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Wi-Fi Based Home Automation Using Android & Arduino Platform

Sushma P[1], Roopa M J[2]
[1]Student, M. Tech, [2]Associate Professor
[1,2]Department of CSE, SJB Institute of Technology, Bangalore, India-560060.

Abstract*: On the way to achieve and satisfy the increased demands of the people to lead a sophisticated lifestyle as an impact of industrial growth and evolution of technologies; the home automation domain is been considered to be a major footstep. Home automation is a method to automatically and remotely initiate and control the activities of the electrical equipments at home, buildings and industries. This paper presents the review on the home automation systems existing methodologies, their out comings and method to overcome the issues present and improvise the system. The proposed system is based on Wi-Fi networking technology and uses Arduino based board has its controller. The graphical user interface is provided by android applications for users to get connected to the hardware and have interaction with their home. Along with the feature of automation and control, the system also provides a way for the users to know about power usage details by the appliances at the home.

Keywords*: - Home Automation, Wi-Fi, Arduino, IoT, Android application.

I. INRODUCTION

Home Automation is a day today fact, where it deals from automating the basic tasks like controlling the light on/off to the complicated automations like automating large production machines in industries. it is a network of physical devices, controller module and mobile application; which can be called as a internetwork of different domains of technology. The home automation technique includes the efforts of various domains like IoT, cloud, embedded technology and mobile devices. IoT being the wide domain for research from few years, the home automation is the best growing application under IoT. Android is another area with greatest industrial growth based on it; people have related each and every task of their routine with smart phones so it would be an efficient way to create interaction between users and the implemented system. The system proposed includes the hardware switch module consisting an arduino microcontroller which is the main controller and the module is provided with a Wi-Fi module to provide access point for the switch. The application connects to this access point through the server, which then communicates with the arduino to get the confirmation. Once it is authenticated the arduino will trigger the signals to the electronic appliances in the house based on the input given by the user from the application. The system provides the power details which help the user to have efficient logic of controlling the equipments.

A. Advantages and Areas of Application of Home Automation.

Home Automation systems are used and applied in many places which have succeeded to help and provide convenience to the users in their life.

1) Automation of air conditioning, heating & ventilation systems
2) Appliances and home lighting control and security systems.
3) Automating of home to help elderly & disabled persons.
4) It provides convenience, security, awareness to users about their home.

II. LITERATURE SURVEY

There are many different existing methods for home automation and this section provides a brief overview of some of the existing techniques. The systems include different hardware implementations and underlying platform technologies like GSM, Bluetooth, Wireless networking, Zigbee, PLC (power line communication and different controller based systems using Raspberry pi, arduino, RF module, ATMEGA microcontroller. There are also some system implementations mainly based on cloud network, IoT, android which are the most preferred methods in recent years. Most of the techniques are implemented based on the inbuilt features provided

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by the off-the-shelf products like GSM and Bluetooth based systems use basic built-in features provided by most of the mobile devices and PCs. Some uses renewable energy sources like solar power which reduce the cost of overall system development. But there are some problems faced with the present systems like poor way of managing, complex infrastructure and difficulty in expansion of system, lower accuracy. The proposed system tries to overcome these disadvantages with more powerful infrastructure.

III. PROPOSED SYSTEM

The system implementation is done using the efficient methodologies like IoT & wireless for networking, android platform for providing user interface and a cost effective hardware module. The main hardware design involves the microcontroller platform. The embedded hardware module includes some important components as: Communication module which could act as a bridge to act between the user and the devices and also between the devices. Controller module which is the responsible unit to take care of the overall automation, measurement and sensor module to provide the details of the changes in the power supply or environmental changes. The Arduino Uno microcontroller can also act as server to connect the home appliances and interface to all hardware modules. The following figure gives the overview of system.

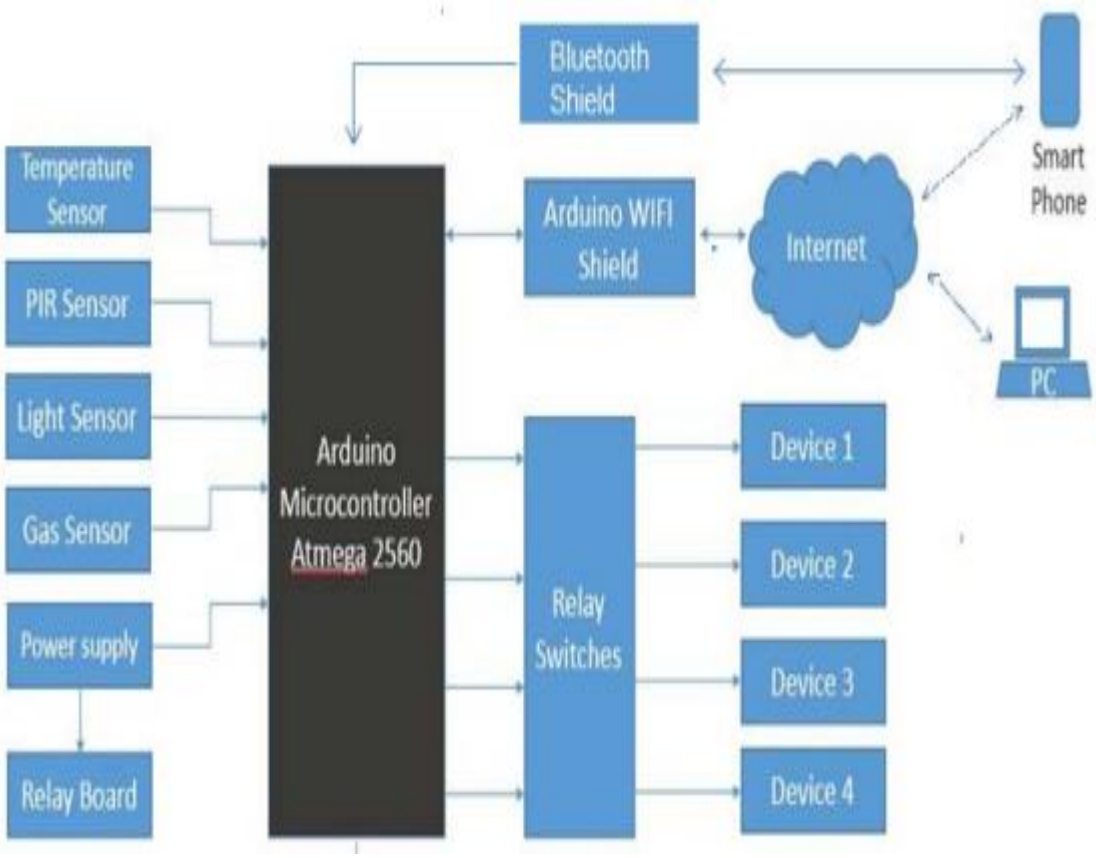

Fig 1: Block diagram for the system.

A. *Algorithmic steps*

1) The user login and register home server.
2) Providing authentication to the module.
3) Fetch data from sensor using microcontroller.
4) Upload the data to server and store the data.
5) Authenticate the android device of the user.
6) User request in the form of commands.
7) Sending the commands through local server to the setup.
8) The home server access the client request.
9) Controlling hardware based on user input.

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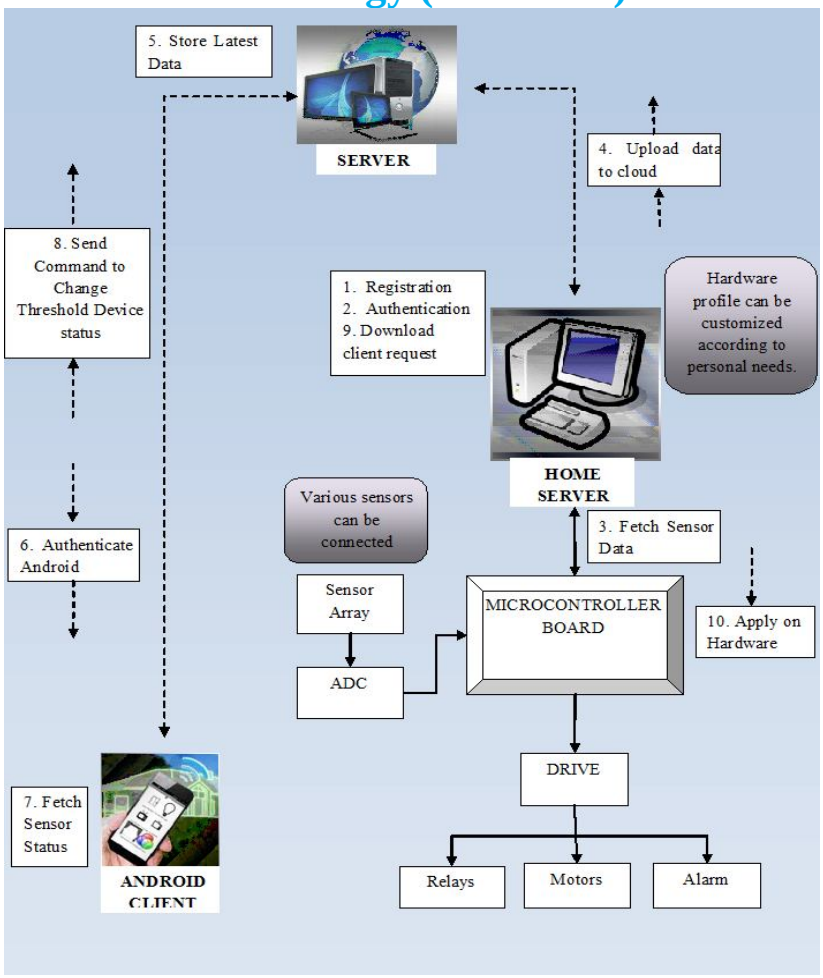

Fig 2: Data flow of the system.

The above figure 2 provides the complete flow of actions of the system. The android client is Host controller of the complete system. The user gets himself connected to the server using the Wi-Fi to the module. The user once the connection is setup through the server by authenticating, triggers the actions through the server to hardware in the form of commands. The android application has also the availability of accessing the database of the system to get the sensor details of the home setup. The microcontroller board with sensors will collect the details about the electronic appliances connected to it at the home which is analysed to know if the devices have been running at a proper power supply and voltage, if any variations in the data the module has a relay component to provide the switch on/off the power supply to the appliances. All the sensor data is being stored in the server since the embedded devices come with very low memory to store all the information.

B. Software Implementation

The software implementation involves the embedded software and the andoid application developement. The embedded software developement requires arduino IDE which involves coding for interfacing the controller module with the physical devices and the server. The android application developement requires Android studio or any other android developement tool. It includes: front-end developement by using XML, it deals with the screen, input, context, mobility as outline for their design. They focus to provide effective user interface and user experience.

The back-end deals with the connection setup, routing, authentications, storage; the actual processing of the applications at the core level. The modules involve: the interface material design using XML and using different widgets provided by tool, manifest file to request for the supportability of features by underlying hardware platform, the main activity files which include the coding for the setting the connection to the server and hardware device using Wi-Fi and establishing database connection, for obtaining details of

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appliances, request, control commands and initiation of the control. The android application provides a easily adaptable interface to the users.

C. Advantages

1) Low cost of overall development and installation of the system: the Arduino boards are inexpensive than other controllers, the cost of cables lessened due to the wireless technology.

2) Easily portable: both the hardware and software are portable across different platforms. The software IDE of android application and arduino embedded software support heterogeneous platforms.

3) Easy programming environment: the arduino and android provide user friendly programming tool features.

4) Expandable/ scalable: the overall system can be scaled up easily according the features and efficiency requirement of the user.

IV. CONCLUSION

The home automation system is the way to automate the home appliances by the user locally and remotely without the need for the user to stay at the place of setup. It provides a safe home as the user will be able to watch and control his home sitting at any place. It has helped people have a tension free life and better lifestyle. The systems have helped a lot for the disabled and old age people by providing control of their home sitting at a place rather than taking risk to move around to automate. The proposed system is efficient in terms of providing the sensor details, controlling, and scalability and cost effective in terms of system setup. The android applications provide no additional investments for having a remote interface. The home automation being a subject of greater innovation and technical growth, it can be enhanced to have a better system including more features and efficiency.

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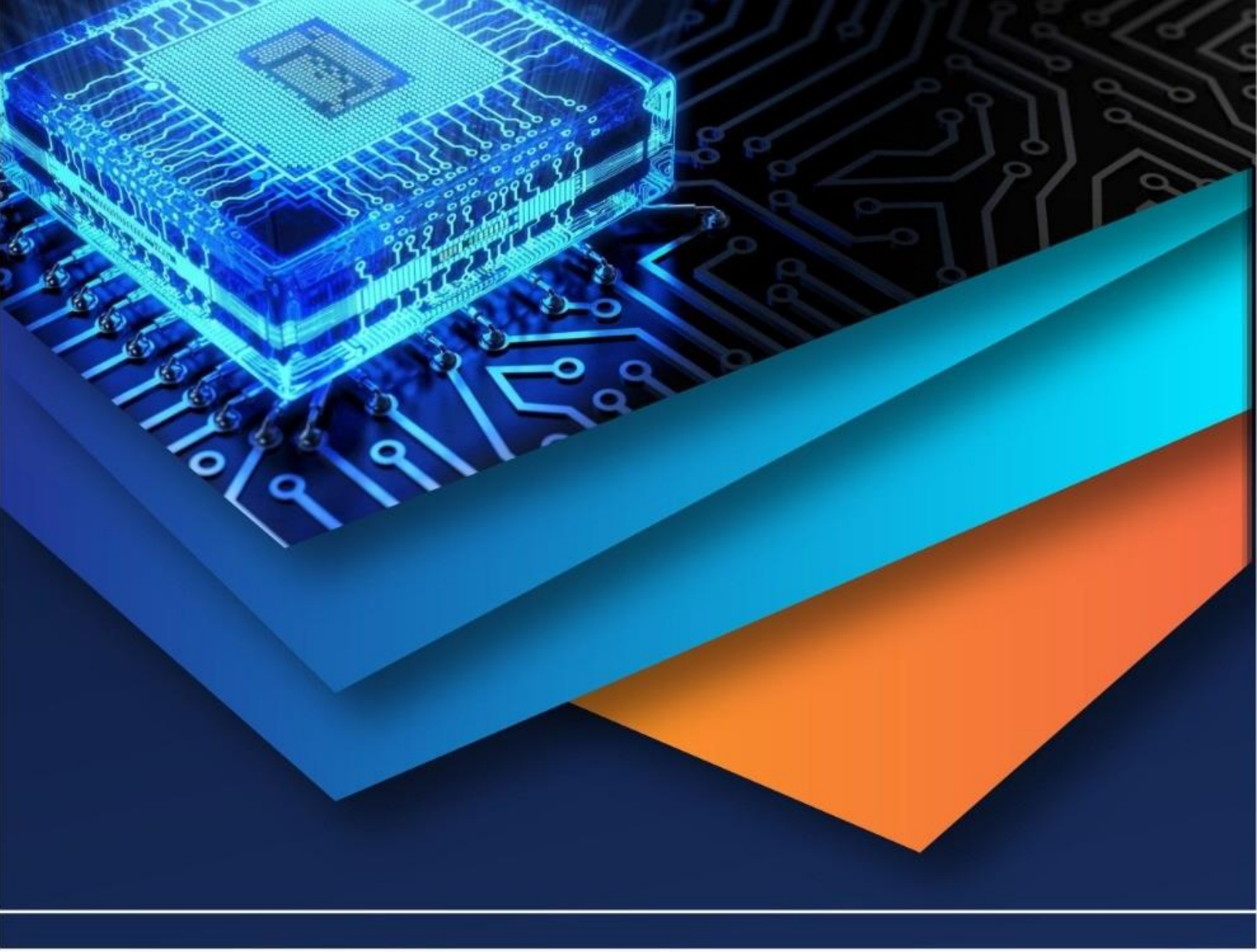

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