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IoT Based Smart Environmental Monitoring Using ARM7

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Abstract— with advancement of Automation technology, life is getting simpler and easier in all aspects. In today's world Automatic systems are being preferred over manual system. With the rapid increase in the number of users of internet over the past decade has made Internet a part and parcel of life, and IoT is the latest and emerging internet technology. Internet of things is a growing network of everyday object-from industrial machine to consumer goods that can share information and complete tasks while you are busy with other activities. Wireless Home Automation system(WHAS) using IoT is a system that uses computers or mobile devices to control basic home functions and features automatically through internet from anywhere around the world, an automated home is sometimes called a smart home. It is meant to save the electric power and human energy. The home automation system differs from other system by allowing the user to operate the system from anywhere around the world through internet connection.

In this paper we present a Home Automation system(HAS) using Intel Galileo that employs the integration of cloud networking, wireless communication, to provide the user with remote control of various lights, fans, and appliances within their home and storing the data in the cloud. The system will automatically change on the basis of sensors' data. This system is designed to be low cost and expandable allowing a variety of devices to be controlled

Key Words: Home automation System (HAS), Internet of Things (IoT), Cloud networking, Wi-Fi network, Intel Galileo Microcontroller

I. INTRODUCTION

A. Overview

Homes of the 21st century will become more and more self-controlled and automated due to the comfort it provides, especially when employed in a private home. A home automation system is a means that allow users to control electric appliances of varying kind.

Many existing, well-established home automation systems are based on wired communication. This does not pose a problem until the system is planned well in advance and installed during the physical construction of the building. But for already existing buildings the implementation cost goes very high.

In contrast, Wireless systems can be of great help for automation systems. With the advancement of wireless technologies such as Wi-Fi, cloud networks in the recent past, wireless systems are used every day and everywhere.

B. Advantages of Home automation systems

In recent years, wireless systems like Wi-Fi have become more and more common in home networking. Also in home and building automation systems, the use of wireless technologies gives several advantages that could not be achieved using a wired network only.

1) Reduced installation costs: First and foremost, installation costs are significantly reduced since no cabling is necessary. Wired solutions require cabling, where material as well as the professional laying of cables (e.g. into walls) is expensive.

2) System scalability and easy extension: Deploying a wireless network is especially advantageous when, due to new or changed requirements, extension of the network is necessary. In contrast to wired installations, in which cabling extension is tedious. This makes wireless installations a seminal investment.

3) Aesthetical benefits: Apart from covering a larger area, this attribute helps to full aesthetical requirements as well. Examples include representative buildings with all-glass architecture and historical buildings where design or conservatory reasons do not allow laying of cables.

4) Integration of mobile devices: With wireless networks, associating mobile devices such as PDAs and Smartphone's with the automation system becomes possible everywhere and at any time, as a device's exact physical location is no longer crucial for a connection (as long as the device is in reach of the network).

For all these reasons, wireless technology is not only an attractive choice in renovation and refurbishment, but also for new installations.

II. SYSTEM ANALYSIS

A. Problem Definition

Home automation systems face four main challenges, these are high cost of ownership, inflexibility, poor manageability, and difficulty in achieving security. The main objectives of this research is to design and implement a home automation system using IoT that is capable of controlling and automating most of the house appliances through an easy manageable web interface. The proposed system has a great flexibility by using Wi-Fi technology to interconnect its distributed sensors to home automation server. This will decrease the deployment cost and will increase the ability of upgrading, and system reconfiguration

B. Proposed System Feature

The proposed system is a distributed home automation system, consists of server, sensors. Server controls and monitors the various sensors, and can be easily configured to handle more hardware interface module (sensors). The Intel Galileo development board, with built in WiFi card port to which the card is inserted, acts as web server. Automation System can be accessed from the web browser of any local PC in the same LAN using server IP, or remotely from any PC or mobile handheld device connected to the internet with appropriate web browser through server real IP (internet IP). WiFi technology is selected to be the network infrastructure that connects server and the sensors. WiFi is chosen to improve system security (by using secure WiFi connection), and to increase system mobility and scalability.

III. SYSTEM DESIGN AND IMPLEMENTATION

A. Proposed Home Automation System

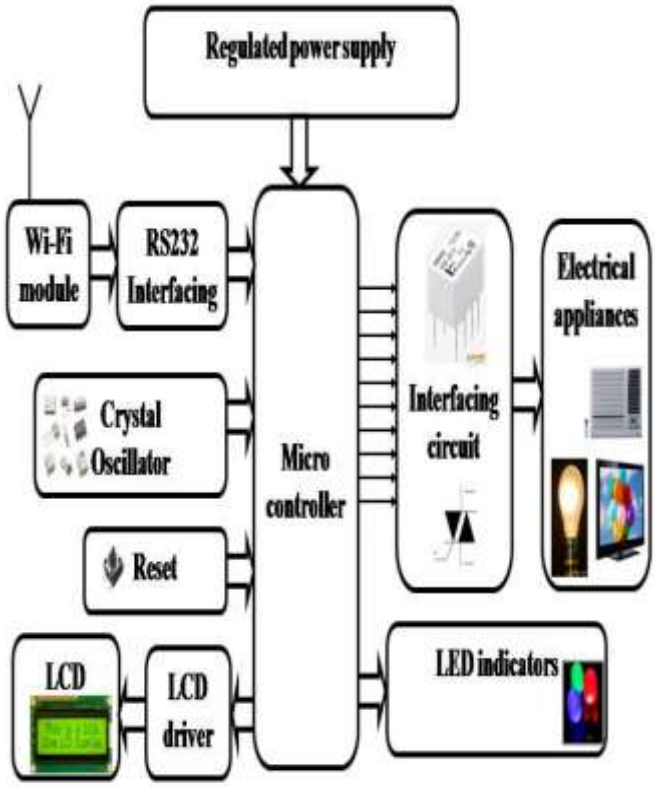
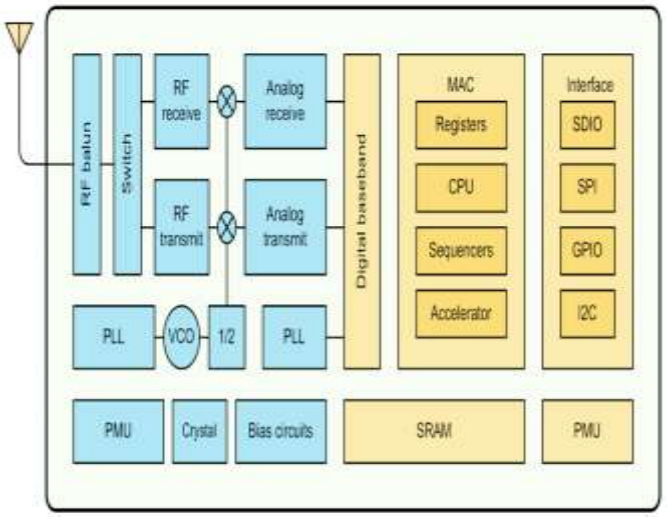
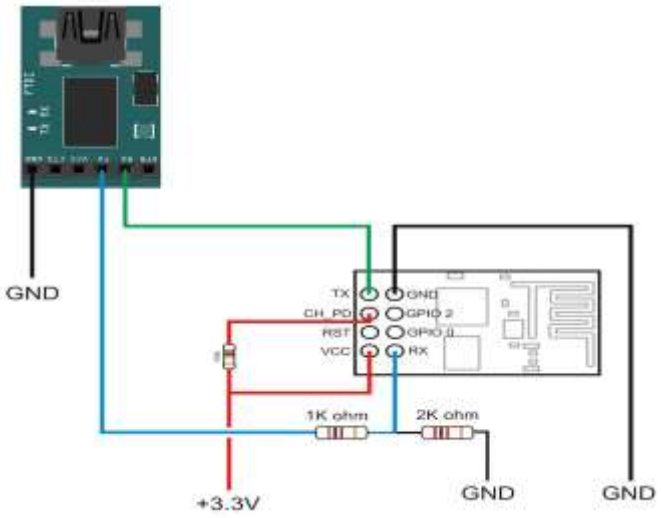


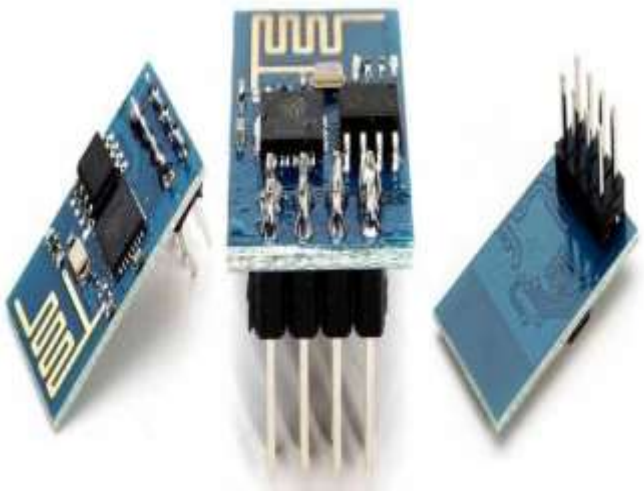
Figure 1: Proposed model of Home automation system

IV. ARCHITECTURE OF MATCHING INSIDE ESP8266

It is actually very difficult to devise a proper algorithm for matching of fingerprint and making the algorithm robust. This chapter discusses the current state of the art feature extraction techniques and gives a literary review of algorithm of matching the extraction.





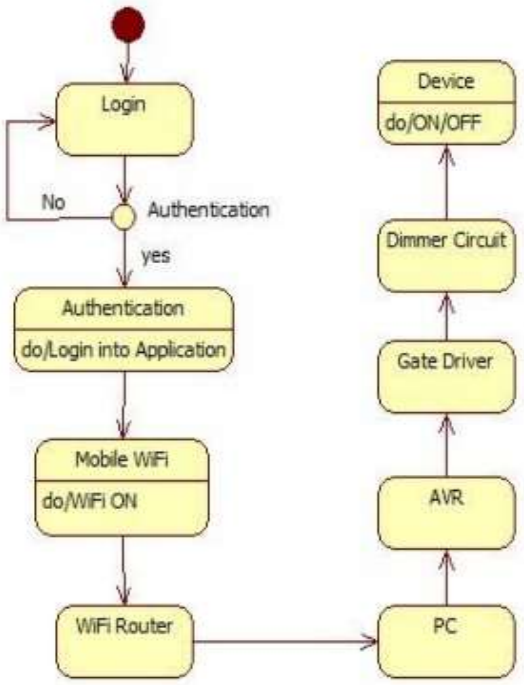


Pin	Name	Alternate Functions	Notes
1	GND		(Pin 1 is on the corner close to the xtal and away from antenna)
2	NC		
3	U1TXD	SPICS1, GPIO1, CLK_RTC	Typically used as serial uart0 TX
4	U1RXD	I2S0_DATA, GPIO3, CLK_XTAL	Typically used as serial uart0 RX
5	GPIO16	XPD_DCDC, RTC_GPIO0, EXT_WAKEUP, DEEPSLEEP	Connected to XPD_DCDC ESP pin, can also be connected to ESP EXT_RSTB (reset) pin by closing jumper near pin 8. Reset pin is active low and has an internal weak pull-up. Connecting jumper is required to wake-up ESP from deep-sleep. RTC produces pulse on XPD_DCDC pin that needs to be fed into EXT_RSTB pin
6	CH_PD		Power-down: low input powers down chip, high powers up: tie high for normal operation or module will not function
7	ANT		WiFi Antenna, do not connect
8	VCC		3.3V input (pin 8 is between antenna and ESP chip)
9	GPIO14	MTMS, I2SI_WS, SP_CLK	
10	GPIO12	MTDI, I2SI_DATA, MISO	
11	GPIO13	MTCK, I2SI_BCK, MOSI	
12	GPIO15	MTDO, I2SO_BCK, SP_CS	At boot: must be low to enter flash or normal boot (high enters special boot modes)
13	GPIO2	I2SO_WS, U1TXD, U0TXD	At boot: must be high to enter flash or normal boot (low enters special boot modes); Typically is used as uart1 TX for debug logging
14	GPIO0	SPICS2, CLK_OUT	At boot: low causes bootloader to enter flash upload mode; high causes normal boot

Commands:

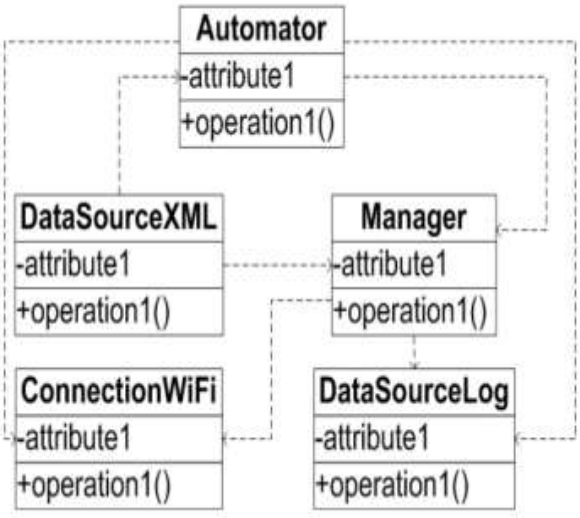
Commands	Description	Type	Set/Execute	Inquiry	test	Parameters	Examples
AT+RST	restart the module	basic	-	-	-	-	
AT+CWMODE	wifi mode	wifi	AT+CWMODE=<mode>	AT+CWMODE?	AT+CWMODE=?	1= Sta, 2= AP, 3=both	
AT+CWJAP	join the AP	wifi	AT+ CWJAP =<ssid>,<pwd >	AT+ CWJAP?	-	ssid = ssid, pwd = wifi password	
AT+CWLAP	list the AP	wifi	AT+CWLAP				
AT+CWQAP	quit the AP	wifi	AT+CWQAP	-	AT+CWQAP=?		
AT+ CWSAP	set the parameters of AP	wifi	AT+ CWSAP= <ssid>, <pwd>,<chl>, <ecn>	AT+ CWSAP?		ssid, pwd, chl = channel, ecn = encryption	Connect to your router: ; AT+CWJAP="YOURSSID","helloworld"; and check if connected: AT+CWJAP?
AT+ CIPSTATUS	get the connection status	TCP/IP	AT+ CIPSTATUS				
AT+CIPSTART	set up TCP or UDP connection	TCP/IP	1)single connection (+CIPMUX=0) AT+CIPSTART= <type>, <addr>,<port>; 2) multiple connection (+CIPMUX=1) AT+CIPSTART= <id> <type>,<addr>, <port>	-	AT+CIPSTART=?	id = 0-4, type = TCP/UDP, addr = IP address, port= port	Connect to another TCP server, set multiple connection first: AT+CIPMUX=1; connect: AT+CIPSTART=4,"TCP","X1.X2.X3.X4",9999
AT+CIPSEND	send data	TCP/IP	1)single connection(+CIPMUX=0) AT+CIPSEND= <length>; 2) multiple connection (+CIPMUX=1) AT+CIPSEND= <id>, <length>		AT+CIPSEND=?		send data: AT+CIPSEND=4,15 and then enter the data
AT+CIPCLOSE	close TCP or UDP connection	TCP/IP	AT+CIPCLOSE=<id> or AT+CIPCLOSE		AT+CIPCLOSE=?		
AT+CIFSR	Get IP address	TCP/IP	AT+CIFSR		AT+ CIFSR=?		
AT+ CIPMUX	set mutiple connection	TCP/IP	AT+ CIPMUX=<mode>	AT+ CIPMUX?		0 for single connection 1 for mutiple connection	
AT+ CIPSERVER	set as server	TCP/IP	AT+ CIPSERVER= <mode>[,<port>]			mode 0 to close server mode, mode 1 to open; port = port	turn on as a TCP server: AT+CIPSERVER=1,8888, check the self server IP address: AT+CIFSR=?

Activity Diagram:

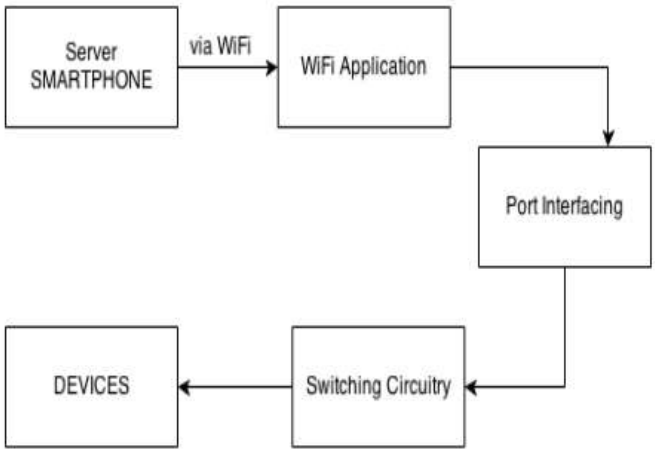


Design and System Architecture

Class Diagram:



System Architecture:



V. RESULTS

1. First of all connect the all connections for the project, It means power supply for controller, 230VAC for bulb.
2. After connect the all connections, Switch on the power supply. When you switch on the supply you can view the name of the project in LCD display "Load controlling using wifi".
3. After that we can initialize the WIFI module with different commands which are noted in code.
4. After initializing it will provide a wifi communication with name of "E-systems"
5. Now connect your mobile to that wifi network.
6. Now open the "Telnet" app and give the IP num: 192.168.4.1 and port num: 80, after entering it now press the "Connect to server" button.
7. After connection now you can control you home appliances through your mobile by using WIFI.
8. When you press the*1 from application the device one will on, *2 for device one off. As well as for second device.

VI. CONCLUSION

The goal of the paper was to design a system, which should be easy to implement, and short ranged. The project is implemented through onboard Wi-Fi, which is inbuilt in the mobile phones having an Android as its system. Implementing the actuators for door systems for more security aspects can increase the future scope of this project.

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