.

A. Node Microcontroller Unit

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SOC from Expressive Systems, and hardware which is based on the ESP-12 module. The term "Node MCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the Eula project, and built on the Es press if Non-OS SDK for ESP8266. It uses many open-source projects, such as lua-cjson and spiffs. The ESP8266 is a low-cost Wi-Fi chip with full TCP/IP stack and MCU (Micro Controller Unit) capability produced by Shanghai-based Chinese manufacturer, Es press if Systems. The chip first came to the attention of western makers in August 2014 with the ESP-01 module, made by a third-party manufacturer, AI-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at the time there was almost no English-language documentation on the chip and the commands it accepted.

Fig. 1. NodeMCU

B. LCD (Liquid Cristal Display)

A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other.

Fig. 2. LCD

C. Ultrasonic Sensor

Ultrasonic Sensors also known as transceivers when they both send and receive work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object. This technology can be used for measuring: wind speed and direction (anemometer), fullness of a tank and speed through air or water. For measuring speed or direction a device uses multiple detectors and calculates the speed from the relative distances to particulates in the air or water. To measure the amount of liquid in a tank, the sensor measures the distance to the surface of the fluid.

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Further applications include: humidifiers, sonar, medical ultrasonography, burglar alarms and non-destructive testing.

Fig. 3. Ultrasonic sensor

D. LED

Fig. 4. LED

A light-emitting diode (LED) is a two-lead semi-conductor light source. It is a p–n junction diode, which emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

An LED is often small in area (less than $1mm^2$) and integrated optical components may be used to shape its radiation pattern.

Recent developments in LEDs permit them to be used in environmental and task lighting. LEDs have many advantages over incandescent light sources including lower energy consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. Light-emitting diodes are now used in applications as diverse as aviation lighting, automotive headlamps, advertising, general lighting, traffic signals, camera flashes and lighted wallpaper. As of 2015, LEDs powerful enough for room lighting remain somewhat more expensive, and require more precise current and heat management, than compact fluorescent lamp sources of comparable output.

The inner workings of an LED, showing circuit (top) and band diagram (bottom).

A P-N junction can convert absorbed light energy into a proportional electric current. The same process is reversed here (i.e., the P-N junction emits light when electrical energy is applied to it). This phenomenon is generally called electroluminescence, which can be defined as the emission of light from a semi-conductor under the influence of an electric field. The charge carriers recombine in a forward-biased P-N junction as the electrons cross from the N-region and recombine with the holes existing in the P-region. Free electrons are in the conduction band of energy levels, while holes are in the valence energy band. Thus, the energy level of the holes will be lesser than the energy levels of the electrons. Some portion of the energy must be dissipated in order to recombine the electrons and the holes. This energy is emitted in the form of heat and light.

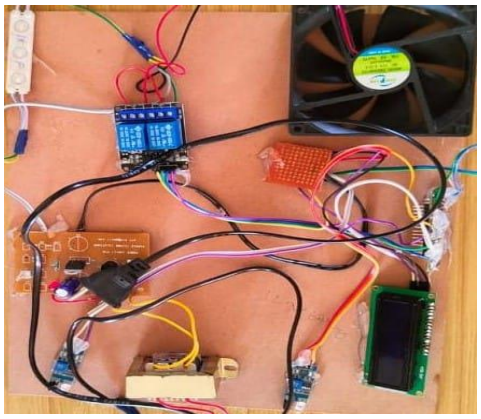

Fig. 5. Hardware setup

2. Conclusion

This paper presented implementation of home automation using ultrasonic sensors.

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