# Bluetooth Based IoT Home Automation

**Govind Singhal[1], Pranav Chaudhary[2], Prashant Sharma[3], Sahil Khan[4]**

[1,2,3,4]*Department of Computer Science and Engineering, Meerut Institute of Engineering and Technology, Meerut 250002, U.P., India*

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***Abstract-*** In This Era, The "Internet Of Things" Is Becoming A Must Known And Interesting Technology & Business Opportunity, With Standards Growing Primarily For Wireless Communication Between Devices And Gadgets In Human Life, In General Referred To As Things. This Paper Aims To Analyse And Build A Smart Home System Using Bluetooth As Communication Medium. To Aim A Product Using The Standard Technology That Will Be Helpful To The Lives Of Others Is A Huge Contribution To Society. The Microcontroller To Be Used In The Prototype Is Arduino UNO And An Onboard Bluetooth Interface Making Use Of The Electrical Appliances Of The Home That Can Be Controlled And Managed.

**I. INTRODUCTION:** Internet Of Things Has Covered Lots Of Things Where Home Automation Comes Under The One Of Its Main Consumer Application. Smart Homes Are Automated Through The Wireless Technologies Such As Wi-Fi Bluetooth Etc. The User Controls Over The Appliance Will Be Obtained By The Android Device; The Microcontroller Has An Alliance With This Device. The Owner Can Operate Any Number Of Appliances Through Their Smartphone Just By Switching ON/OFF Various Appliances Inside The House, Which Are Connected And Controlled By The Arduino Via Bluetooth Shown In Figure 1. The User Will Be At Full Comfort As There Is No Need For Physically Operating The Appliances, It Is Just Like Changing Your Room A.C Temperature Through Remote. Thus Using The Same Set Of Technology, The Issue Regarding Of Home Security And Home Automation Can Be Sort Out Easily. A Network of PAN Connected Objects Able To Collect And Exchange Data. User Can Remotely Control And Monitor The Devices And Machines. The Electrical Appliances Cannot Be Operated From A Remote Location Because Range Of Bluetooth Is Limited. Thus Functions Like Turning On Fan From Outside Of House Can't Be Done But Because Of This, It Is More Secured.

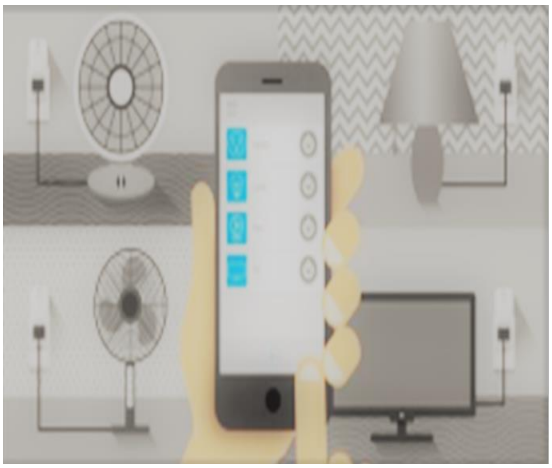

Fig. 1 Demonstration

The Problems Faced By Ongoing Home Systems In Providing Information About The Circumstances Of Having Multiple Users Access To The System Is Tried To Overcome In This Paper. In This Paper, Both Smart Building And Secured Home Automation Systems Are Merged Which Make Them More Comfortable And Provide A Better Solution To The User & Combined With Simplicity. This Research Paper Will Compare And Contrast The Existing Systems With This Bluetooth Home Automation System And Look At Their Various Features And Advantages.

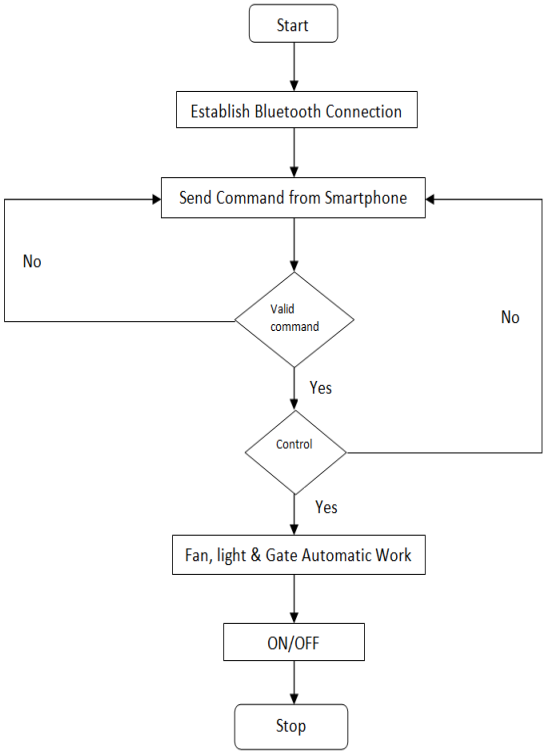


Fig. 2 Flowchart

## II. METHODOLOGY

In This Home Automation System, The Connection Is Established Between Arduino UNO And The Phone Via Bluetooth For Operating The Appliances I.E. LED, Fan And A Garage Gate Etc. The Home Appliances Are Directly Connected To The Arduino And A Bluetooth Based Wireless Connection Is Established Between Arduino And Smartphone. Appliances Are Connected To The Input/Output Or The Digital Pins Of The Board.

Algorithm

1. Establish Bluetooth Connection.

2. Send Command From Smartphone.

3. **If** Valid Command, **Then**

4. **If** Controls The Appliances, **Then**

ON/OFF The Appliances,

5. **Else** Invalid Command.

Bluetooth Module HC-05 Has Rx And Tx Pin That Receives And Transfers Information Signal Obtained From The User Through The App To The Microchip. Arduino Is Programmed In Arduino IDE In Accordance With Demand Which In Return Carry Out Some Math And Logical Operations To Operate The Appliances. A Library File Named As Software Serial Is Included To Have An Interface Between The Arduino And Bluetooth Module.

```
#Include <Softwareserial.H>

Const Int Rxpin = 4;

Const Int Txpin = 2;

//Declaring The Pins At Which Bluetooth Module Is Connected.

Softwareserial Myserial(Rxpin, Txpin);
```

Two Main Functions I.E. Void Setup() And Void Loop() Are Used While Programming The Arduino Through Which We Define The Pins At Which Appliances Are Connected To Behave As The Output And Sets The Command To Switch The Appliance ON Or OFF According To The User Preference. To Guide The Arduino Boards, Commands Are Sent From The Android Application To The Board.

```
Const Int Loads[] = {9, 10, 11, 12};

Void Setup()

 {

  For (Int I=0;I<4;I++)

  {

    Pinmode(Loads[I], OUTPUT);

//Pins Are Declared And Specified To Behave As Output

  }

}

Void Loop() {

  If(Myserial.Available() > 0){

   State = Myserial.Read();

   Flag=0;

  }

  Switch(State) {

   Case '0':Digitalwrite(Loads[0], HIGH);

        Flag=1;

        Break;

   Case '1':Digitalwrite(Loads[0], LOW);

        Flag=1;

        Break;

//Switching The Appliance ON(Set High) Or OFF(Set Low) According To The Command Sends By The User

  }
```

}

## III. ARCHITECTURE

The Architecture For This Project Is Designed To Be Flexible, Effective, Safe And Secure. The Whole Motive Is To Minimize The Physical Intervention And Automate It To The Greater Extent Possible.

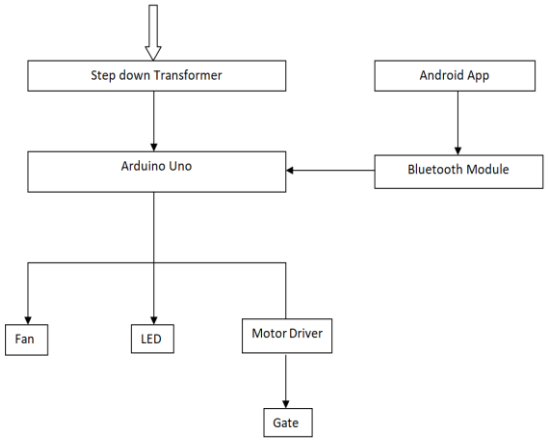


Fig. 3 Architecture

The User Must Have A Dedicated Android Application For Controlling Appliances With Proper Bluetooth Connectivity. With The Help Of This, Multiple Appliances Can Be Operated At A Time. This Home Automation Model Consists Of Three Main Components Given Below:

A) Arduino Uno

B) Bluetooth HC-05

C) Motor Driver

## IV. DESCRIPTION OF HARDWARE

*1. Arduino UNO:*

Arduino Uno Is The Main Component Of This Model Which Is A Microchip Having A Type B USB Port, A Power Jack Which Is Used To Supply Power And A Reset Button. HC-05 And Appliances Are Connected To The Digital Pins Of The Board Which Are Defined While Encoding It. It Is Generally Coded In C, C++ Language In Arduino IDE.

*2. HC-05:*

HC-05 Is A Serial Port Protocol Bluetooth Module Used To Provide Connectivity Between Arduino And Android App. It Receives The Command From The User And Transfers It To The Microchip. It Has Rx And Tx Pin Which Is Used To Receive The Serial Data From The User And Transmit To The Arduino. Enable Key Pin Helps In To Switch Between Set Low (Data Mode) And Set High (AT Command Mode).

*3. Motor Driver:*

Microcontroller Works On The Low Current While The Motor Requires More Power Comparatively. So Here A Motor Driver Is Used To Amplify A Low Current Into A Higher Current Signal With An External Power Source Of 9V So That The Motor Of The Gate Can Be Operated Smoothly.

A Prototype Model Containing All Components And Home Appliances Like LED, Fan And A Gate Is Shown In Figure4.

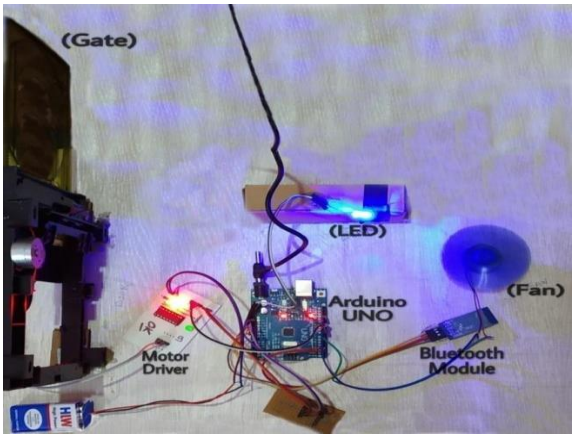


Fig. 4 Prototype Model

## V. COMPARISION WITH EXISTING SYSTEMS (WIFI BASED)

| Factors of comparision | Wifi Module | Bluetooth Module |
|---|---|---|
| Range | 50-100 meters | 0-10 meters |
| Networking topologies | Point to hub | Ad-hoc, very small networks |
| Operating frequency | 2.4 and 5 GHz | 2.4 GHz |
| Power consumption | High | Medium |
| Cost | High | Low |
| Flexibility | Multiple users | Limited users |

Fig. 5 Comparison

Bluetooth Based Home Automation System Is More Secured Compared To The Wi-Fi Based Because Of The Shorter Range Availability, Only Limited Users Can Have Access To The Appliances Whereas In The Wi-Fi Module Based Whoever Has The Password Of The Wi-Fi Can Operate The Appliance. So In A Worst Case Scenario There Can Be A Outsider Or Intruder Who May Have Access To The Wi-Fi, Can Control The Appliance And Causes Inconvenience To The User Whereas In A Bluetooth Module Only One Device Can Be Connected At A Time. Moreover In Wi-Fi Based System, There Are Possible Chances Of Data Breach Or Leaking Of Personal Information Over The Internet Whereas Bluetooth Based System Don't Require Internet Connectivity. Thus Considering Such Cases

Bluetooth Based Home Automation System Is More Secured.

## VII. RESULT

On The Report Of The Projected Plan, The End Product Of This Paper Brings On A Smart Automated Home System. Users Can Easily Control And Operate Home Appliances Like Fan, LED And Garage Gate Without Any Manual Intervention Through An App. The Main Purpose Of This Is Also To Provide A Secured Home Automation System Which Restricts The Access Of Any Other User Or Intruder. In This Paper, Description And Working Of The Hardware Components I.E. Arduino UNO, HC-05 And Motor Driver Is Also Provided.

## VI. CONCLUSION

As The Home Automation Is Taking Wings, The General People Get To Know More About The System. This System Is Not Only User-Oriented But Also Helps In Making Lives Easier. Even If Home Automation Becomes An Only Part Of Life, It Will Revolutionize Things A Lot In The Upcoming Years. This Project Brings On An Approach To Lead The Way For Lot Of Smart Home Systems. Smart Houses Are Like Big Gadget Consists Of More Than One Technology And Its Applications Which Can Be Used To Offer Safety And Administer The House Effortlessly. This Project Mentioned The Designed Modules Like Controlling Of Light, Fan And Garage Gate Through Bluetooth Based Android App Managed Via Arduino Microcontroller.

## VIII. FUTURE SCOPE

Using This Proposed System, Automation Can Be Broaden To Include Innumerable Other Options For Highly Secured Home System And Various Other Feature Like Operating A Garage Gate Without Stepping Out Of Your Car And Many More. This Will Reduce The Work Of A Person Who Is In Hurry. This Kind Of System With Corresponding Changes Can Be Implemented For Physically Challenged People Or At The Workplace Where Human Working Environment Is Dangerous.

Smart Home As A Service Not Only Allows Users To Control Electronic Devices Remotely, They Also Help Them To Watch Over A Tab On Energy Utilisation. Also The High Demand For Up-To-Date Security And Surveillance Has Created A Effective Growth Of Home Automation Market Worldwide.

## REFERENCES

*[1] Prof. M. B. Salunke, Darshan Sonar, Nilesh Dengle, Sachinkangude, Dattatraya Gawade, "Home Automation Using Cloud Computing And Mobile Devices", Vol. 3, Issue 2 (Feb. 2013), ||V2|| PP 35-37.*

*[2] Jin, M.; Jia, R.; Spanos, C. (2017-01-01). "Virtual Occupancy Sensing: Using Smart Meters To Indicate Your Presence". IEEE Transactions On Mobile Computing. PP (99): 3264–3277.*

*[3] Mitali Patil, Ashwini Bedare, Varsha Pacharne "The Design And Implementation Of Voice Controlled Wireless Intelligent Home Automation System Based On Zigbee." International Journal Of Advanced Research In Computer Science And Software Engineering.*

*[4] N.David, A.Chima, A.Ugochukwu And E.Obinna,"Design Of A Home Automation System Using Arduino", International JournalOf Scientific & Engineering Research, Vol. 6, Pp. 795-801, June-2015.*

*[5] Prof. M. B. Salunke, Darshan Sonar, Nilesh Dengle, Sachinkangude, Dattatraya Gawade, "Home Automation UsingCloud Computing And Mobile Devices", Vol. 3, Issue 2 (Feb.2013), ||V2|| PP 35-37.*

*[6] A. Elshafee And K. A. Hamed, "Design And Implementation Of A Wi-Fi Based Home Automation System, "World Academy Of Science, Engineering And Technology, Vol. 68, Pp. 2177-2180, 2012.*

*[7] Rye, Dave (October 1999). "My Life At X10". AV And Industry Emagazine. AV And Automation Industry Emagazine. Archived From The Original On September 30, 2014.Retrieved October 8, 2014.*