

Web and Android based Automation using IoT

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Abstract - With the early 20th century, the existence of new technology named Internet of Things (IoT) was stated which deals with the interconnection of things. We adopted this technology for our work to automate and manually control the home appliances making home a better-automated place without human intervention called Smart home. Here, in our work, this technology is supported by an android application installed in Smart Phones and WebPage for User-Interface (UI), various sensors to let appliances to talk, Arduino Uno as a central unit and Wi-Fi for connectivity between central unit and UI.

Keywords: IoT, Smart Home, Smart phones, Android Application, Web-pages, Arduino, Wi-Fi Module.

the motto of our paper. The proposed system tries to reduce the human effort maintaining the proper and healthy environment. This paper also deals with the monitoring system using the ESP8266 with IP connectivity for accessing and controlling devices using the android application.

The remaining paper is mapped as follows: In section 2, we briefly explain about the literature survey. Section 3 deals with our proposed model, section 4 deals with the designing and section 5 deals with the implementation of the proposed model. Finally, the conclusion followed by the references referred.

I. INTRODUCTION

The invention of a new technology called IoT has resulted in the new revolution in the field of automation as well as has great contribution in the field of information and communication technology. The term IoT was coined by Kelvin Ashton in 1999. "The IoT is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction." [6]

According to ABI Research [7], "The installed base of active Wireless connected devices will exceed 16 billion in 2014, about 20% more than in 2013. The numbers of devices will more than double from the current level, with 40.9 billion forecasted for 2020. 75% of the growth between today and the end of the decade will come from non-hub devices: sensor nodes and accessories". With these data, we can state that the IoT has great future ahead as one is far more interested getting connected to others either human-to-human or human-to-machine or even machine-to-machine. Anyone from any other place can connect to entirely dynamic network of IoT. This has revolutionized the areas like transportation, health, etc. with far better automation and it tends to expand its network. This also has played a great role in automating the home appliances giving it more intelligence in order to comfort and improve the quality of life with minimal effort.

Various appliances like light, fan, air-conditioner, music systems, home security etc can be inter-connected to each other with an aim to automate them through the change in their environment accordingly and to control them remotely using the web as well as the android application present in the Smartphones. This leads to the ease of access along with energy saving intention by continuous monitoring. This is what

II. LITERATURE SURVEY

Being popular, smart home has attracted the interest of people in technology. There are many studies and successful experiments on this work. Among which some of them we studied as our literature survey. They are as mentioned below:

Rutuja D. Ektapure and Devendra Ingale, [1] deals with the android based automation using the Raspberry pi as well as the Arduino. Here, the system is automated as well as controlled manually. Manual control is done using the android application installed in the smart phone.

R. Mohana and R. Murugasami, [2] the smart home is controlled with GSM where the message is sent over an android phone to the system. The system decodes it and processes accordingly. The backward communication is also possible using the text messages.

Aamir Ali Malik and Fahad Raza Nizamani, [3] shows how the smart home with voice recognition help to the old aged people. This model uses the Matlab to process, train and test the voice that is to be stored as reference. When the voice command matches the reference, the system is controlled as per the command.

Dhakad, Dhake, et. Al, [4] ASP.NET is used to create the website so that the smart home could be controlled through it. This model uses ATmega2560 Arduino version. The Intel Galileo development board with built in Wi-Fi card port acts as web server.

Ihedioha and Eneh, [5] the proposed system uses ATmega2560 microcontroller to control the appliances of the smart home. The command is given to the microcontroller through GSM module in the form of SMS.

III. PROPOSED SYSTEM

This section deals with the proposed system. Here, we modulate the proposed system into four different modules to make it easy to deal with. User Interface: to deal with the user interaction with the system, Wi-Fi module: to deal with the connectivity, Programming Module: to deal with the Arduino programming and finally the Sensor Module: to read the status of the appliances in the given environment and let them exchange information.

As the smart home system can be controlled manually through the android application and the web page, we need to assure more security to prevent from others to enter into the system and control the appliances. So, we have provided authentication of the user using the android application and web pages. This is our first step to secure system. All the data read by the sensors and is processed by Arduino, the microcontroller, and depending on the conditions given by the user to it, it controls the appliances. If the data is read inappropriately or some inappropriate and unwanted changes occur in the system environment then the system plays alarm and sends information about it to the owner through the Wi-Fi module as an email. This inappropriate changes may be the motion, leakage of gas etc. This is our second step for security.

This proposed model system can also be controlled automatically. This fact is made possible by use of some specific sensors and Arduino. How it controls the appliances automatically is that the sensor data is read and processed by the Arduino which then checks with the feasible condition given during the programming. If that particular condition is matched then the Arduino sends the signal to the appliances to operate accordingly without any intervention of the user. This may be the alarm played with the unusual motion or the leakage of the gas or something other of similar kind.

IV. DESIGN

The Architectural diagram of the proposed system is shown in the figure below:



Fig. 1 Architecture Diagram

As shown the figure Fig. 1, we have various components grouped together comprising various modules of the system. Here, we discuss about working of those various modules and their interaction.

LDR, Motion Sensors, Temperature Sensors etc. are in the sensor module. These are connected to the Arduino board and the different hardware like light, LCD etc. These sensors in the sensor unit read the change in the environment and report it to the Arduino board.

Arduino board is programmed in such a way that the process can be automated like when the LDR sensor senses less light intensity then it glows on the light. Not only that, on receiving the command from the UI, it processes and act accordingly to turn on or off the various hardware. Automated processes like displaying the temperature and humidity on the LCD display, playing the buzzer when motion is detected are also implemented.

Wi-Fi Module deals with the connectivity between the UI and the Arduino. The connectivity takes place with respect to the IP address. Here, we use ESP8266 Wi-Fi module in our proposed system.

In order to deal with the system, we have implemented two UI's. The first one is Android application. The android application for the smart phone to control the system is created using the Blynk application which is an online to create an application allowing us to connect to system providing various libraries to the Arduino to support for. The latter one is the use of web pages. Here we have provide quite more security by directing user to cross through different phases like register and login, providing a sense of the authentication. The data entered in the login phase is checked with the database containing the data during register. The user will be directed only if the credential matches otherwise it shows the error saying incorrect login credential. The data flow diagram is shown in the figure below:

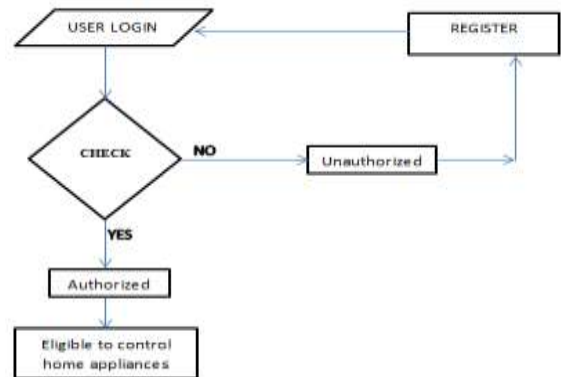


Fig. 2 Dataflow diagram of Web

V. IMPLEMENTATION

The proposed system is implemented successfully. We have implemented the system from the hardware to the software level providing the security with authentication and the unwanted changes in the environment of the system. The system is implemented in modular form and is then tested with successful results.

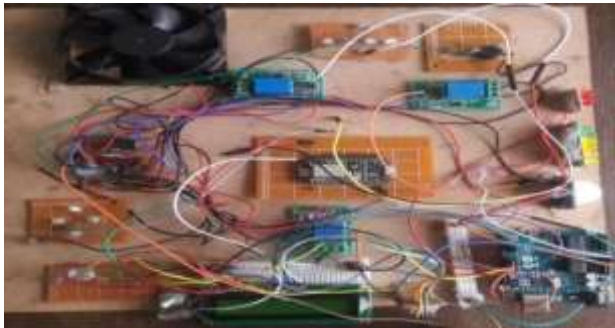


Fig. 3 Proposed System

The implementation of the proposed system is shown in the Fig. 3.

The connection of the temperature sensor, LED's, fan, motion sensor, LDR, buzzer, relays and LCD display is connected to the Arduino board as shown in the Fig. 3. The connection is using the jumper cables and bread board. The sensors read the analog data and send it to the Arduino and it then checks with the given condition as a program. If condition is matched then the respective appliance is controlled. LCD is used to display the humidity and the temperature. The controlling of the appliances can be done from the application as well as web pages.

The implementation of the login pages, register pages and android application is shown in the figures Fig. 4, Fig. 5 and Fig. 6 respectively.

The implementation of the login page and register pages as shown in Fig. 4 and Fig. 5 respectively are done using the MySQL database as a backend followed by the PHP whereas the front end design is done using the HTML, CSS and javascript.



Fig. 4 Login Page

Login page collects the credential of the user so that the user can be authenticated before the user tries to enter the homepage to control the appliances. It checks the credential with the credential present in the database and directs to the respective page.



Fig. 5 Register Page

Through the register page as shown in the Fig. 5, the user can login himself by providing the required credentials. The credentials are stored in the database for the future reference.

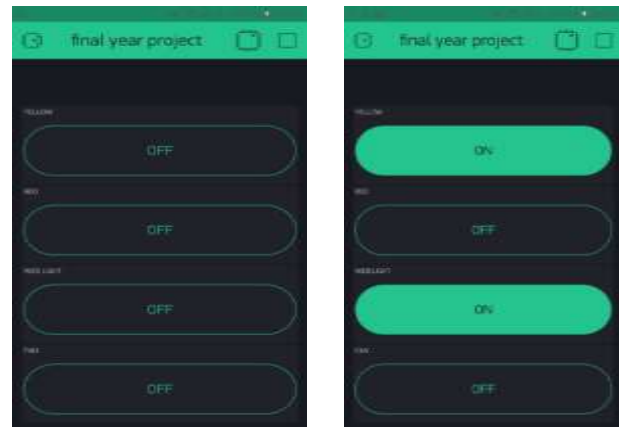


Fig. 6 Android Application

The implementation of the android application as shown in Fig. 6 is done using the Blynk application available in the play store. Through the button as shown in the Fig. 6, the user can control the appliances.

The performance of the proposed system is quite good as it is independent on the combination of the appliances controlled during the instance. Rather the performance of the system is highly dependent on the speed of the broadband connection as all the system relies on it. Fast the broadband connection, faster is the response of the system. So, we can say that the system is directly dependent on the speed of the broadband connection.

VI. CONCLUSION

We conclude that this system will play a crucial role in the busy human life making them easy and far more comfortable

with low cost and flexibility. The proposed model uses the Smartphone with the android application as well as web pages specially designed for laptops and personal computers for accessing the appliances of the Smart home. The specific android application with more security for the particular system may be developed to provide more features. More appliances may be added in parallel with the functions in diversity for more functionality to be performed with. Moreover, in future, this model can be modified providing extra features like voice controlled, mind controlled supporting the intelligence to the far beyond the deep.

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