Ubiquitous computing: Study for Smart Industry and Real Time Monitoring of Industries Using IOT

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Abstract— **In this paper we have studied and developed a model to make industries as smart. First and foremost by using this model we can monitor industrial parameters such as temperature, pressure, oil level in the real time environment. We have given idea about how to utilize the sensors in different industry environment by implementing new applications like employee health monitoring, wastage monitoring within the industry environment. And also we studied about making sensors for industries and how to the sensors from other areas to industries.**

Keywords-ubiquitous computing,wireless sensor network,zigbee,

I. INTRODUCTION

A. *Ubiquitous Computing*

Ubiquitous computing or pervasive computing is a paradigm shift where technology becomes virtually invisible in our lives. We can embed the devices using pervasive computing technologies.

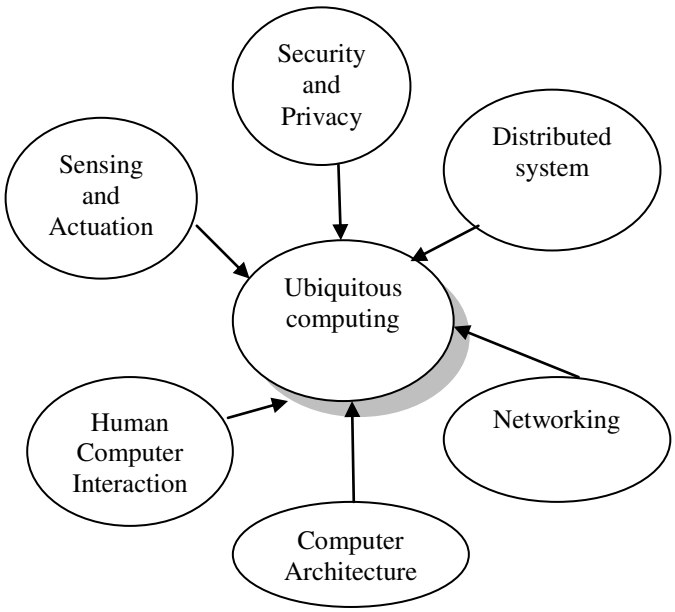

Figure 1: Ubiquitous computing

Ubiquitous computing provides accessing of data at anytime, anyplace in a consistent way. So that we can access data in some specific applications like monitoring of wastages, employee health monitoring, hazard places monitoring in industry environment [1].

B. *Pervasive systems*

Sensors in pervasive computing are deployed anywhere and on any objects or human bodies. They collect data including a user's location, motion, environment, temperature, biomedical information humidity. Service provision of a pervasive computing system relies on the sensitivity of an environment, supported by a range of Sensors. Sensing technologies depends on designing sensors with smaller size, lighter weight, lower cost, and longer battery life.

Sensors can thus be embedded in an environment and integrated into industry instruments and onto human bodies. Sensors in pervasive computing can capture a broad range of information on the following aspects;

Environment: humidity, temperature barometric pressure, light, usage of electricity, water, and gas;

Device: state of devices (available or busy), functions of devices (printing or photocopying), the size of memory, the resolution of screen, or even embedded operating systems;

User: location, schedule, motion data like acceleration of different parts of bodies, and biometrical data like heart rate and blood pressure;

Interaction: interacting with real objects through RFID and object motion sensors, and interacting with devices through virtual sensors like monitoring frequencies of a user using his keyboard and mouse [1].

II. WIRELESS SENSOR NETWORK

Wireless sensor network is a self healing network. By using sensors we can continuously monitoring the industrial parameters like pressure, temperature, and oil levels of tank in chemical industries. A wireless sensor network (WSN) is usually collected by a large number of small nodes each one having a processing unit, a radio transceiver and an antenna for wireless communication, one or more sensor units (e.g., temperature, movement), and a power unit usually equipped with a low capacity battery. Due to its limited power resources, batteries efficient power management (PM) mechanisms need to extend nodes' lifetime.

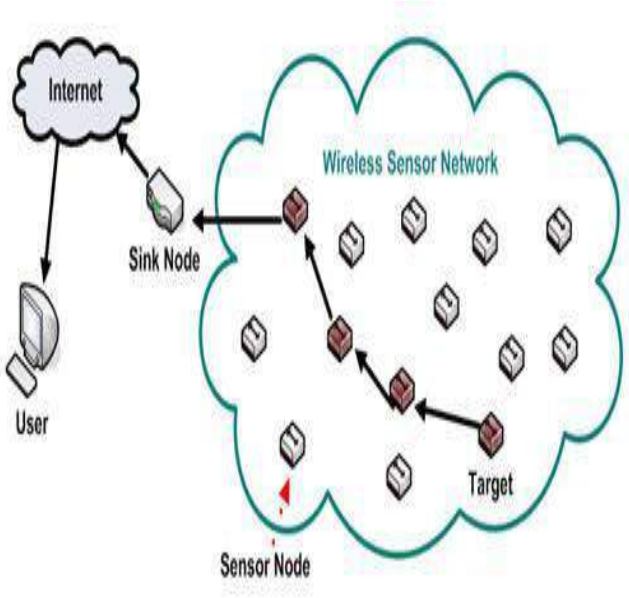

Figure 2: Wireless sensor Network

III ZIGBEE

Low power wireless sensor network. Operates in three different frequencies. There are three different types of zigbee devices, that are ZC (zigbee coordinator), ZR (zigbee router), and ZE (zigbee end device). The IEEE 802.15.4 standard defines the physical and MAC (Medium Access Control) layers.

The physical layer supports three frequency bands with different gross data rates: 2.450 MHz (250 kbs-1), 915 MHz (40 kbs-1) and 868 MHz (20 kbs-1). It also supports functionalities for channel selection, link quality estimation, energy measurement and clear channel assessment. ZigBee standardizes both the network and the application layer [2].

ZigBee is a short-distance, simple-structured, low power, and low-transmission rate wireless communications technology. It has a transmission range of 100 m and uses the free 900 MHz and 2.4 GHz transmission frequencies. The physical layer supports three frequency bands with different gross data rates: 2.450 MHz (250 kbs-1), 915 MHz (40 kbs-1) and 868 MHz (20 kbs-1). It also supports functionalities for channel selection, link quality estimation, energy measurement and clear channel assessment. ZigBee standardizes both the network and the application layer [3].

ZigBee is a short-distance, simple-structured, low power, and low-transmission rate wireless communications technology. It has a transmission range of 100 m and uses the free 900 MHz and 2.4 GHz transmission frequencies. In addition, due to the low transmission rate and small amount of data transmitted, the sending and receiving time is kept low. In non-work mode, ZigBee is placed in sleep mode. In the conversion time between work and sleep modes, only 15 ms are needed for normal sleep activation time and only 30 ms are needed in the equipment search time, making ZigBee fairly power-saving. The MAC level of ZigBee utilizes a talk-when-ready collision prevention mechanism: data is transmitted immediately when there is need, and each transmitted data packet is confirmed to be received by receiver and is responded to with a confirmation message; if a confirmation message is not received in response, then a collision has occurred and the data packet is transmitted again. This method greatly increases the reliability of the system's data transmission. In addition, a ZigBee network can include a maximum of 255 nodes, making it highly expandable.

IV PROPOSED SYSTEM

The proposed architecture shows a model for make smart industry and real time monitoring of industries using pervasive systems. The monitoring system presents the following three subsystems

1) data acquisition subsystem; 2) remote
server (RS) subsystem; and 3) supervisory control subsystem.

In the architecture explained about four specific applications like wastage monitoring, employee health monitoring, power monitoring within the industry environment. This proposed model gives idea about how to utilize the sensors in industries by efficient way.

Devices and sensors used for to make zigbee wireless sensor Network in industry environment are;

- Zigbee Transceiver
- Different sensor
- Gateway

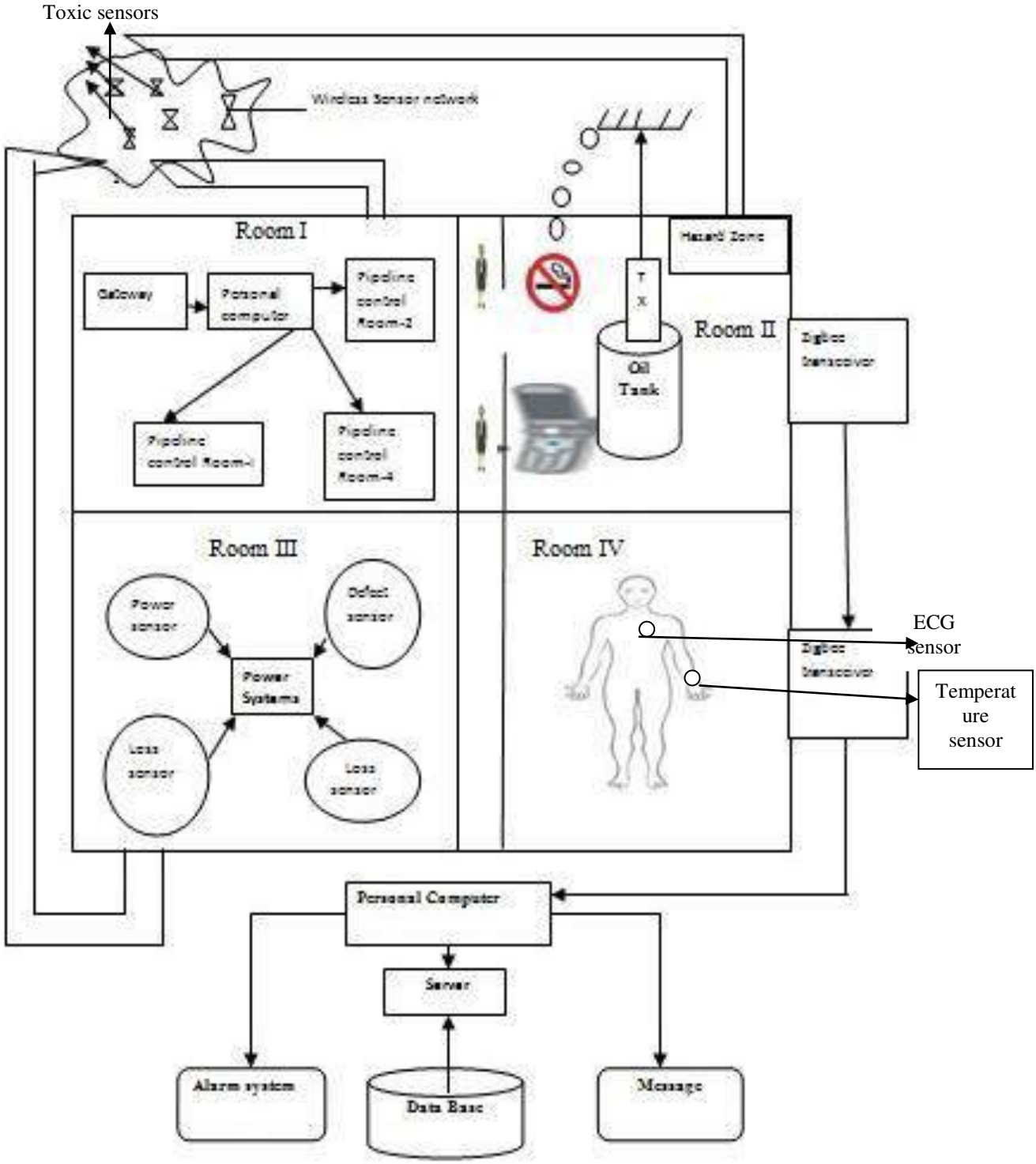

Figure 3: Smart industry

Devices used for to get sensor data from sensor network for further actions are;

- Personal computer
- Server
- Database
- Alarm system
- Mobile

The main aim of this architecture is to make industries as smart with sensors by using pervasive system.

A. *Wastage Monitoring Using Zigbee Wireless Sensor Network:*

In chemical industries, wastages are dumped in a particular location or dump site. Continued presence of chemical waste in large quantities at a particular spot can cause hazardous reactions. It can cause environmental hazards like soil erosion, water pollution, air pollution etc. Usually, chemical industries employ pipelining system for dumping the wastages to land. Environmental hazards can be prevented if a maintenance system is engaged to monitor the chemical waste disposal in industries.

We propose a monitoring system using Zigbee wireless sensor network. In our proposed system, we suggest the use of several dumpsites rather than a particular site. When chemical waste dumped in a particular site reaches the limit of maximum safely storable capacity, the system raises an alarm to indicate the need to change the dump site. The chemical waste stored in the dump site is recycled while; the other dump site is being used.

The toxic sensors in the Zigbee wireless sensor network, senses the data on the chemical waste being disposed; by continuous monitoring of the dumpsite. The sensed data include details on the toxic liquid or gas being disposed, the disposed amount etc. These details are sent to the Personal computer via a Gateway. A Gateway is the device which can be used to connect two networks of different protocols. In a communication network; a gateway is a network node equipped for interfacing with another network that uses different protocols and data formats. The chemical server is connected to a database which contains the minimum and maximum threshold value of the different toxic substances.

The alarm is raised to alert the different rooms that controls waste disposal, when the toxic material being disposed nears the maximum threshold value. The alarm system is triggered by the chemical server, and the alarm signal is sent through the ethernet connections to the different waste disposal control rooms.

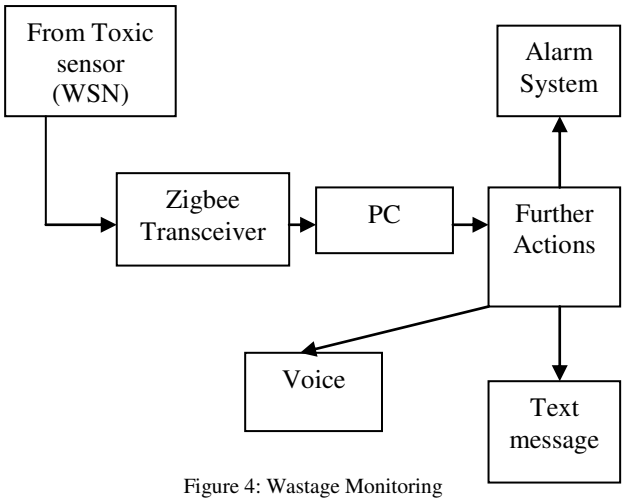

Figure 4: Wastage Monitoring

B. *Employee Health Monitoring:*

By using sensors we can make employee health monitoring system in the industries. Sometimes the employee may work continuously in the room of machinery. So their body temperature will rise. Due to this some problem may arise to the employee. By using temperature sensors we can monitor the employee's body temperature continuously in the industry environment. By fixing temperature, pressure and ECG sensors in employee body can be monitor their body condition while they are working in the industry. Serious patients may carry medical phone with radio transceiver with micro sensors for sensing body parameters such as blood pressure, body temperature.

By implementing wearable computing technique we can use medical watches to transmit sensing data. Medical watches are normally more cost effective and smaller than medical phones. It have much lower battery power than the Zigbee transceiver and can only relay their data through multihop route to other nodes (such as a nearby watch or receiver).

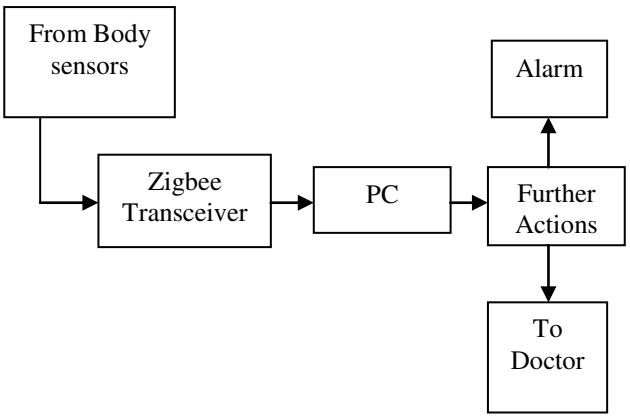

Figure 5: Employee monitoring

Figure 5: Employee Health Monitoring

C. *Power Room Monitoring:*

By using sensors we can monitor the power in industries. By deploying power loss sensors in and around the industry we can continuously monitor the power loss and all. If any fire accident occurs in the industry we can design the network automatically shut down the industry power system or can be stop the power where we want

Industrial automations which are mostly depend upon the power systems & which requires distance controlled and regulated systems. Mostly voltage and current equipped parameters along with power and energy management system forms the industrial scenario for automations. Wireless technology which meets to cost, speed and distance scenario will always be a point of an interest for research. In this research work we mainly monitored power related parameters and enable remote switching devices for proper power management systems using ZigBee. This paper proposes a digital system for condition monitoring, diagnosis, and supervisory control for electric systems parameters like voltage and current using wireless sensor networks (WSNs) based on ZigBee. Its main feature is its use of the ZigBee protocol as the communication medium between the transmitter and receiver modules. It illustrates that the new ZigBee standard performs well in industrial environments.

D. *Hazard Place Teller Device:*

By using sensor we can monitor the oil tanks and petroleum tanks continuously in the liquid field industries. Sometimes fire accident or some other accident occurs to employee due to proper information does not passes to the employee in correct time and real time.

For that we can design one device called hazardous place teller device, which is a basic zigbee transmitter. In that zigbee transmitter we can program according to our usage. When we connect proximity sensors near to the oil tanks whenever any Employee entering in that region it will detect that object. By Connecting zigbee transceiver we can transmit this information to personal computer which is in control room. By making alarm system or speech technique we can make sound in that region like DON'T SMOKE HERE'. So we can avoid fire accident in industries.

And also in chemical industries some hazardous chemical may be dumped in rooms. If employee smells or touch that chemicals he may be get injured. In that situation by using above pervasive system we can make alarm or send text to employee who entered in that region.

We wrote code to that device when any object comes near to the oil tank produce sound as "DON'T SMOKE HERE".

V. CONCLUSION

In this paper we have given idea about real time monitoring of industries and also given ideas about how to utilize the sensors in industries. We have given an idea for make industries as smart and hazard place teller device which gives hazard place indication by sensing the object when it enters to the hazardous region. Now we are working with MATLAB simulation for how to send the real time data efficiently.

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