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Towards the Implementation of IoT for Environmental Condition Monitoring in Homes

ADITHYAVARMA[1], Y.SRINIVAS[2]
[1]Assistant Professor, Dept of ECE, MLRITM, Hyderabad, India.
[2]PG Scholar, Dept of ECE, MLRITM, Hyderabad, India.

Abstract: In this paper, we have reported an effective implementation of monitoring regular domestic conditions by means of low cost ubiquitous sensing system. The description about the integrated network architecture and the interconnecting mechanisms for the reliable measurement of parameters by smart sensors and transmission of data via zigbee is being presented. The longitudinal learning system was able to provide a self-control mechanism for better operation of the devices in monitoring stage. The framework of the monitoring system is based on a combination of pervasive distributed sensing units, information system for data aggregation, and reasoning and context awareness. Results are encouraging as the reliability of sensing information transmission through the proposed integrated network architecture is 97%. The prototype was tested to generate real-time graphical information rather than a test bed scenario. In this project the microcontroller interfaces with humidity sensor, temperature sensor, LDR sensor and zigbee module. The microcontrollers take data from these sensors and send it receiver part through zigbee wireless communication. Using that data the controller control the home appliances. In receiver side the data can be monitor through PC.

Keywords: LDR Sensor, Zigbee, Microcontroller, IoT**.**

I. INTROCUTION

The advancements in Internet technologies and Wireless Sensor Networks (WSN), a new trend in the era of ubiquity is being realized. Enormous increase in users of Internet and modifications on the internetworking technologies enable networking of everyday objects .Internet of Things (IoT) is all about physical items talking to each other, machine-to-machine communications and person-to-computer comm.-unications will be extended to things. Key technologies that will drive the future IoT will be related to Smart sensor technologies including WSN, Nanotechnology and Miniaturization. Humans usually inside their home interact with the environment settings like light, air, etc., and regulate accordingly. If the settings of the environment can be made to respond to human behaviour automatically, then there are several advantages. The automation of home settings to act according to the inhabitant requirements is termed as intelligent home automation system. Ambient intelligence responds to the behaviour of inhabitants in home and provides them with various facilities In general,intelligent home automation system consists of clusters of sensors, collecting different types of data, regarding the residents and utility consumption at home. Systems with computing capabilities analyze the assimilated data to recognize the activities of inhabitants or events. These can automate the domestic utilizations effectively and also can support the inhabitant by reducing the costs and improving the standard of living. In the recent past, several research activities were actively involved with IoT such as. Most of the research activities related to IoT are confined to management of resource constraint devices, and different mechanisms of interconnection.

The future cyber-age networked infrastructures of household appliances in homes are likely to be reliant on sensors embedded in/on the infrastructure. Such technologies will act as a catalyst to the evolution of a new generation of services that will have a great impact on the social and technological eco-system. According to it can be envisaged that the next generation systems and services will encompass several domains such as e-Governance, Health Care, Transportation, Waste Management, Food Supply Chains, and Energy & Utilities. New technologies and applications built on top of smart devices may fulfill the vision of Intelligent Infra structure. There are several examples of intelligent home automation or “Smart Home Monitoring” in research labs around the world, such as the Gator Tech Smart House, Casas Smart Home, iDorm , Georgia Tech Aware Home Place Lab etc. To date, there has been no complete development of a monitoring smart home of commercial perspective, norany investigation into how such a house is perceived by either the inhabitants or their careers.

The smart homes designed so far are for different purposes such as information collection and decision support system for the wellbeing of the inhabitants storing and retrieving of multimedia data and surveillance, where the data is captured from the environment and processed to obtain information that can help to raise alarms, in order to protect the home and the inhabitants from systems for wellness determination of inhabitants

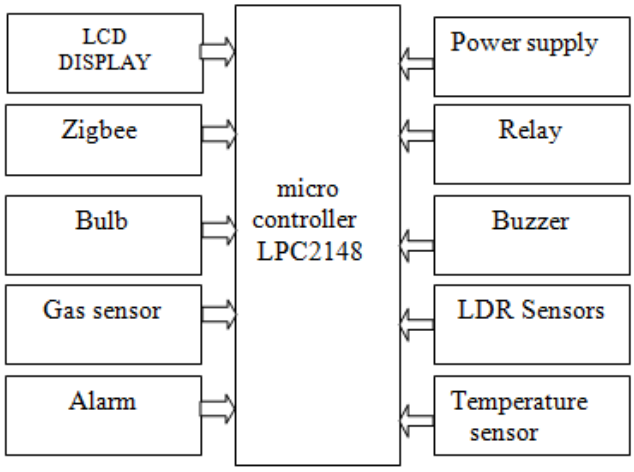

Fig1. Block Diagram of IOT.

A. Existing Method

In previous we are normally control the home appliances through switches. But that is difficult for elder people and not comfort for all. And in this the power consumption also high. To overcome these problems through the proposed system

II. PROPOSED METHOD

The main Aim of the paper In this paper, we have reported an effective implementation of monitoring regular domestic conditions by means of low cost ubiquitous sensing system. The description about the integrated network architecture and the interconnecting mechanisms for the reliable measurement of parameters by smart sensors and transmission of data via zigbee is being presented. The longitudinal learning system was able to provide a self-control mechanism for better operation of the devices in monitoring stage. The remote measurement and controlling of domestic devices over the Internet can be mechanized by following certain network architectural design strategies and applying ZigBee communication standards. The data transmission of smart sensing devices augmented with ZigBee over the internet can be done by integrating an internet gateway with WSNZigBee network. In a ZigBee network, end devices collect and forward data to a coordinator and then ZigBee protocol data format is translated to Internet protocol (IPV6) format by the gateway. The home automation scheme proposed in this paper can distantly measure electrical parameters and control domestic objects. The unified system will assist the inhabitants to avoid multiple systems to monitor their domestic utilization. The system can be run with the help of an inhabitant favourite laptop or i-pad device. shows the basic layout depicting key elements of the integrated WSN with internet system. It consists of i) Smart Sensing devices, ii) IoT Gateway and iii) Internet Server.

A. ZigBee Wireless Sensor Network

The ZigBee WSN comprises of XBee-S2 modules built by Digi are configured as end devices sensor nodes and communicate wirelessly to a coordinator in the form of a mesh topology. If the end device is within the range of the coordinator device, the system runs like a star topology.Otherwise, hopping takes place and the outer most end device will send its data to the nearby router and consequently the data will reach to the coordinator.The coordinator is connected to a router with a wired serial connection. The router runs an open source embedded Linux OpenWRT software, providing networking functionality to connect the internet. This essentially provides internet access to the Xbee-S2 sensor data collected by the Xbee-S2 coordinator. Router acts as an IoT application gateway and interconnects the IPv6 and ZigBee network.A private IPv6 network using a Virtual Private Network VPN is used for connecting the IoT application gateway to the server. The server collects sensor data forwarded by the application gateway and store in a database for further processing and then to be viewed via a website. Data can be viewed in terms of previous day, week, and month time periods graphically .In the present setup, heterogeneous sensing units are designed and developed indigenously for intelligent home monitoring systems to integrate with IoT networks.

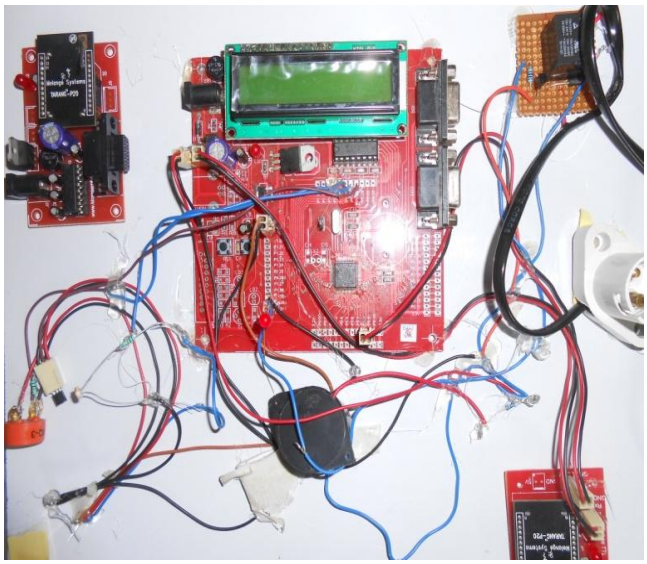

Fig2. System structure connecting different sensing.

1. Micrcontroller unit

The LPC21418 microcontroller is based on a 16/32 bit ARM7 TDMI-S CPU with real-time embedded trace support and emulation that combines the microcontroller with high speed embedded flash memory ranging from 32 kB to 512 kB. A 128-bit wide memory interface and its architecture enables 32-bit code execution at the maximum clock rate. For typical codes, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty. A serial communications interfaces ranging from a USB 2.0 Full Speed device, SPI, multiple UARTS, SSP to I2Cs and on-chip SRAM of 8 kB up to 40 kB, make these devices suitable for communication gateways and protocol converters , voice recognition and low end imaging ,soft modems.

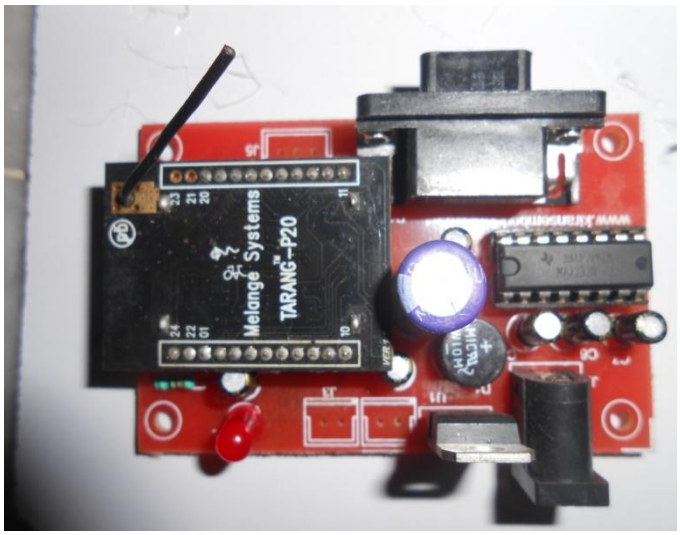

Fig3. ZigBee module

2. Address Transformation

The key element in the data transformation from ZigBee to IPV6 format is the address translation. This was implemented by the application gateway program for determining the source or destination address of a packet that encapsulates a ZigBee packets' payload. The corresponding application gateway performs the address transformation mechanism for ZigBee to address non ZigBee nodes. ZigBee is based upon the 802.14.5 protocol which uses a 64 bit address for each node on a PAN,and 16 bits to identify the PAN ID. IPv6 uses 128 bits to address a node on the network, of which 48 bits represent the network, 16 bits represent the local network and 64 bits represent the host id sensor node Therefore, the node address for 802.15.4 can placed in an IPv6 address, and the PAN ID can be used to identify the ZigBee network in an IPv6 address.

3.Liquid Crystal Display

Which do not emit light directly. This display is used to view the operations of things.

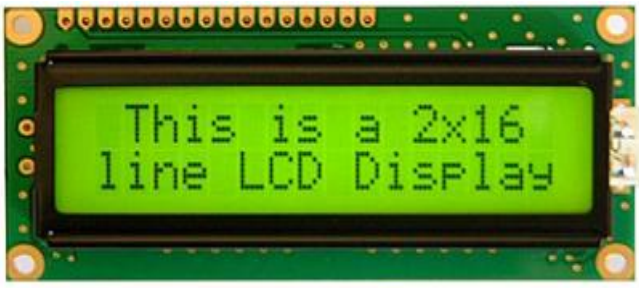

Fig4. Display unit.

4. LDRs

Two LDRs (light dependent resistors) are used in place of temperature sensors to track the light and its units are sent to motor via microcontroller and LDRs are present on the solar panel. Shown in fig5.

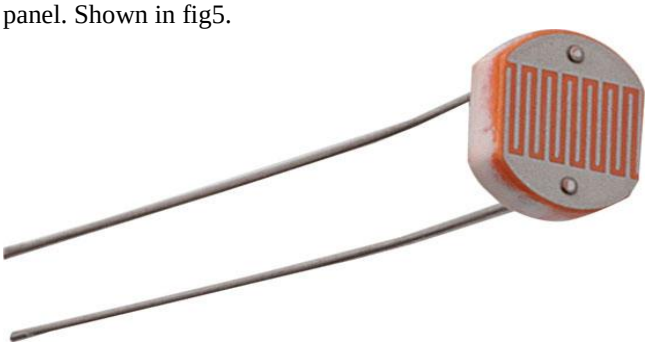

Fig5 LDRs.

5. MQ-2 GASSENSOR

It can detect: LPG, i-butane, propane, methane, alcohol, Hydrogen, smoke accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range.

Fig6. MQ-2 Gas Sensor.

Description: MQ-2 Semiconductor Sensor for Combustible Gas Sensitive material of MQ-2 gas sensor is SnO2, which with lower conductivity in clean air. When the target combustible gas exist, The sensors conductivity is more higher along with the gas concentration rising. Please use simple electro circuit, Convert change of conductivity to correspond output signal of gas concentration. MQ-2 gas sensor has high sensitivity to LPG, Propane and Hydrogen, also could be used to Methane and other combustible steam, it is with low cost and suitable for different application

LM35: The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of

±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range.

Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 μA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range.

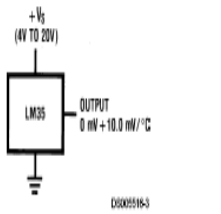

FIGURE 1. Basic Centigrade Temperature Sensor (+2°C to +150°C)

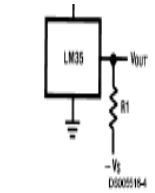

FIGURE 2. Full-Range Centigrade Temperature Sensor

Fig5. Basic Centigrade Temperature Sensor.

Fig6. Communication module.

IV. CONCLUSION AND FUTURE SCOPE

This paper mainly focused on the process of with the advancements in Internet technologies and Wireless Sensor Networks WSN, a new trend in the era of ubiquity is being realized. Enormous increase in users of Internet and modifications on the internetworking technologies enable networking of everyday objects "Internet of Things IoT" is all about physical items talking to each other, machine to machine communications and person to computer communications will be extended to things. Key technologies that will drive the future IoT will be related to Smart sensor technologies including WSN, Nanotechnology and Miniaturization. Humans usually inside their home interact with the environment settings like light, air, etc., and regulate accordingly. If the settings of the environment can be made to respond to human behavior automatically, then there are several advantages. The automation of home settings to act according to the inhabitant requirements is termed as intelligent home automation system. Ambient intelligence responds to the behavior of inhabitants in home and provides them with various facilities.

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Author's Profile:

Adithyavarma M.Tech
Assistant Professor,
Dept. of ECE,
MLRITM,

Y Srinivas,
Pursuing M.Tech
Dept. of ECE.
MLRITM.