CONNECTED HOME PROJECT A COMPACT BASED IOT-DRIVEN AUTOMATION SYSTEM

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ABSTRACT-The main objective of this project is to develop a compact IoT device for smart home system using an NodeMCU board with Wi-Fi being remotely controlled by any Android OS smartphone. As technology is advancing, houses are also getting smarter. Modern houses are gradually shifting from conventional switches to a centralized control system, involving remote-controlled switches. Presently, conventional wall switches located in different parts of the house make it difficult for the user to go near them to operate. Even more, it becomes more difficult for the elderly or physically challenged people to do so. A remote-controlled smart home system provides the most modern solution with smartphones. To achieve this, a Relay module is interfaced to the NodeMCU board at the receiver end while on the transmitter end, a GUI application on the cell phone sends ON/OFF commands to the receiver where loads are connected. The loads can be turned ON/OFF remotely through this technology by touching the specified location on the GUI. The loads are operated by NodeMCU board.

INTRODUTION

Nowadays, Remote controls are used for television sets and other electronic systems, which have made our lives easy. The currently available smart home systems which would give the facility to control tube lights, fans and other electrical appliances at home using a remote control are not cost-effective. In this project, we have come up with a new system where we use NodeMCU to build a smart home system using Wi-Fi. This system is cost effective and can give the user, the ability to control any electronic device without even spending on the remote control. This project helps the user to control all the electronic devices using his/her smartphone. Time is a very valuable thing. Everybody wants to save time as much as they can. New technologies are being introduced to save time. To save people's time a Smart Home system using Wi-Fi is introduced. With the help of this system, one can control home appliances from mobile phone.

LITERATURESURVEY

1.Abi,Keerthi.Literature review on Home Automation System.(2012). This literature review discusses IoT-based home automation systems, highlighting how appliances connect to an Arduino BT board via Bluetooth, allowing remote access and control through a smartphone or portable

device. 2.Sharma.A and Gupta.R. GSM Based Home Automation using Arduino.(2015) In GSM based Home Automation Project, one can control the home appliances, using the simple GSM based phone, just by sending SMS through his phone. In this project, no Smart phone is needed, just the old GSM phone will work to switch ON and OFF any home electronic appliances, from anywhere. 3. Kumar, V.Home Automation using NodeMCU and Relay Modules. Journal of Smart Systems and Technologies.(2018) This project presents an IoT-based home automation system using NodeMCU and relay modules to control home appliances via Wi-Fi. Users can send ON/OFF commands through a mobile app, providing a cost-effective and efficient solution for remote appliance management, particularly benefiting the elderly and disabled. Here in this project called “Connected Home”, Wi-Fi Module is used to take commands as input. The webpage is designed and used to fetch the input to the NodeMCU module through Wi-Fi. The commands from the microcontroller to the relay module connected to the loads control its switching.

THE PROPOSED SYSTEM The block diagram shows the flow of the hardware part of the project.

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User Interface: The user interface is a webpage that allows the user to interact with the system. The user can send commands to turn on or off the load, and the webpage can display the status of the load.

NodeMCU: The NodeMCU is a small, low-cost microcontroller withbuilt- in Wi-Fi. It connects to the user interface webpage and receives commands from the user. The NodeMCU then sends these commands to relay.

Relays: The relays are switches that are controlled by the NodeMCU. They are used to turn the load on or off. The relays can be connected to any kind of load, such as lights, fans, or motors.

Load: The load is the device that is being controlled by the system. It could be any kind of electrical device that can be turned on or off, such as a light bulb, a fan, or a motor. Overall, the system works by receiving commands from the user interface webpage, sending those commands to the NodeMCU, which then controls the relays, which in turn control the load. The system can also send status updates back to the user interface webpage, allowing the user to see the current state of the load.

COMPONENTS REQUIRED

NODEMCU NodeMCU is an open-source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (microcontroller unit). Strictly speaking, the term "NodeMCU" refers to the firmware rather than the associated development kits. Both the firmware and prototyping board designs are source. The firmware uses the Lua scripting language. The prototyping hardware typically used is a circuit board functioning as a dual inline package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna.

FEATURES OF THE NODEMCU Developer ESP8266 Open-source Community Type Single-board microcontroller Introductory price 300-400 Rs Operating system XTOS CPU ESP8266

Operating system XTOS Memory 128kBytes Storage 4Mbytes Power USB

Power Pins There are four power pins. VIN pin and three 3.3V pins. VIN can be used to directly supply the NodeMCU/ESP8266 and its peripherals. Power delivered on VIN is regulated through the onboard regulator on the NodeMCU module – you can also supply 5V regulated to the VIN pin 3.3V pins are the output of the onboard voltage regulator and can be used to supply power to external components**. GND** are the ground pins of NodeMCU/ESP8266 **I2C** Pins are used to connect I2C sensors and peripherals. Both I2C Master and I2C Slave are supported. I2C interface functionality programmatically, and the clock frequency is 100 kHz at a maximum. It should be noted that I2C clock frequency should be higher than the slowest clockfrequency of the slave device. **GPIO** Pins NodeMCU/ESP8266 has 17 GPIO pins which can be assigned to functions such as I2C, I2S, UART, PWM, IR Remote Control, LED Light and Button programmatically. Each digital enabled GPIO can be configured to internal pull-up or pull-down, or set to high impedance. When configured as an input, it can also be set to edge-trigger or level-trigger to generate CPU interrupts. **ADC Channel** The NodeMCU is embedded with a 10-bit precision SAR ADC. The two functions can be implemented using ADC. Testing power supply voltage of VDD3P3 pin and testing input voltage of TOUT pin. However, they cannot be implemented at the same time. **UART Pins** NodeMCU/ESP8266 has 2 UART interfaces (UART0 and UART1) which provide asynchronous communication (RS232 and RS485), and can communicate at up to 4.5 Mbps. UART0 (TXD0, RXD0, RST0 & CTS0 pins) can be used for communication. However, UART1 (TXD1 pin) features only data transmit signal so, it is usually used for printing log. **SPI Pins** NodeMCU/ESP8266 features two SPIs (SPI and HSPI) in slave and master modes. These SPIs also support the following general-purpose SPI features: • Timing modes of the SPI format transfer • Up to 80 MHz and the divided clocks of 80MHz **SDIO Pins** NodeMCU/ESP8266 features Secure Digital Input/Output Interface (SDIO) which is used to directly interface SD cards. 4-bit 25 MHz SDIO v1.1 and 4-bit 50 MHz SDIO v2.0 are supported. **PWM Pins** The board has 4 channels of Pulse Width Modulation (PWM). The PWM output can be implemented programmatically and used for driving digital motors and LEDs. PWM frequency range is adjustable from 1000 μs to 10000 μs (100 Hz and 1 kHz). Control Pins are used to control the NodeMCU/ESP8266. These pins include Chip Enable pin (EN), Reset pin (RST) and WAKE pin. EN: The ESP8266 chip is enabled when EN pin is pulled HIGH. When pulled LOW the chip works at minimum power. RST: RST pin is used to reset the ESP8266 chip. WAKE: Wake pin is used to wake the chip from deep-sleep.

ESP-8266 MODULE (HC-05)

INTRODUCTION 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. The very low price and the fact that there were very few external components on the

module, which suggest that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, chip, and the software on it, as well as to translate the Chinese documentation. The ESP8266 is an ESP8266 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to wi-fi.

FEATURES:

• Low cost, compact and powerful Wi-Fi Module Power Supply: +3.3V only • Current Consumption: 100mA • I/O Voltage: 3.6V (max) • I/O source current: 12mA (max) • Built-in low power 32-bit MCU @ 80MHz • 512kB Flash Memory • Can be used as Station or Access Point

SPECIFICATION:

• 2.4 GHz Wi-Fi (802.11 b/g/n, supporting WPA/WPA2). General-purpose input/output (16 GPIO). • Inter-Integrated Circuit (I^2C) serial communication protocol. • Analog-to-digital conversion (10-bit ADC). • Serial Peripheral Interface (SPI)serial communication protocol. • I^2S (Inter-IC Sound) interfaces with DMA (Direct Memory Access)(sharing pins)

RESULTS

CONCLUSION

As the name indicates, 'Connected home' makes the system more flexible and provides an attractive user interface compared to other home automation systems. In this system, mobile phones are integrated into home automation systems. A novel architecture for a home automation system is proposed using relatively new communication technologies. The system consists of mainly two components a NodeMCU (Wi-Fi module, ESP8266 microcontroller) and a relay module. Wi-Fi is used as the communication channel between the android phone and the microcontroller. The complexity of the notions involved in the home automation system are hidden by including them in a simple, but comprehensive set of related concepts. This simplification is needed to fit as much of the functionality on the limited space offered by a mobile phone's display. This paper proposes a low-cost, secure, ubiquitously accessible, auto- configurable, remotely controlled solution. The approach discussed in the paper is novel and has achieved the target to control home appliances remotely using Wi-Fi technology to connect system parts, satisfying user needs and requirements. Wi-Fi technology- capable solution has proved to be controlled remotely, provide homesecurity, and is cost-effective as compared to the previously existing systems. Hence, it is concluded that the required goals and objectives of the home automation system have been achieved. The system design and architecture were discussed, and the prototype presents the basic level of home appliance control and remote monitoring has been implemented. Finally, the suggested system outperforms the commercially available home automation systems as it much simpler and convenient to use.

FUTURE ENHACEMENT

The future enhancement for IoT-based smart homes is enormous and has the potential to revolutionize the way we live. With the increasing adoption of smart home devices and the proliferation of IoT technology, it is expected to see more advanced and sophisticated smart home systems in the future. Integration of smart home systems with other IoT devices and services, such as wearables, smart appliances, and home security systems will enable more seamless and interconnected smart home ecosystems that can provide a range of benefits, such as enhanced safety and security, improved energy efficiency, and more convenient and comfortable living. Overall, the future scope for IoT-based smart homes is vast and promising. More advanced, wiser, and interconnected smart home solutions that benefit homeowners and enhance their quality of life are excepted.

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