

WIFI Controlled Central Automation using Node Mcu

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Abstract – Home automation is becoming accepted due to its frequent benefits. Home mechanization refers to the manage of home appliance and domestic features by local network or by remote control. Artificial Intelligence provides us the frame to go real-time choice and automation for Internet of Things (IoT).The work deals with discussion about different intelligent home automation system and technology from a various features viewpoint. The occupation focus on concept of home automation where the monitoring and control operations are facilitate through smart devices installed in inhabited buildings. various home automation method and knowledge consider in analysis with central controller base (Arduino or Raspberry pi), web based, electronic mail based, Bluetooth-based, mobile-based, SMS based, ZigBee based, double tenor Multi Frequency-based, cloud-based and the Internet with presentation.

Keywords – Home Automation, Intelligence, Microcontroller, Sensor System

I. INTRODUCTION

Automation is a method, technique, or system of operating or scheming a process by electronic devices with reducing human association to a smallest amount. The fundamental of structure an mechanization system for an office or home is rising day-by-day with many profit. Industrialist and researchers are functioning to make proficient and affordability mechanical system to monitor and manage different machinery like light, fan, AC base on the necessity. Mechanization makes not merely an able but also an cost-effective use of the electrical energy and stream and reduce much of the expenditure [5]. IoT grant to public and equipment to be linked Any-time, anywhere, with any person, in an ideal world by any net and any service [10]. Mechanization is one more significant appliance of IoT technology. It is the monitor of the energy utilization and the scheming the atmosphere in building, school, office by different types of sensors and actuators that manage light, warmth, and humidity.

II. Home Automation

The elegant residence recognized as home mechanization, with the use of new equipment, to make the household behavior more suitable, at ease, protected and efficient. The home computerization system includes main mechanisms which are:

User interface: as a monitor, PC, or mobile phone, for example, that can give instructions to manage System.

Mode of transmission: wired links (example Ethernet) or Wireless (radio effect, infrared, Bluetooth, GSM) etc.

Central Controller: It is hardware boundary that communicate with user interface by scheming home Services

Electronic devices, a light, an AC or a warmer, which is well-suited with the broadcast method, and associated.

Features of Home Automation System

In current days, wireless systems like Remote manage have develop into more well-liked in home network. Also in mechanization system, the use of wireless technologies provides more than a few compensation that might not be achieve with the use of a wired system only.

Reduced Installation costs

Mechanism expenses are considerably cheap because no wiring is needed.

Internet Connectivity

Manage devices from wherever in the globe with use cell phone to organize smart home.

Scalable and Expandable

With the evaluate of Wireless system is particularly of use when, due to New or altered requirements, an addition of the network is essential.

The “Figure 1” show estimated trend in the smart home market in the upcoming day [10].

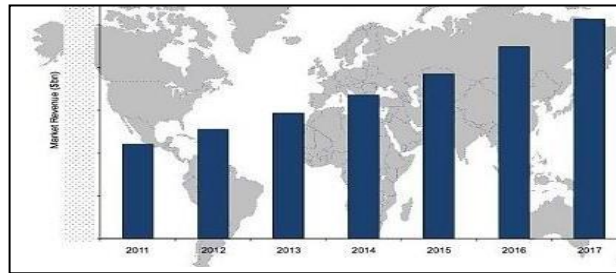


Figure 1: Popularity of Smart home

Security

Simply insert devices to produce an included smart home protection system and built-in protection ensure reliability of smart home.

Challenges of Home Automation System

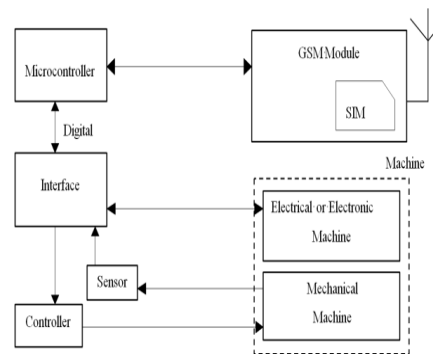
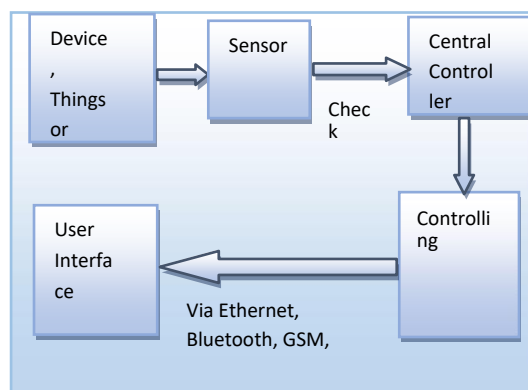


Figure 2: Basic Block Diagram of Home Automation

The work of John J. Greichen [12] discusses various of the early challenge faced by home mechanization systems. These include high developed expenses, high improvement cost, high mechanism costs, and further service and sustain expenses, be deficient in home mechanization standards, consumer unfamiliarity with equipment, and multipart user interface. With the development of occasion, express growth in expertise and giving out authority which leads to a significant decrease in device cost and size. All of these factor have contribute to the fame of electronic devices nowadays, so people are no longer puzzled or uncertain about the use of the processor, mobile, or tablets. Moreover, a lot of home automation protocols, message and interface standard.

III. LITERATURE REVIEW

In this part, discuss different Home Automation method with their machinery with features, advantage and limits they have. The Figure 2 shows essential structural design of Remote Home Automation. The Home automation system that use Wi-Fi technology [1]. scheme consists of three most important mechanism; web server, which present scheme core that control, and monitor users’ home and hardware interface component (Arduino PCB (ready-made), Wi-Fi guard PCB, 3 key in alarms PCB, and 3 output actuators PCB.), which provide suitable interface to sensors and actuator of home mechanization system. The method is improved from the scalability and flexibility point of view than the commercially obtainable home automation systems. The customer may use the same machinery to login to the server web based function. If server is associated to the internet, so remote user can way in server web based application through the internet using companionable web browser. The purpose has been developed base on the method [2]. An interface license has been developed to guarantee communication among the remote user, server, raspberry pi card and the home appliance. The application has been install on an android Smartphone, a web server, and a raspberry pi card to manage the cover up of windows. Android application on a smart phone issue control to raspberry pi card. An interface card has been realize to inform signal connecting the actuator sensors and the raspberry pi card.

metadata from home appliance and send to the cloud-based data server to accumulate on HDFS (Hadoop Distributed File System), method them using Map Reduce and use to give with a monitor purpose to Remote client [3].

It has been implementing with Raspberry Pi during interpretation the subject of electronic mail and the algorithm. Raspberry Pi prove to be a influential, cost-effective and proficient stage for implement the smart home mechanization [4]. Raspberry pi base home computerization is better than other home mechanization methods is numerous way. For example, in home computerization through DTMF (dual tone multi-frequency) [11], the call tariff is a massive drawback, which is not the case in their projected technique. Also, in Web server based home mechanization, the plan of web server and the memory space necessary is evicted by this technique, for the reason that it basically uses the already obtainable web server service provide by G-mail. LEDs were used to point out the switch accomplishment. Method is interactive, proficient and flexible.

Shih-Pang Tseng et al. [5] projected Smart House Monitor & Manager (SHMM), based on the ZigBee, all sensors and actuators are associated by a ZigBee wireless group. They intended a easy smart socket, which can remote manage via ZigBee. processor host is used as a information collector and the movement sense, all sensing information are transfer to the VM in the cloud. The client can use the processor or Android mobile phone to monitor or manage through the Internet to power-saving of the house. Arduino microcontroller to collect user instructions to perform through an Ethernet shield. Our house net used simultaneously together wireless ZigBee and wired X10 technologies [6]. This method follows smart task development with a heuristic for the Resource-constrained-scheduling predicament (RCSPSP). The mobile phone device can be moreover wired to the central manager during USB cable or communicate with it wirelessly, within the possibility of the home. Arduino contain the web server appliances that communicate in the course of the HTTP protocol with

Web-based Android appliance. The method is highly flexible and scalable and stretchy.

The home network which monitor the appliance, sensors and transmit information to the cloud-based records server which manage the information and provide services for user by transmit information and getting client instructions from mobile phone appliance [7]. The projected method has excellent modularity and configurability individuality with very low power expenditure in cost efficient method.

Purpose developed by the Android platform forbidden and monitor from a remote site using the smart home app and an Arduino Ethernet based micro web-server [8]. The sensors and actuators/relay are openly interfaced to the main manager. projected plan offer are the manage of power administration system such as lightings, heat, habituation, protection, fire recognition and interference recognition with siren and electronic mail notification.

Embed method Raspberry Pi to supply as a communication opportunity among mobile devices and Konnex-Bus (KNX) home mechanization system [9]. Store the information of all actor and sensors within a Smart Home, as an alternative of using divide profiles. ensure energy-consumption could be compact, compare to a standard desktop PC.

Double tone multi frequency (DTMF) used in phone line [13]. There are three mechanism in the method DTMF receiver and ring detector, IO interface unit, computer The computer detect the ringing of the line and then authenticate the client and use the keypad tones to manage the plans as necessary. An example of stepper motor manage is in use up. This method has the benefit of being safe and allow global standardization. This is for the reason that the DTMF tones are the similar all over the globe. But it suffer from the disadvantage that the numeral of appliance is inadequate by the amount of key in the keypad.

PIC16F887 microcontroller for home appliance control with GSM for manage of the appliance. [14]. It has high accessibility, exposure and protection but the expenditure of SMS. AT instructions can be send throughout the GSM system to control the home plans. The method does not does not have any state in sequence connected to the plans and expect the client to maintain path of it.

Arduino board is the manager used to organize the appliance by using GSM machinery. It uses definite peripheral drivers and relay to accomplish this interfacing. The appliance on smartphone generate SMS communication based on the client instructions and send it to the GSM modem attach to the Arduino and manage the home appliance [15]. The method has drawback of cost and consistency of SMS. An interface cannot be modified based on plans.

It has been planned Arduino board with Bluetooth board were residential for home mechanization [16]. Python program is used on the mobile phone to give the user interface. The Bluetooth board has I/O port and relay are used for interfacing with the campaign which are to be controlled and monitor. The Bluetooth is password protected to make certain that the method is safe from intruder. The Bluetooth has a vary of 10 to 100.

Compassion of System

Discuss association of Different Home mechanization system by consider its Central Microcontroller, Communication interface, client interface, provide features and their profit as shown in Table 1.

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Evolution of System

Raspberry Pi

It is a credit-card-sized single microcontroller PC. Python as the most important programming language. It is easy to study and appropriate for real world application [4]. There are two most important type of pi first one is Model A has 256 Mb RAM, one USB port and no network link and Model B has 512 Mb , 2 USB ports and an Ethernet port. It has a Broadcom BCM2835 method on a chip which include an ARM1176JZF -S 700 MHz processor, Video Core IV GPU, and an SD card. The chip in particular provide HDMI and there is no VGA sustain. Arduino can effectively work with Raspberry Pi computer.

Arduino

It is a microcontroller board, not completely computer. In this, written code are just execute without any complication. It is an 8 bit Atmel AVR Microcontroller which comprise of 32K and 512K of onboard flash memory, 2K of RAM, runs at 8- 84MHz clock rapidity with voltages of 2.7V-12V.programming is accomplished using C and carry no operating system. The code is written in the PC and then send through USB cable for completion. Its production simply covers digital input-output pins that are between 9-54 AND 6-12 analog input pins. Its power expenses is less than 0.5 watt.

Table 1. Comparison

Sr No.	System	Communication Interface	Controller	User Interface	Applications	Benefits
1.	Wi-Fi based using Arduino Microcontroller	Wireless LAN and Wi-Fi shield	Hardware interface module	web based Application.	Temperature and humidity, Motion detection, Fire detection, Door status, Light level ,Video monitoring, Controlling appliances	Low cost, Secure, Ubiquitsly accessible, Auto-configure, Remotely controlled
2.	Web service and android app Based using Raspberry pi	Web server and interface card	Raspberry pi	Android application	Controlling shutter of window	Autonomous, and Quite scalable
3.	Cloud Based Using Hadoop System	Cloud based data server uses Hadoop Technology	Home gateway and Router	Smart device	Monitoring and Controlling Home Appliances	Effectively manage Semi structure and unstruct data, Reduce computational burden of smart devices
4.	Email Based using Raspberry pi	Internet Modem	Raspberry pi	E-mail	Switching LED	Smart, economic and Efficient
5.	Cloud Based Using Zig Bee Microcontroller	Zig bee wireless Network	Smart Socket	PC or Android Phone	entrance control management, monitoring the power consumption, temperature and humidity	Convenience, safety and power saving
6.	Smart Task Scheduling Based using Arduino and Android	Wired X10 and Wireless Zig bee	Arduino	Android Application	Energy Management and task scheduling with power and cost	Energy-efficient and Highly scalable
7.	Wireless Sensors Based with mobile Technology	cloud-based data server	PCB circuits	Mobile Application	monitor the home conditions and power consumption of appliance	Low power consumption And system cost efficiency.

8.	Android based using Arduino	Micro Web Server	Arduino Mega 2560 and the Arduino Ethernet shield	Android App	Light switches, Temperature, Humidity sensors, Intrusion detection., Smoke/Gas sensor	Feasibility and Effectiveness
9.	Konnex-Bus based using raspberry pi	SIP Provider	Raspberry pi and Konnex Bus	Mobile App	Lights Control, Temperature Monitoring	Performance improved, energy-consumption could be Reduced.
10.	By Using DTMF	DTMF Receiver	Logical Controller with I/O interface	Computer	Authentication of user by ringing line	Secure and allow International Standard
11.	GSM Based Using PIC Microcontroller	SMS	PIC16F887 microcontroller	Mobile phone	Control appliances	High availability, coverage and Security but costs for the SMS.
12.	GSM Based Using Arduino	SMS	Arduino	Smartphone App	Control appliances	Simplicity
13.	Bluetooth Based using Arduino	Bluetooth	Arduino	Python supported mobile	controlling	Secured and Low cost



Fig. The proposed home automation system layout

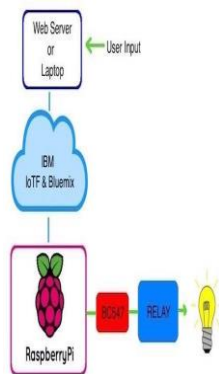


Fig. Sending Commands to Raspberry pi

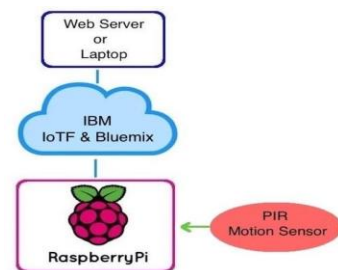


Fig. Receiving data from Raspberry pi

IV.CONCLUSION

Based on survey study the association of home automation systems is presented. Microcontroller, client interface, a communication interface and their presentation factor are compare. There are a numeral of do-it-yourself (DIY) platform accessible that permit to create Home mechanization method rapidly and simply with low cost and high presentation e.g. Raspberry pi, Arduino, other microcontrollers, etc. In this evaluation explain different home mechanization method e.g. Web based, email based, Bluetooth-based, mobile-based, SMS based, ZigBee-based, Dual Tone Multi Frequency-based, cloud-based and Internet based. In prospect home computerization will additional smart and fast. It would be extensive to the large- scale atmosphere such as college, office and factory etc.

References

[1] Ahmed ElShafee, Karim Alaa Hamed, "Design and Implementation of a WiFi Based Home Automation System", International Journal of Computer, Electrical, Automation, Control and Information Engineering Vol: 6, No: 8, 2012.
 [2] Jain Sarthak, Vaibhav Anant and Goyal Lovely, "Raspberry Pi based Interactive Home Automation System through E-mail.", IEEE transaction, 2014 International Conference on Reliability, Optimization and Information Technology ICROIT 2014, India, Feb 6- 8 2014.
 [3] Hayet Lamine and Hafedh Abid, "Remote control of a domestic equipment from an Android application based on Raspberry pi card", IEEE

- transaction 15th international conference on Sciences and Techniques of Automatic control & computer engineering - STA'2014, Hammamet, Tunisia, December 21-23, 2014.
- [4] R.Pivare, M.Tazil,"Bluetooth Based Home Automation System Using Cell Phone", 2011, IEEE 15th International Symposium on Consumer Electronics Singapore, pp.192- 195.
- [5] Ardam H. and Coskun I., "A remote controller for home and office appliances by telephone", IEEE Transactions on Consumer Electronics, vol. 44, no. 4,pp. 1291-1297, 1998.
- [6] Kim Baraka, Marc Ghobril, Sami Malek, Rouwaida Kanj, Ayman Kayssi ,,"Smart Power Management System For Home Appliances And Wellness Based On Wireless Sensors Network And Mobile Technology",
- [7] .2015 XVIII AISEM Annual Conference, 978-1-4799- 8591-3/15©2015 IEEE.
- [8] Rozita Teymourzadeh,Salah Addin Ahmed,Kok Wai Chan a nd Mok Vee Hoong , "Smart GSM Based Home Automation System", 2013, IEEE Conference on Systems, Process & Control, Kuala Lumpur, Malaysia.
- [9] Andrea Zanella, Nicola Bui, Angelo Castellani, Lorenzo Vangelista, and Michele Zorzi, "Internet of Things for Smart Cities", IEEE INTERNET OF THINGS JOURNAL, VOL. 1, NO. 1, FEBRUARY 2014.
- [10] Greichen, J.J., "Value based home automation or today's market," IEEE Transactions on Consumer Electronics, vol. 38, no. 3, pp.34-38, Aug. 1992
- [12]]Mahesh.N.Jivani, "GSM Based Home Automation System Using App-Inventor for Android Mobile Phone", 2014, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 3(9), pp. 12121-12128.
- [13] Baki Koyuncu, "PC Remote Control of Appliances by Using Telephone Lines", 1995, IEEE Transactions on Consumer Electronics,Vol. 41(1), pp. 201-209.
- [14] Alheraish, "Design and Implementation of Home Automation System," IEEE Transactions on Consumer Electronics, vol. 50, no. 4, pp.1087-1092, Nov. 2004
- [15] BakiKoyuncu, "PC Remote Control of Appliances by Using Telephone Lines", 1995, IEEE Transactions on Consumer Electronics,Vol. 41(1), pp. 201-209.
- [16] Shiu Kumar," UBIQUITOUS SMART HOME SYSTEM USING ANDROID APPLICATION ", International Journal of Computer Networks & Communications (IJCNC) Vol.6, No.1, January 2014.
- [17] Yadnya Adhiya, Shriya Ghuge, H.D Gadade "A survey on home automation system using IOT" IJRITCC Volume_5_Issues-March_17_Volume_5_Issue_3
- [18] Shih-Pang Tseng, Bo-Rong Li, Jun-Long Pan, and ChiaJuLin,"An Application of Internet of Things with Motion Sensing on Smart House", 978-1-4799-6284-6/14© 2014 IEEE.