

OPTIMIZATION OF RESOURCES WITH INTERNET OF THINGS(IOT) IN HEALTHCARE, MINING, TRANSPORTATION AND LOGISTICS INDUSTRY

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Abstract

Internet of Things is a future technology which connects every electronic device to each other over Internet to make a smart system of systems. Internet of things connect person-person, person-device, also device-device. This technology has wide area applications in industry, business, public administration and e-Governance. Every industry and business firm tries to develop their own IoT application to improve production of goods, services, customer satisfaction, safety of their employees and their storage areas. This paper discusses role of IoT in optimization of resources in health-care industry, mining industry, transportation and logistics industry, further it presents sense and control of hazards in mining by connecting all equipment and sensors over IoT system, in Automotive Industry, it is proposed that IoT system may collect data from user Automobile to improve the design of vehicles and can also be used for research purposes to improve efficiency, it can identify defective parts of the vehicle which needs to be replaced, in Transportation and Logistic Industry, it is proposed to use the GPS and RFID tag to track consignment and transport vehicle.

Keywords—IoT; Medication; RFID; WMS.

1. INTRODUCTION

Concept of “Internet of Things” came into existence in 1999. Internet of Things (IoT) can be simply defined as connection of all devices to the internet using any of the available technology (Wi-Fi, Bluetooth, Zigbee etc.) and then putting the information gathered through sensing equipment to coordinate and work in synchronization to realize an intelligent system. In other words, IoT refers to a new technology which joins all type of sensors and the internet. Internet of Things supports various sensors and input/output devices like microphone, camera, speaker, Bluetooth, display etc. depending upon the application it is being deployed for. A number of industrial IoT schemes have been directed in areas such as food processing industry, agriculture, environmental monitoring, security, surveillance etc.

The main component of medical Internet of Things is RFID [1] system. RFID automatically detects any still and moving bodies. Its main aim is to monitor and control entities via internet. The medical Internet of Things is a technology that embeds sensors in medical equipment, chains them with internet and integrates them with patients and hospital procedures. There is a rising awareness in using IoT technologies in many of applied industries. IoT with reference to Mining generally refers to put on monitoring apparatus in the mining processes (like mining, transport, machinery and ventilation) [2] to gain real time data in order to guarantee safety and efficiency in production. As gradually, more number of current and new

electromechanical equipment took into the mining production process, old-style general management must move to the fine management involving IoT. From the installation, selection, storage, inspection and operation of electromechanical equipment, the entire process wishes to be under full life-cycle management and has to be run in the "control" state which can be achieved with the help of integration of different processes. As the internet of things technology enlarges, the logistics data management can be achieved through the internet of things by associating RFID and GPS technology [3] which can resolve many problems in the grounds of logistics. This paper presents applications of IoT in Medical and Health industry, Mining Industry and Cargo transportation management system combining RFID, GPS and GPRS technologies ensuring the safety of cargo during transportation.

2. IoT IN MEDICAL AND HEALTH CARE INDUSTRY

Public demand for appropriate, low-cost, easily available and area specific expertise medical health care is growing day by day but resources are not increasing as fast as the demand, this has setup a challenge for government. This problem can be reduced with the help of technology, by bridging gaps between resources and needy. IoT can provide best medical assistance to patient, in minimum cost and shorter time. IoT can also help in production, delivery and tracing of the medication equipment. It can also be very useful in managing medical information like patient medical records, sample identification and infection identification.

With help of IoT a platform for health care can be constructed for critically ill patients through remote monitoring, this platform connect every medical equipment to collect data from the patient body and which can be transmitted to the experts.

2.1 Medical Material Management and Control

Medical material management can have IoT technology guided platform to monitor production, duplication and delivery of products like medications and medical equipment's. To stop medical product duplication RFID tags can be used, by mounting these tags inside the products we can identify any product at any point of time. These RFID tags are unique and difficult to replace, so we can easily separate the duplicate products from original products by just scanning there RFIDs. RFID tags can help in keeping track of product information. For example if all the medical information has been put on a public medical database which allow patients and hospitals to check their medications and equipment's tags, then counterfeit medications can easily be identified. IoT is also useful in tracing the medicines in real time by attaching RFID tag to the medicines. With the help of these tags hospital staff can identify and collect correlated data of medicine like name, batch, origin, delivery, storage etc. These information help in tracing the poor quality and expired medicines.

2.2 Medical Information Management

Hospital information management systems have become lingua franca of the hour; it mainly includes sample identification, patient or doctor identification, medical equipment and medical record identification. Patient information include medical history, medical examination reports, records of treatment and other details. These provides support to the doctor, in preparing treatment plan.

It avoids occurrence of wrong medication and intra venous injections. In case of any medical emergency the doctor has to attend multiple patients at the same time which may cause interchange of medical reports between two dissimilar patients which can mislead doctors and lead to improper treatment. So to avoid this situation, hospital can use RFID technology to quickly confirm the identity of patients and also their medical examination reports. IoT can support medication storage management, RFID tags will simplify the paper and manual records of storage. It can be used to avoid confusion in medicines name, formula and doses. RFID tags can find use in blood information management to reduce time in identification and examination report generation.

2.3 Telemedicine

Telemedicine is a new kind of medical service which is the combination of computer technology, communication technology, medical technology and multimedia technology, purposes to advance the diagnosis and medical support level, decrease health care cost, meet medical necessity of persons and build a patient centered service system to bring out continuous monitoring of critically patients. With the development of the remote technology, progressive sensors are able to communicate successfully to make a Body Sensor Network for the patient. Telemedicine Monitoring has also steadily focusing on improving people's way of life to providing lifesaving data [5].

2.4 Mobile Medical care

In the mobile medical and health care, only those medical device are employed which are portable and can easy connect wirelessly with the internet access devices like cellphone, computer, server etc.

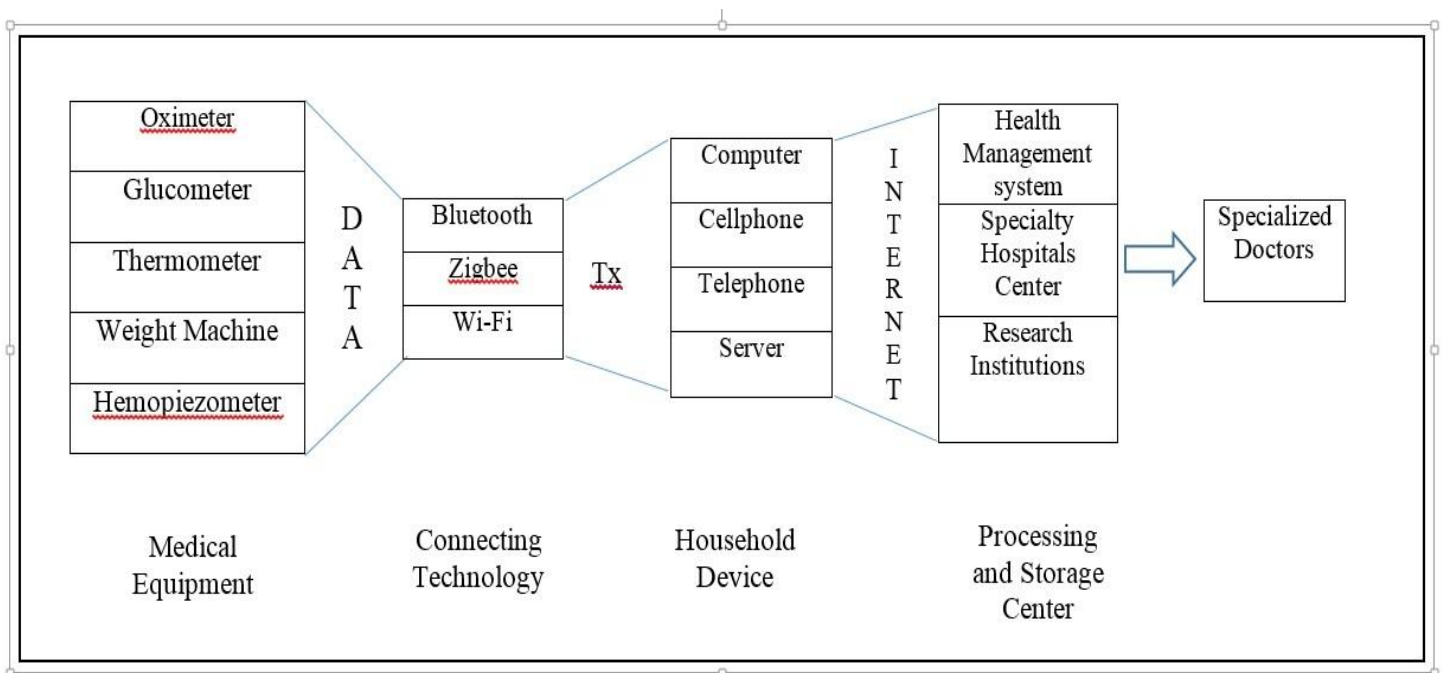


Fig 1. IoT embedded in Health Management System

These mobile devices collect medical data from human body and transmit the data stream through internet using Bluetooth, Wi-Fi, Zigbee technologies as shown in Figure 1. Through internet these data streams reach the medical health care centers and Research institution, where they are first processed and if the data analysis indicates infection then the information is transferred to expert level for further medication.

3. IoT IN MINING INDUSTRY

Mining industry contributes a lot to economy be it a under developed nation, developing nation or a developed nation. Most of countries in middle-east and Africa, earn their 90 % [6] of GDP through mining industry. Safety of workers as well as the mining equipment is the important factors for the industry, whenever any hazard occurs in mining field, it costs hundreds of life and millions of dollars for the industry. Now days, increase in number of modern equipment, typical mining environment and geological challenges makes the mining environment more complex. To solve this problem we need a perfect synchronization high up in management and maintenance of equipment's to uphold mining work. As compared to other production industries or factories the working condition of mining industries are very different, mining always happens deep down inside the earth surface that causes increase in temperature and ground gas leakage (like methane, CO₂). [7] Therefore, to function properly mine environment are maintained by the equipment those runs continuously. Any unexpected problem in those equipment can cause a series of hazards, we need an Integrated Automatic Control and Monitoring system that connect every equipment of mine, and also collect real time data from them. Internet of Thing technology in mine provides real time operational solution by synchronizing data from every equipment for automatic control and monitoring. Every equipment of mining industry has high safety and reliability measures, those are designed for complex environment and has high mobility. These equipment embed multiple sensors that produce the real time data for Integration Control and Monitoring system. In the Integrated Control and Monitoring system, real time data characterizes equipment description and condition. Staff can easily understand those data and use them to ensure life of equipment, calibrate maintenance cycle and identify inactive equipment. These data streams also stores data in data collection center for future reference, in case of any accident this data help the staff to find cause of accident and fill the gap in security and safety protocol.

Features of Integrated Control Monitoring System include

- i. This system has to first store the data which is provided by the manufacturer of equipment's.
- ii. It records data from equipment's when it is first installed under the supervision of engineers in the mining area.
- iii. The real time data is constantly collected by IoT system, from every functioning equipment of mine for the monitoring purposes.

- iv. Based on the real time data and pre-stored data, the system will calculate life time and maintenance time for every equipment [8].
- v. It generates alarm if any equipment becomes inactive and stops working.
- vi. This system reduces the human interfere to reduce the error which are sometimes cause of hazard.
- vii. This system automatically generates record for maintenance; helps the management to predict the next year maintenance and running cost [9] for industry.

4. IOT IN TRANSPORTATION AND LOGISTICS INDUSTRY

IoT benefits Logistic industry in number of ways, millions of shipment are required to be moved by machines, vehicles and peoples every day, that is the reason, why the logistic industry finds perfect binding with IoT. This technology connects every asset of logistics industry further it analyzes their data to optimize the resources available with the industry. IoT technology in industry will introduce many handheld scanners and multiple sensors that can monitor cargo in warehouse as well as in delivery trucks.

4.1 IoT in Warehouse

Warehouse is a central hub in the goods supply chain. Today's due to the competitive climate, only those logistic companies will survive which provide fast delivery, cost efficiency and better flexibility in warehousing for their customers. Which is not easy task. There are thousands of different form and types of goods stored in the warehouse, every area of the warehouse should be optimized to ensure the faster retrieval, process and delivery of goods. In the warehouse, RFID tagging can provide low cost identification system driven by IoT. Warehouse Management System (WMS) [10] will connect the wireless reader sensors (RFID reader) that capture transmitted data from each box that arrives through gate. Scanned data includes the information like volume and dimension of the good, sent to the WMS for processing. This will eliminate the time consuming task like manual counting and volume scanning of goods. The camera attached to the gate may also use to detect the damage in goods by scanning imperfections in their dimension and volume.

WMS can also provide real time data for inventory management that prevents situation like out-of stock. If any time any item get misplaced, the WMS sensors collect that data and alert the warehouse manager. To maintain the quality of goods the sensors monitors the environmental conditions for the items and alerts the WMS if any changes in the temperature and humidity occurs. WMS compares the data with the threshold value decided for every good and then alerts the warehouse manager. WMS also connects machines which use to load and unload cargo, if any machine get over busy or idle then it automatically distribute the work accordingly.

4.2 IoT in Frieght Transportation

Today it is possible to track any shipment and cargo containers in the middle of the Pacific Ocean. But that lag in providing inside information of cargo container. This leads to theft cost of billions of dollars every year to the companies, because it causes delay in inventory and cost of stolen goods. Location and condition monitoring through IoT can provide new level to transportation visibility and security. It provide clear visibility of goods meter by meter and second by second by using sensors inside the truck and multiple sensor tags inside the item, by constantly transmitting data on location and detection of possible theft by sensing the package has been opened or not. GPS and GPRS modules are used to collect and transmit the real time location of the cargo. GPRS module also connects to the other sensors that constantly transmit data which can be analyzed in base station of company. IoT can be used to monitor health and safety of the caring vehicles. If any problem generates in the vehicle then it alerts both driver and the company which help the management to give quick and accurate response. IoT generates an opportunity in fleet and asset management. The sensor of truck and container constantly monitor it functionality.

5. CONCLUSION

The Internet of Things (IoT) generates huge potential in applications related to Health care, Mining and Transportation industry. It can help hospitals to realize intelligent health treatment and management systems, which involve collection, storing, handling, transmitting and sharing medial information like equipment, medication and personal information within hospital, further IoT can evolve a management system for mining equipment's based on IoT and IT technologies, which can offer effective monitoring, health maintenance and evaluation of electromechanical equipment in the mine. IoT can be embedded in transportation industry by making their services more safe, intelligent and flexible.

ACKNOWLEDGMENT

The authors are very grateful to respected Mr. Aseem Chauhan, Chairman, Amity University Lucknow, and Maj. Gen. K.K. Ohri, AVSM (Retd.), Pro-VC, Amity University, Lucknow Uttar Pradesh, India, for providing excellent research infrastructure facilities in the University campus. Authors also pay their best regards to Wg. Cdr. (Dr.) Anil Kumar (Retd.), Director Amity School of Engineering & Technology, Amity University, Lucknow, Prof. O.P. Singh, HOD, ECE, Amity University, Lucknow for giving their motivational support and help to carry out the present research work.

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