E-Home: A complete home automation solution

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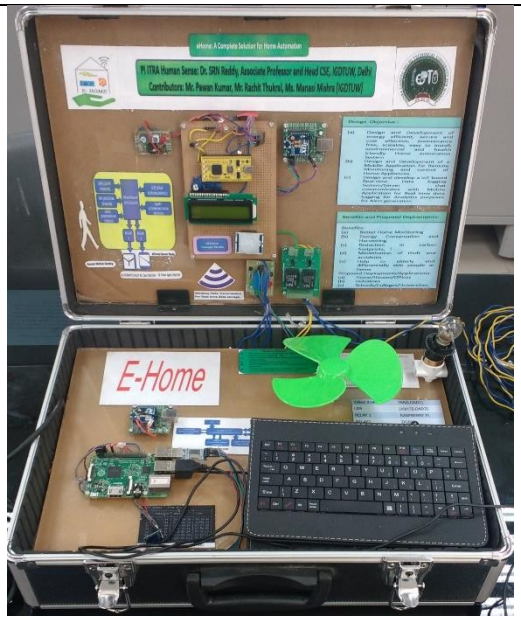
[Research Scholars: Pawan Kumar, Rachit Thukral, Manasi Mishra]

Home Automation: Home automation or smart home is the residential extension of building automation and involves the control and automation of lighting, heating (such as smart thermostats), ventilation, air conditioning (HVAC), and security, as well as home appliances such as washer/dryers, ovens or refrigerators/freezers that use wireless communication technology for remote monitoring.

Remote Monitoring: Apps can provide a wealth of information about your home, from the status of the current moment to a detailed history of what has happened up to now inside the home. You can check your security system's status, whether the lights are on, what the current temperature of your home is and much more.

Remote controlling: You can control your devices remotely with the help of your smartphone or desktop via any wireless communication technology such as Bluetooth, wifi etc

E-Home is a complete system for automatic as well as manual controlling of various home appliances. The picture of e-home system and its feature are given below:



System feature:

- Miniature nodes deployed at different locations in a room/house
- Cost effective and affordable system for Indian users.
- Anytime, any level scalability
- Heterogeneous nodes for meeting low cost criterion
- System to operate on a number of available communication interfaces with ease

1. **Design Objective:**

   (a) Design and Development of energy efficient, secure and cost effective, maintenance free, scalable, easy to install, environmental and health friendly Home Automation System

   (b) Design and Development of a Mobile Application for remote Monitoring and control of Home Appliances.

   (c) Design and develop a IoT based Real-time Data logging System/Server that communicates with Mobile Application for Real time data logging for Analytics purposes for Alert generation

2. **System Architecture:**

   a. **Hardware Architecture:** The system consists of 3 nodes (i) Sensor Node (ii) Gateway node (iii) Control Node

      i. **Sensor Node:** A sensor node, also known as a mote, is a node in a sensor network that is capable of performing some processing, gathering sensory information and communicating with other connected nodes in the network.

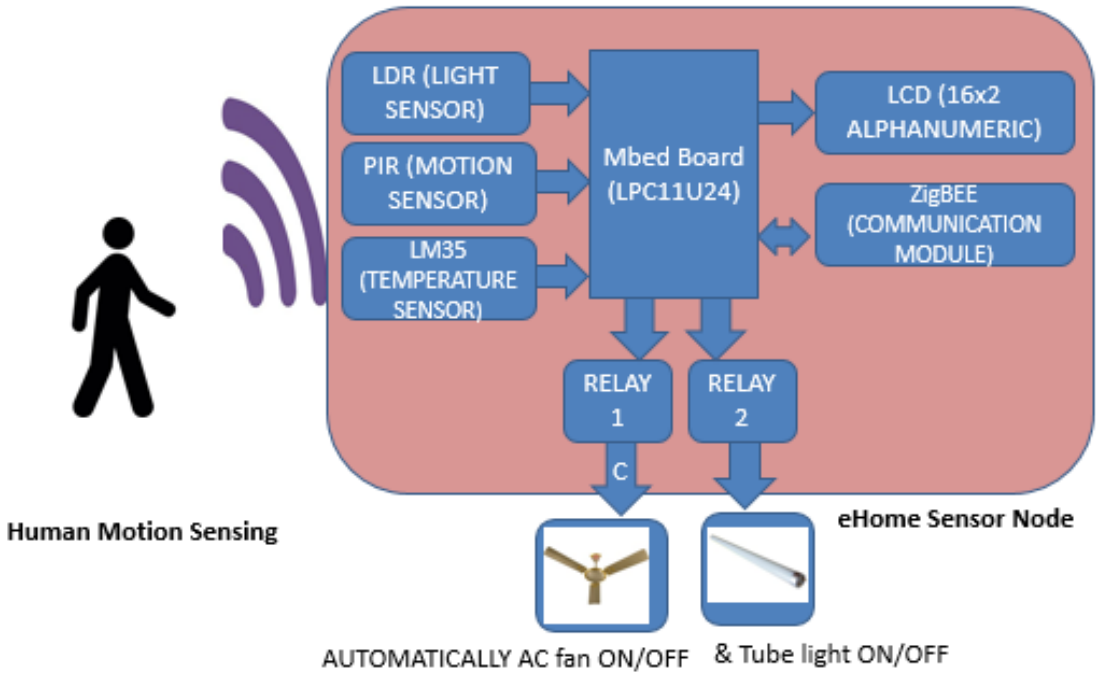


Fig 1: Architecture of sensor node

ii. **Gateway Node:** It collects the information from the other nodes in the network and saves it in the local database. A server is also installed for remote monitoring of home. It acts as an interface for the communication of various other nodes in the network.

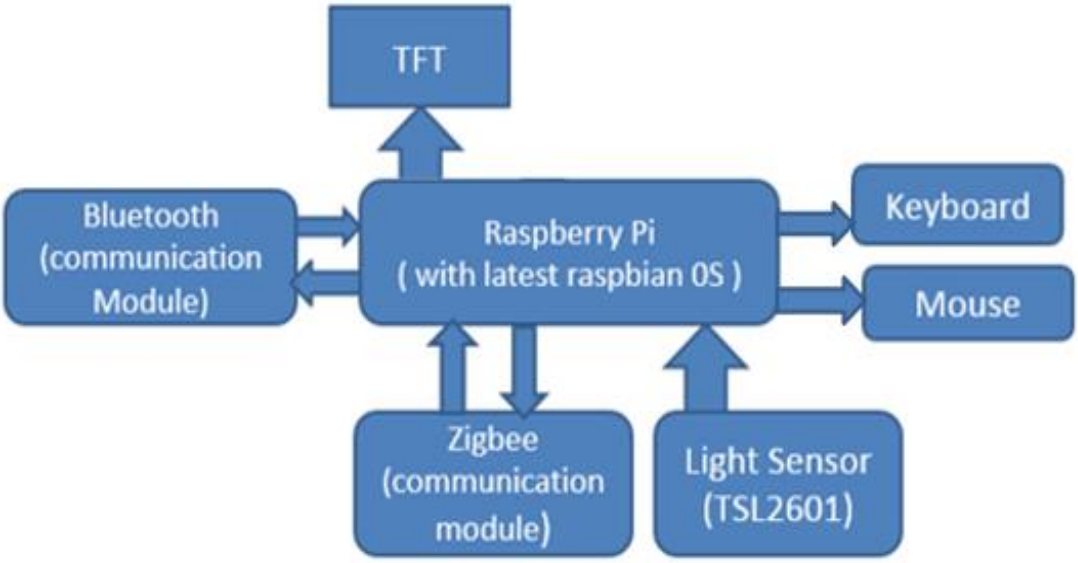


Fig 2: Architecture of gateway node

iii. **Control Node:**

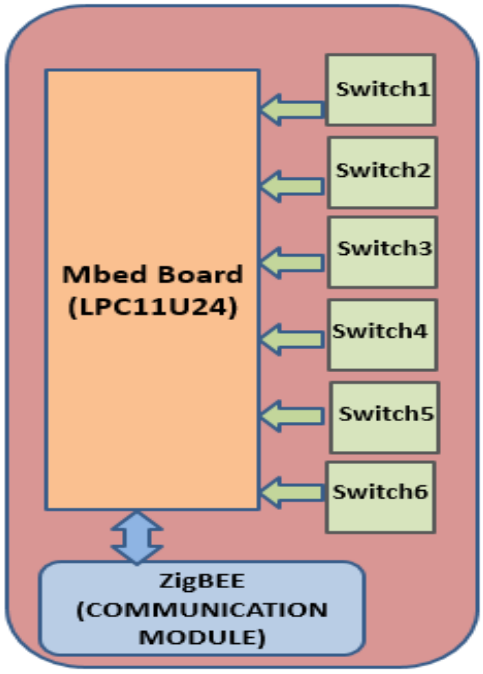


Fig 3: Architecture of control node

b. Software Architecture:

The system is designed such that it works in basically two modes. They are

1. **Automatic Mode:** All the appliances are controlled automatically with response to the sensor data and the data is send to the gateway node and is saved in the database and server.
2. **Manual Mode:** Any appliance can be controlled by the user. This mode is further subdivided into two modes. They are:
    a. **Switch Mode:** Any appliance can be controlled by switches/pushbuttons in the control node
    b. **Bluetooth Mode:** Any application can be controlled using Bluetooth app

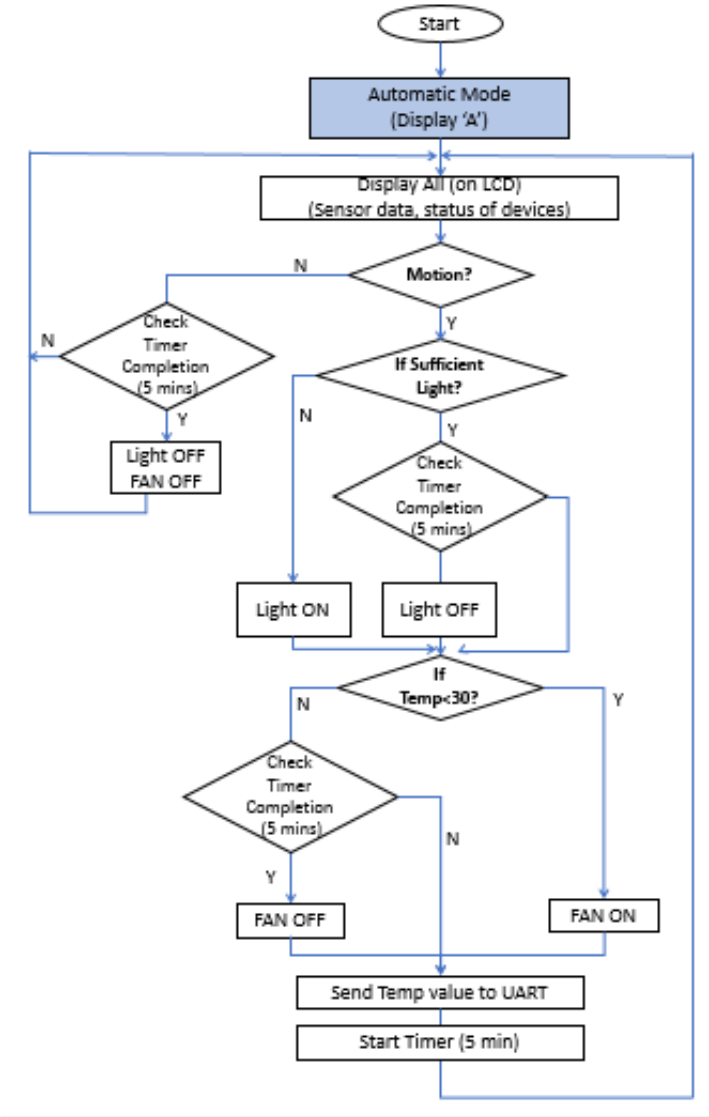


Fig 4(a)

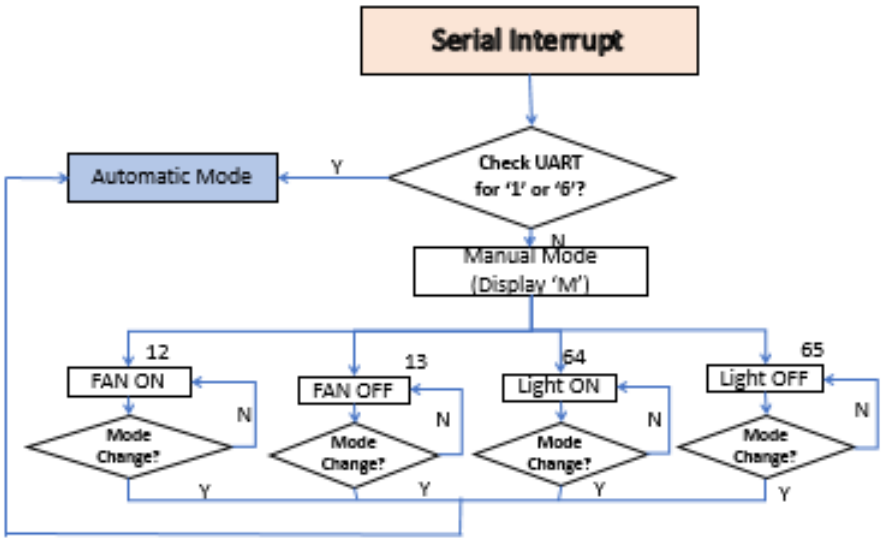


Fig 4 (b)

Fig 4: Flow chart of the sensor node

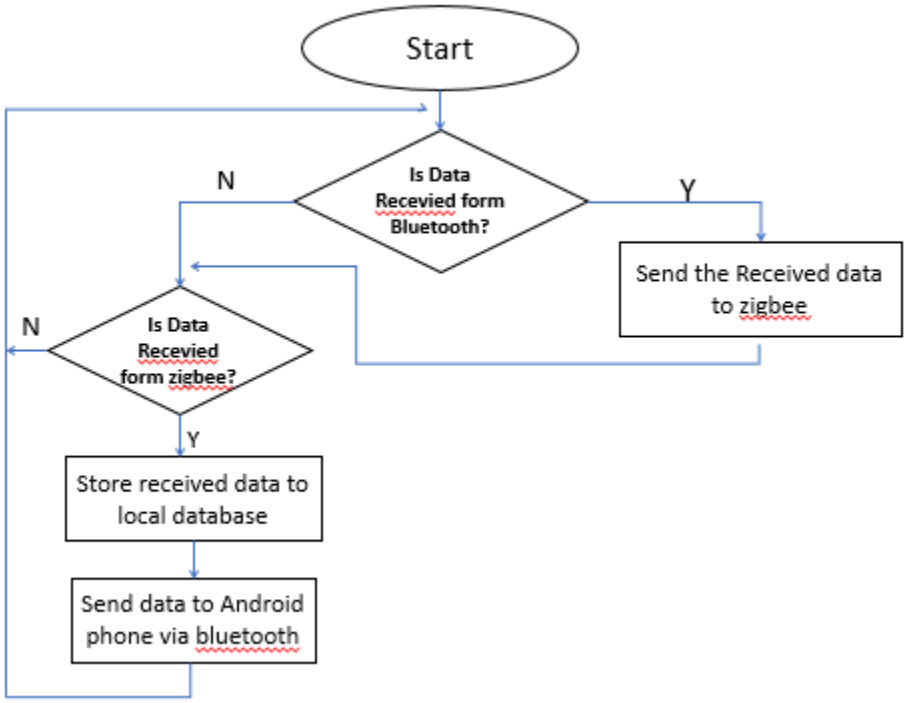


Fig 5: Flow chart of gateway node

c. **Network Architecture:** Network architecture shows that how the nodes are connected to each other. Our system uses heterogenous communication technologies for better performance. Fig 6 show the network architecture of the system

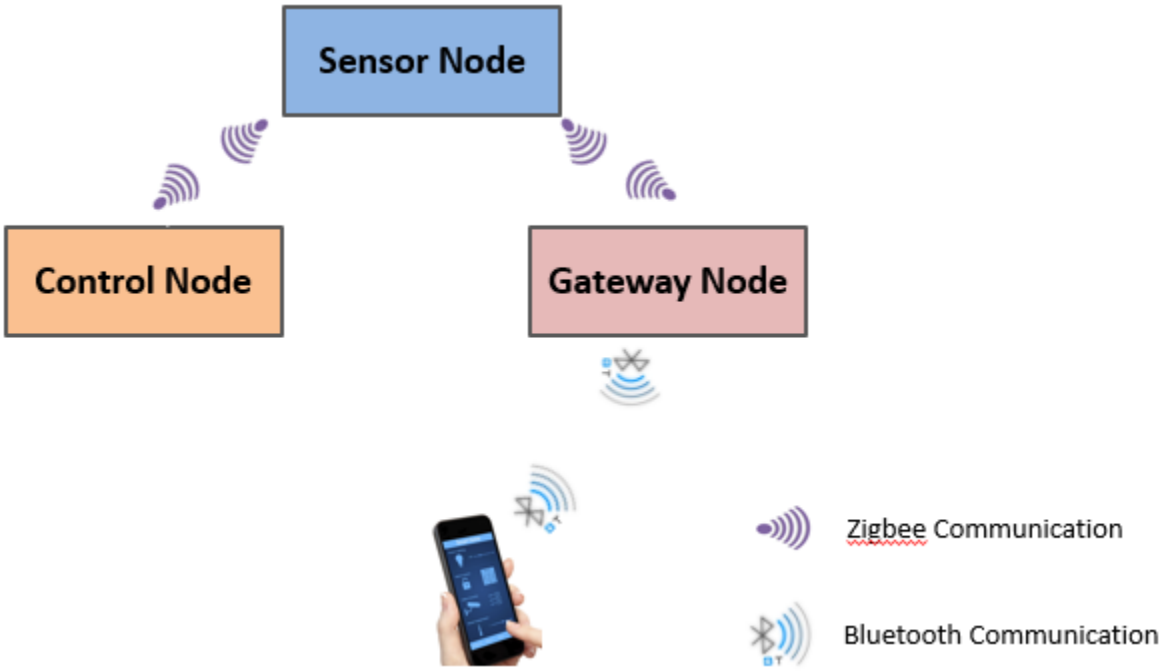


Fig 6: Network Architecture of sensor node

3. **Benefits:**
   (a) Better Home Monitoring
   (b) Energy Conservation and Harvesting
   (c) Reduction in carbon footprints,
   (d) Minimization of theft and accidents
   (e) Help to elderly and differentially able people at home
4. **Proposed Deployments/Applications:**
   (a) Home/Houses/Offices
   (b) Industries
   (c) Schools/Colleges/Universities