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IoT based Intelligent home using Smart Devices

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ABSTRACT: The proposed system is providing feature of IoT Based smart System including smart alarm clock which will automatically adjust the alarm time as per train schedule and accordingly other appliances (geezer), secondly switch timer that will sense the mobile charger and switch it off when mobile gets charged and smart fridge which will detect the daily needs (eggs, Milk) stored in it and if it gets finished then it will automatically send message to the grocery shop. All this smart devices and WSN nodes are connected through Wireless module to a centralized server. A Raspberry pi will be used as central server. API is used for getting live train status for smart clock. Smart fridge uses pressure and temperature sensor for gathering information and send a message using free web services. This whole system can be controlled by a web browser. This system embraces the functions of appliance monitor, control and management, home security.

KEYWORDS*:* WSN, IoT, Smart Device, Automation,etc

I. INTRODUCTION

With advancement of Automation technology, life is getting simpler and easier in all aspects. In today's world Automatic systems are being preferred over manual system. With the rapid increase in the number of users of internet over the past decade has made Internet a part and parcel of life, and IoT is the latest and emerging internet technology. Internet of things is a growing network of everyday object-from industrial machine to consumer goods that can share information and complete tasks while you are busy with other activities. Intelligent Home Automation system using IoT and smart devices is a system that uses computers or mobile devices to control basic home functions and features automatically through internet from anywhere around the world, an automated home is sometimes called a smart home. Smart device is an electronic device generally connected to other devices or networks via different protocols such as Bluetooth-NFC-WiFi-3G-etc. that can operate to some extent interactively and autonomously. Already existing buildings the implementation cost goes very high. In contrast, Wireless systems can be of great help for automation systems. With the advancement of wireless technologies such as Wi-Fi, cloud networks in the recent past, wireless systems are used every day and everywhere. In this project we present The proposed system is providing feature of IoT Based smart System including smart alarm clock which will automatically adjust the alarm time as per train schedule and accordingly other appliances (geezer), secondly switch timer that will sense the mobile charger and switch it off when mobile gets charged and smart fridge which will detect the daily needs (eggs, Milk) stored in it and if it gets finished then it will automatically send message to the grocery shop. Also the system consisting of nodes which consists of light dimmer, temperature sensor and motion sensor. All this smart devices and WSN nodes are connected via WIFI module to a centralized server. A Raspberry pi will be used as central server which is connected to the internet. API is used for getting live train status for smart clock. Smart fridge uses pressure and temperature sensor for gathering information of daily needs and send a message using free web services. This whole system can be controlled by a web browser of mobile phone or laptop and it can also be controlled from anywhere in the world via internet. The smart control system embraces the functions of appliance monitor, control and management, home security, energy statistics and analysis

II. LITERATURE REVIEW

Sirsath N. S, proposed a Home Automation system that employs the integration of multi-touch mobile devices, cloud networking, wireless communication, and power-line communication to provide the user with remote control of various

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lights and appliances within their home. This system uses a consolidation of a mobile phone application, handheld wireless remote, and PC based program to provide a means of user interface to the consumer [1].

Basil Hamed, described the design and implement a control and monitor system for smart house. Smart house system consists of many systems that controlled by LabVIEW software as the main controlling system in the paper. Also, the smart house system was supported by remote control system as a sub controlling system. The system also is connected to the internet to monitor and control the house equipment's from anywhere in the world using LabVIEW [2].

Deepali Javale, presents assist to handicapped/old aged people. It gives basic idea of how to control various home appliances and provide a security using Android phone/tab. The design consists of Android phone with home automation application, Arduino Mega ADK. User can interact with the android phone and send control signal to the Arduino ADK which in turn will control other embedded devices/sensors [3].

Mohammad El-Basioni, proposed a new design for the smart home using the wireless sensor network and the biometric technologies. The system employs the biometric in the authentication for home entrance which enhances home security as well as easiness of home entering process. The structure of the system is described and the incorporated communications are analyzed, also estimation for the whole system cost is given which is something lacking in a lot of other smart home designs offers. WB-SH is designed to be capable of incorporating in a building automation system and it can be applied to offices, clinics, and other places. The paper ends with an imagination for the future of the smart home when employs the biometric technology in a larger and more comprehensive form. The paper ends with an imagination for the future of the smart home when employs the biometric technology in a larger and more comprehensive form [4].

III. PROJECT OVERVIEW

The project overview is shown in figure 1. The present paper describes the development of WSN based Intelligent home using Smart Devices.

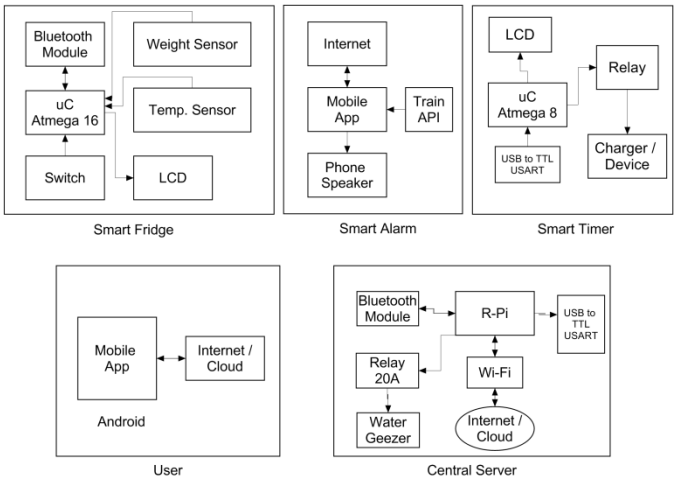

Figure1: Project overview

The system consist of five sections; smart fridge, smart alarm, smart timer, central server and user mobile phone. The information is sent and received to and from central server through internet/cloud. An android application is developed for ease of remote controlling of system. As long as there is range present for internet, the system can be controlled from anywhere in globe. The wireless connection is implemented in order to reduce set up difficulty. Figure 2 represents the flow chart for the smart fridge node.

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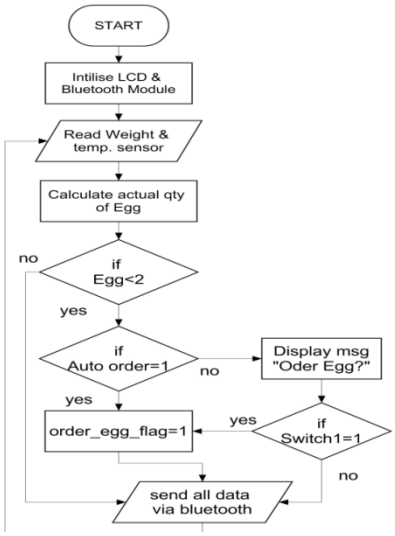

Figure2: Smart fridge node

The system consists of various sensors, transceivers, microcontroller and Raspberry Pi module through which all system is controlled.

Smart fridge:

The smart fridge system detects the actual quantity and availability of daily needed grocery in the fridge and displays the quantity of present grocery (Eggs and Milk) in the fridge on LCD display. Figure2 shows the load cell placed inside the fridge.

Figure3: Weighing load cell

It warns to User when the quantity of Eggs or Milk goes below to a particular level on the LCD. When the auto mode is ON, the order is placed automatically through SMS (Short Message Service) to the Grocery Store for the daily need material.

Figure4: Push buttons to place order manually

When auto mode is OFF, then user can place order manually by pushing the buttons provide on fridge or by app, then system sends signal to central server and server send SMS to grocery shop. The manual switches are shown in figure4.

Hardware used:

The different sensors and hardware used in the system are as followed.

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Raspberry Pi 3:

The Raspberry Pi 3 Model B is the second generation Raspberry Pi. It replaced the original Raspberry Pi 2 Model B+ Compared to the Raspberry Pi 1 it has: A 1.2GHz quad-core ARM Cortex-A53 CPU, 1GB RAM. Like the Pi 1 Model B+, it also has: 4 USB ports, 40 GPIO pins, Full HDMI port, Ethernet port, Combined 3.5mm audio jack and composite video, Camera interface (CSI),Display interface (DSI),Micro SD card slot, Video Core IV 3D graphics core as well as inbuilt Bluetooth and Wi-Fi.

Figure5: Raspberry Pi 3

Load cell (weight sensor):

To measure the quantity of grocery in fridge load cell sensor is used. Load cell is one kind of electronic transducer which generate electrical signal depending on the force applied on it. YZC-131 load cell can measure up to 3Kg of weight. It has sensitivity of 2+-10% (mv/V), Input resistance 415+-15ohm and operating voltage of 10V DC. Figure3 shows the weighing sensor.

Temperature sensor:

In this paper LM35 is used for measurement of temperature.

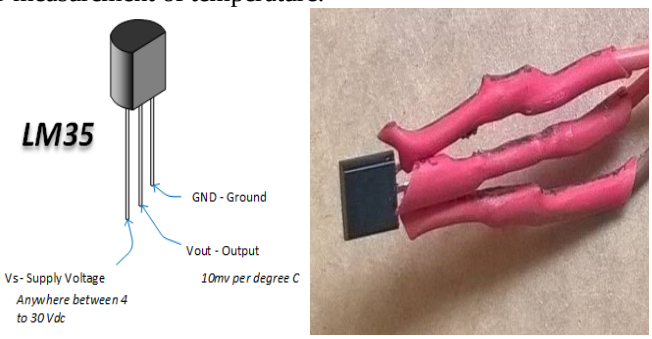

Figure7: Temperature sensor

Bluetooth module:

Bluetooth module is transceiver used for transmitting and/or receiving the data. There are various Bluetooth modules which act as either master and/or slave. Bluetooth module hc06 act as only slave but module hc05 act as both master and slave. It uses SPP (Serial Port Protocol) and used to set wireless serial connection setup. It transmits the values of each sensor to central computer through cp2012 module which is integrated USB transceiver. The data transmitted are stored into .csv (comma-separated values) format file for ease of access.

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Figure8: Bluetooth module

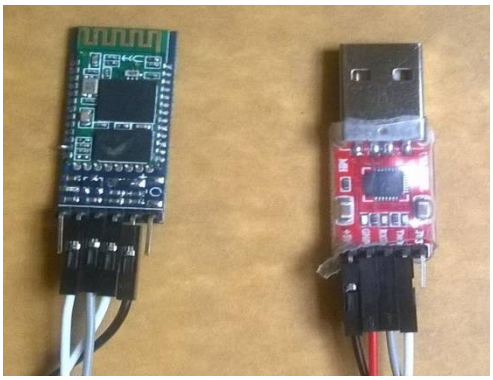

Figure9: cp2012 module

Figure8 represents master Bluetooth module while figure9 shows slave Bluetooth module with cp2102 module which are connected with pin-to-pin connector so as to transfer the data to central computer.

Relay:
A relay is device which uses electromagnetic induction to connect or disconnect a contact between two terminal, it's just same as our mechanical switch but in autonomous mode. we have use two relay ,one for smart timer and another for geezer. the first relay is GOODSKY GU-SH-112D relay. It is SPDT relay operating at 12V DC. It can bear 30A current for 240VAC.this will be sufficient current for geezer. Other relay is 5V SPDT relay having rating of 10A for 240VAC.

Figure10: relay switch

Software used:
The following software supports have been taken for the system.
a) Python Scripting: Python scripting language is opencv. Python scripting used for fingerprint reader access, fingerprint authentication & recognition.
b) Android Studio: Used for GUI creation of android app.
c) PHP V.5.3: PHP is a programming language used in server design. This plays important role of SMS sending.
d) Open shift cloud software: Open shift cloud software is platform for service cloud. Server code needs to host somewhere therefore open shift cloud is used to host.

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V. EXPERIMENTATION WORK

The prototype model is prepared by integration of sensors, transceivers and Raspberry Pi. Figure10 shows the experimentation set up.

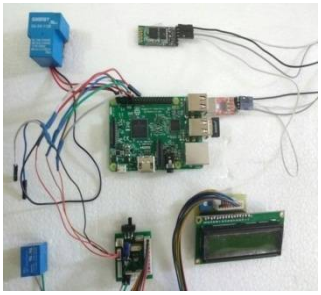

Figure11: Server

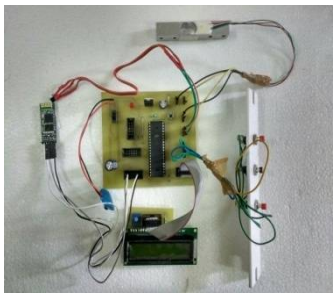

Figure12: Smart fridge

Figure11 consist of raspberry pi and smart timer node. ATmega 8 is used in smart timer, ATmega8 and raspberry pi communicate with each other using USART protocol. A 16x2 LCD display is connoted to the microcontroller in 4 bit mode. The display is used for value of set time and remaining time of timer. SPDT (Single pole Double Throw) relay act as a mechanical switch for turning ON/OFF of ac power supply. A Bluetooth module is connected to the R-Pi using USB to TTL converter. Another SPDT relay is used for turning ON/OFF the geezer.
Figure12 represents the circuit of smart fridge, which uses ATmega 16 microcontroller and connected to R-Pi using Bluetooth module. Push buttons are used for placing the order manually.

The proteus simulation is shown in Figure 13, which representation the working simulation of experimentation.

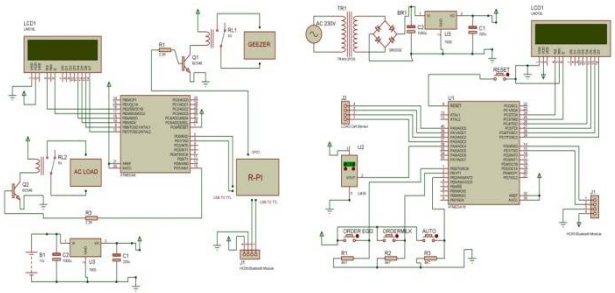

Figure13: Protus Simulation of system

VI. RESULTS AND DISCUSSION

The experimentation is carried out and the following results have been obtained. When the quantity of eggs drops below minimum level, then automatic SMS has been sent to grocery with order details. Figure15 shows the SMS sent by the system

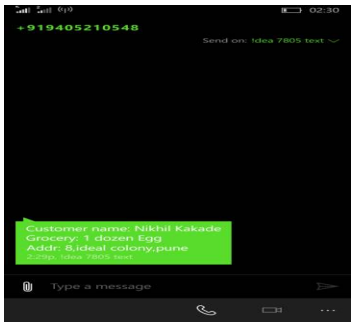

Figure15: SMS sent by the system to the grocery shop

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The user can also place the order of grocery from the android app, as well as he can check the present status of grocery present in the fridge. Figure16 shows the screenshot of android application developed with android studio software.

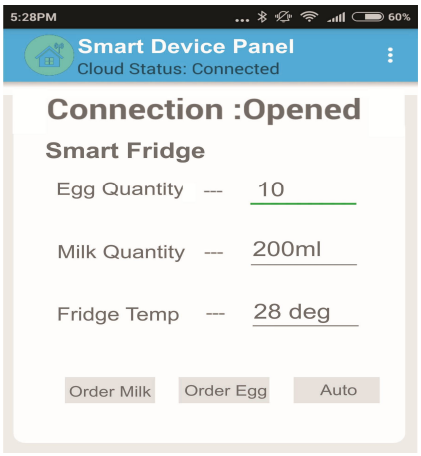

Figure16: Android app

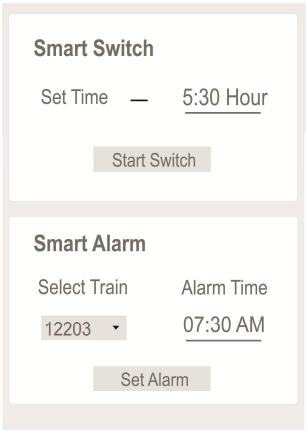

Figure17: Smart Alarm

Figure17 represents the screenshot of setting of smart switch and smart alarm. In smart switch section, when the power supply is disconnected from device when the set time is over. In smart alarm section user can select the train number and the system will automatically check the live train status and accordingly adjust alarm time. The geezer switch will get ON automatically prior 5 minutes of alarm ring.

VII. CONCLUSION

Home networking and architecture design are very important for a smart home automation system. The interfacing of sensors and microcontroller with raspberry pi is successfully simulated and tested for all smart nodes along with feature of remote controlling using Android application. With successful design and testing of hardware, this project proves to be very useful in daily home management with increased smartness with usage of smart devices.

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BIOGRAPHY

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