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IOT Based Smart Home

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Abstract: *Internet of Things (IOT) is network in which physical objects are connected to embedded electronic devices and data is shared and transferred using network connectivity. Internet of things has been used in many applications from last few decades which have made remote monitoring and control of any plant or system easier. In India from last few years a new campaign has been started that is “Smart Cities”.*

Development of smart cities has become the goal of government and infrastructure authorities. While developing a smart city the main aim is to ease life of a citizen by providing facilities for education, transportation, and most importantly “Smart Homes”.

A smart city includes smart home as an integral part.

IOT based Smart Home System is a smart way to handle various physical objects from remote distance. It is automation of Home, Home security and Household activities. It may includes centralized monitoring and control of Lightning of entire home, Home appliances, Accidental prevention (Gas leakage, Fire, etc.). Smart Home provides a convenient, comfortable, energy efficient and secure system. The aim of our project is to develop a Smart home monitoring and control system using techniques based on Internet of things.

I. INTRODUCTION

Currently almost all the public is having their own wish of having a smart home. All the peoples are busy nowadays and the schedule is outside the home for many hours a day. In order to protect and have a overlook at their home, a smart home automation system is being implemented.

Various kinds of sensors will be implemented in the owners home. These sensors will be converting analog data into digital data. This digital data will be given to the Personal Computer through Ethernet. Further the data will be uploaded on the cloud server and through the cloud computing the data will be directly send to the owner’s mobile phone via a message service.

The owner of smart home can check the data from any location. While being not at home the owner can check data like temperature at home, leakage of lpg gas, water level or motion in the home during their absence etc. The result will be smart home automation and security and privacy of the home will be maintained.

II. LITERATURE SURVEY

The Internet of things (IOT) is the internetworking of the physical devices, vehicles also referred to as “connected devices” and “smart devices”, buildings and other items-embedded with electronics, software, sensors, actuators and network connectivity that enables these objects to collect and exchange data.

The concept of a network of smart devices was discussed as early as 1982, with a modified coke machine at Cornegie Mellon University becoming the first Internet

connected appliance, able to report its inventory and whether newly loaded drinks were cold. As of 2016, the vision of the internet of things has evolved due to a convergence of multiple technologies including wireless communication, real time analytics, machine learning, commodity sensors and embedded systems. This means that traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation) and other all contribute to Internet of things.

A Smart city is an urban development vision to integrate multiple information and communication technology (ICT) and Internet of things. The goal of building a smart city is to improve quality of life by using urban informatics and technology to improve the efficiency of services and meet resident’s needs. The sectors that have been developing smart cities include government services, transport and traffic management, energy, health care, water, innovative urban agriculture and waste management.

We have gone through few papers published in Engineering Journals which elaborate the application and use of Internet of things:

Reference [1]: Ethernet Theory of Operation, M. Simmons Microchip Technology Inc. elaborates the method to use Microchip’s Ethernet Controller.

Reference [2]: A Brief Tutorial on the PHY and MAC layers of the IEEE 802.11b Standard, Benjamin E. Henty, July 12, 2001 explains the PHY and MAC layers of Ethernet.

Reference [3]: Microcontroller Based Ethernet Embedded Systems, R. Demeter1 & R. Câmpeanu1 explain interfacing of AVR microcontroller and Microchip’s Ethernet of controller.

The smart home system based on internet of things can be an important step in developing smart city. The smart home system which we are developing as our project include few sensors along with Texas Instrument’s ARM CORTEX based microcontroller M4F core TM4C1294ENCPTDI for signal acquisition and conditioning. Further the controller is connected to the personal computer to control and monitor the data acquired by sensors.

The smart home system can be installed and used in all the buildings and homes. This is a energy efficient and cost effective method of control of home security and safety, including the lightening in the home, water flow from the taps, etc. A person i. e. the owner of home can monitor the conditions of home from a remote place as well.

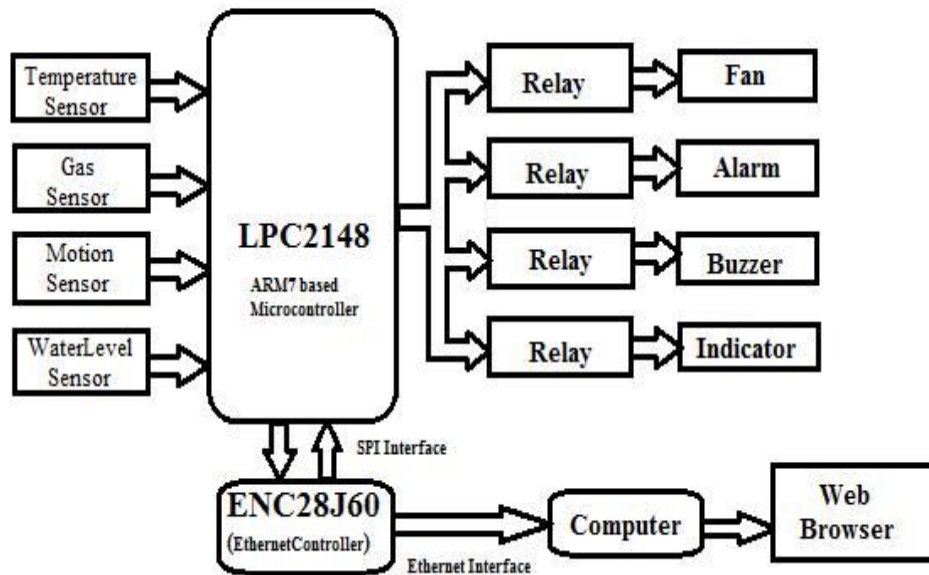


Fig: Block Diagram

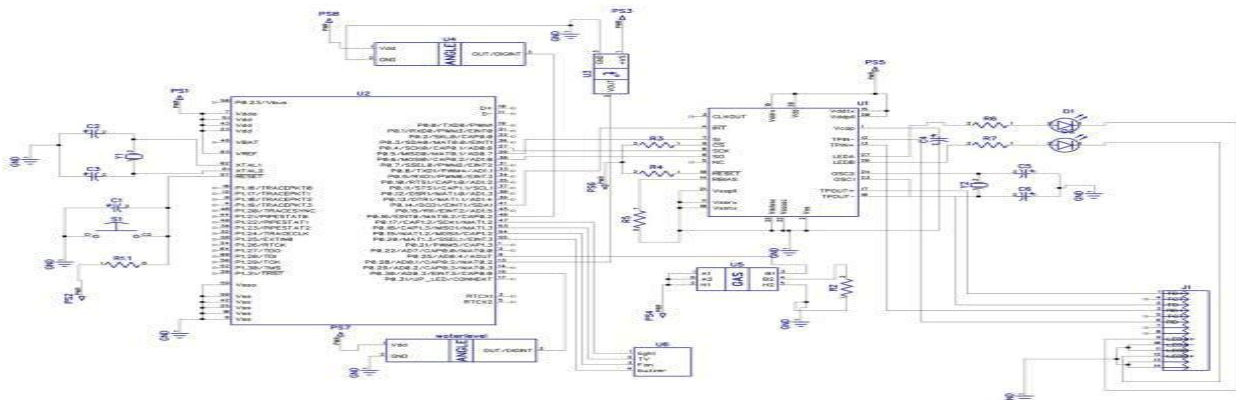


Fig: Circuit Diagram

III. PERFORMANCE ANALYSIS

This project is based on security and safety of home and its owner.

The performance analysis phase involves a deep initial research about the current scenario about home safety and a need for a better security system.

The first step is to study the requirements of the system and the availability of the required modules in the market to build the system successfully.

According to study and different requirements, we finalized to include a Ethernet medium that connects and works as an interface between the owner and the home. We can send and receive messages using cloud server.

We have included the motor and buzzer which is one of the main components of the proposed system.

We have also added the sensors that will provide us the precise condition of the home which can be viewed in real time.

The final module included in this system is the cloud server. The cloud server is a web server which stores data from pc and inform to the owner of home through a message on their phone.

After deciding to use these components we studied about software requirements and finalized to use μ -vision IDE for coding, Proteus Design Suite for preparing a general circuit diagram and Diptrace software for the preparation of PCB layout of final circuit of the system.

After finalizing these hardware and software requirements, we prepared general layout of the system, prepared a proper program for the system and successfully built the system with a proper combination of hardware and software that ensures a convenient security system for home.

Various steps involved in the execution process of the system are as follows:

Step 1: When the power is switched on, the system will wait for few seconds and sense the parameters by respective sensors used in system.

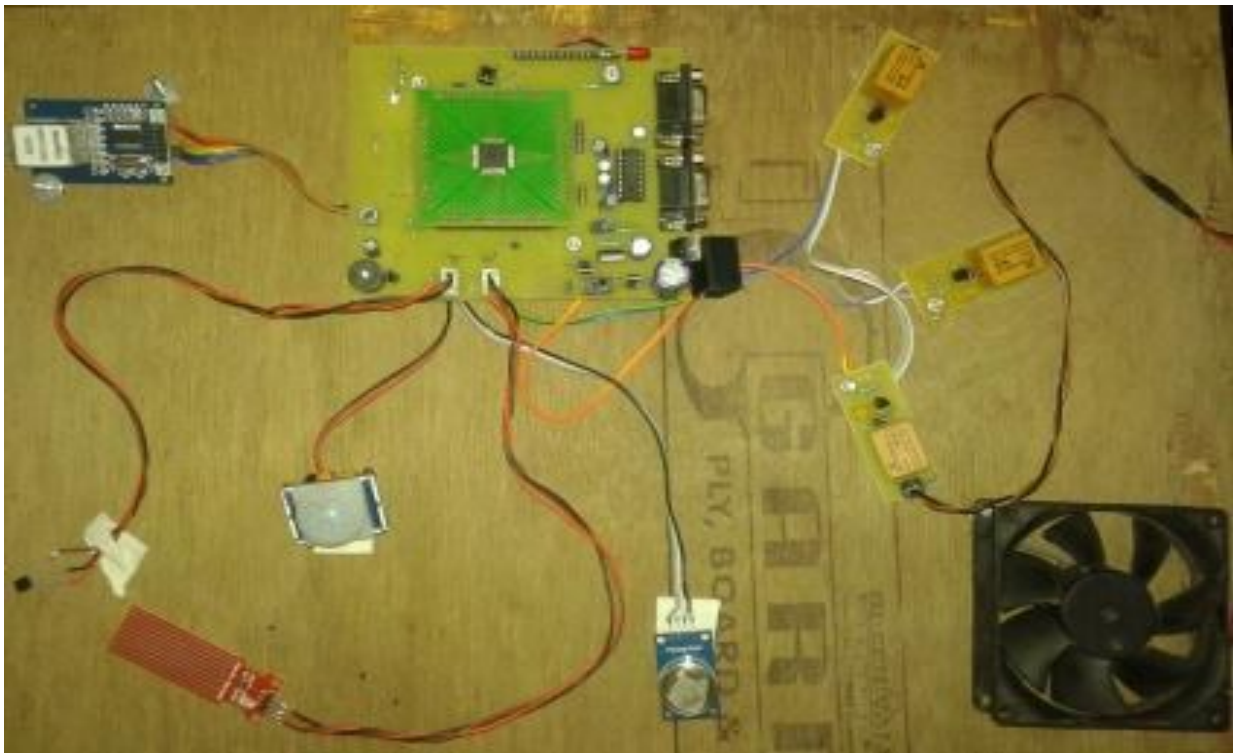


Fig: Actual Hardware

Step 2: The sensor will sense the temperature. If the temperature is above a threshold level, the relay circuit will make buzzer ON, and the fan will be switched ON. For gas sensor, if the leakage of gas will rise above a threshold level, the relay circuit will make the alarm ON

Step 3: The data from sensors will be interfaced to personal computer via Ethernet. An Ethernet controller (ENC28J60) is used for this purpose. This data will be accessed using a web browser.

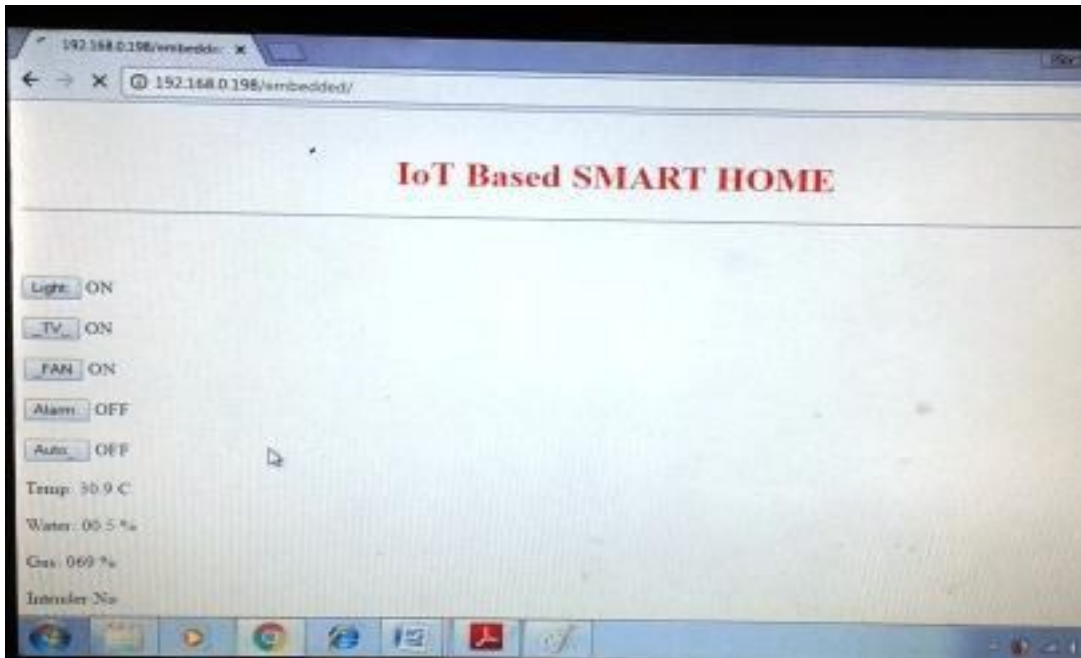


Fig: Web Browser

Step 4: The Owner can monitor the sensor data and control them using via web browser.

IV. ADVANTAGES, DISADVANTAGES AND APPLICATIONS

A. Advantages

- 1) Home security can be improved in response to the increasing number of accidents.
- 2) Managing all your home devices from one place.
- 3) Increased energy efficiency.
- 4) Improved appliance functionality and avoidance of accidents.
- 5) Prevention from thefts and robbery.

B. Disadvantages

- 1) There is a possibility that data sent to the owner could be interrupted sometimes due to internet access issues, but it can be solved by remaining connected to the internet.
- 2) Higher cost issues.
- 3) Internet security issues Applications :
- 4) This project can be used in homes for monitoring or controlling the devices in Home.
- 5) It can also be used in malls, hospitals and schools.
- 6) Security department like Police Department, Military Department etc for continuous monitoring of devices and appliances .

V. CONCLUSION

- A. In this project, we have proposed a novel method of smart homes and security systems used to monitor the home appliances.
- B. We can monitor the data of home devices from any location.
- C. With the help of gas sensor and smoke detector sensor, accidental conditions can be avoided which ensures security of the owner and home .
- D. The temperature sensor and water level sensors will provide low consumption of appliances as per power usage.
- E. This system can actually prove to be beneficial for all homes to ensure a better and reliable security system.



VI. FUTURE SCOPE

The project “Internet of Things based Smart Home” discussed here is just a small application of IOT. We are implementing smart home system monitoring temperature, water level and LPG leakage detection. We can extend this by adding home lightning control, energy efficiency monitoring, appliance control, smoke detector, etc.

The system can be connected to cloud based server from where it can be possible to inform the user via email and also inform the government rescue and security forces.

The project can be extended to Building automation and smart control.

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