IoT based Smart Home Automation System using Sensor Node

The Internet of Things [1] is the interconnection of the various computing devices embedded in the daily appliances to the internet, thus enabling them to communicate with each other. This enhances the end users quality of life and to improve efficiency and sustainability in the day to day activities. In shortly, many of the smart devices will be communicating over IoT [2] The analyst firm Gartner predicts that by 2020 there will be more than 20 billion devices connected to the Internet of Things. As we will approach that value, it is predicted that around $6 billion will flow into the various domains of IoT like application development, device hardware, system integration, data storage, security, and connectivity. Nearly $6 Trillion will be spent on IoT solutions by 2025. We are living in a world that is rapidly evolving regarding automation. Automation is the ability to schedule events for the devices connected to the local network or the internet through time-related or stimulus-triggered programs. From large industries to small offices, everywhere the concept of automation are being implemented to reduce human intervention and to improve energy efficiency and productivity. Home automation or domestics is the process of automating the various appliances inside a house thus converting it into a smart house [3, 4]. It involves the automation of heating, lighting, ventilation, climate control as well as various other embedded system devices that can be connected to the internet. Another major characteristic of the present generation of home automation is the remote monitoring and access of the automated appliances. With the evolution of smartphones and tablets and the development of various communication technologies like Wi-Fi, Bluetooth and ZigBee we have gained the ability to connect to our home network while we are away indeed. There are many advantages associated with home automation. One of the advantages is the immense potential for energy conservation and cost saving. The efficient home automation system is proposed in this paper. The significant contributions of this paper are as follows: 1) Initially, we automate the functioning of some essential home appliances like fans, lights, air-conditioners and water heaters by the readings received by various sensors installed at different parts of the house. 2) All These sensors will be connected to the Node MCU ESP8266 or the Arduino Uno which will process the readings received by the sensors and control the relays connected to the appliances 3) A CT sensor is used to measure the energy consumed in the home regularly and updated in the database. Further, our solution uses database values and calculates power bill and it notifies through the SMS for every 15 days. 4) A load sensor has also been connected to the Arduino which keeps a track on the amount of LPG in the cylinder. If the weight of the cylinder reaches a certain threshold, then a SMS is directly sent to the gas booking agency and the user is notified about the booking along with the unique booking ID. This paper is henceforth is organized as follows. The existing home automation solutions are explained in Section II. Motivation is described in Section III. Section IV discusses the proposed work. Finally, the paper is concluded in Section V. II. RELATED WORK Home Automation has been on the rise in the recent times. Starting from agriculture, to the cities having the tallest of the skyscrapers are inclined towards automation. In this section, we will discuss the various existing solutions proposed by different research papers. In [5] the author uses 433 MHz radio frequency control module to control the home appliances directly.



Sensor Node Layer: The sensors, namely, light sensor, IR sensor and temperature sensor are connected to the NodeMCU ESP8266. The CT sensor, HX711 ADC module and the load cell are connected to the Arduino coupled with Ethernet shield. The sensors acquire the data of the variables of the home environment and send the data to the NodeMCU. The NodeMCU then Triggers the relays connected to the lights, blinds, fan, air conditioner and the heater as and when the necessary conditions are met. A microcontroller is a control device that comes embedded with peripherals, memory and a processor. The remote controlling and automation of the appliances are made possible by the microcontroller which is programmed to process the response produced by the various sensors and to trigger the appliances according to the automation architecture. The two microcontrollers used in the project are:

• **Arduino Uno:** Arduino Uno is a microcontroller board based on the ATmega328P microprocessor. It has 14 digital I/O pins, six analog inputs along with various other ports and jacks. The Arduino can be powered directly by the computer with the help of the USB cable provided, or it can be powered using an AC-to-DC adapter or a battery. The Arduino can be programmed using the Arduino IDE which is

based on the C programming language. It is a relatively compact and easy to handle the device

with many processing capabilities.

• **Node MCU ESP8266**: The ESP8266 is a low-cost Wi-Fi chip with full TCP/IP stack and MCU

(microcontroller unit) capability produced by a Shanghai-based Chinese manufacturer, Espressif Systems. The low cost, compact size and the presence of an inbuilt Wi-Fi module were the

reasons for selecting this microcontroller.

2) **Sensor Data and Database Interface Layer:** The CT sensor (non-invasive current sensor) sends its data to the Arduino coupled with the Ethernet shield. The data received is processed by the Arduino (Arduino IDE commands) and as a result, the energy consumed, and the price for the units consumed is sent to the database using the connected Ethernet shield. The load cell and the ADC module sense the weight of the gas cylinder, and when the value reaches less than the set field, the weight is then sent to the database for further utilization.