BENEFICIATION OF INTERNET OF THINGS IN INDUSTRY

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ABSTRACT

IOT has recently become more relevant to the practical world largely because of the growth of mobile devices, embedded and ubiquitous communication, cloud computing and data analytics .Ubiquitous sensing enabled by Wireless Sensor Network (WSN) technologies cuts across many areas of modern day living Internet of Things (IoT) has provided a promising opportunity to build powerful industrial systems and applications by leveraging the growing ubiquity of RFID, wireless, mobile and sensor devices. A wide range of industrial IoT applications have been developed and deployed in recent years. Internet of Things demand:-A shared understanding of situation of its users and their appliances, Software architecture and pervasive communication networks to process and convey contextual information to where it is relevant, The analytics tool in the IOT that aim for autonomous and smart behavior.This study summaries the few industrial applications of" Internet Of Things".

Keywords:-IoT,Sensors,Industry

I. INTRODUCTION TO INTERNET OF THINGS

INTERNET OF THINGS:- The IOT [1]concept was coined by a member of the Radio Frequency Identification (RFID) development community, Kevin Ashton in 1999, and it has recently become more relevant to the practical world largely because of the growth of mobile devices, embedded and ubiquitous communication, cloud computing and data analytics. Ubiquitous sensing enabled by Wireless Sensor Network (WSN)[2] technologies cuts across many areas of modern day living. This offers the ability to measure, infer and understand environmental indicators, from delicate ecologies and natural resources to urban environments. The proliferation of these devices in a communicating–actuating network creates the Internet of Things (IoT), wherein sensors and actuators blend seamlessly with the environment around us, and the information is shared across platforms in order to develop a common operating picture (COP).

Internet of Things demand:-

1) A shared understanding of situation of its users and their appliances.

2) Software architecture and pervasive communication networks to process and convey contextual information to where it is relevant.

3) The analytics tool in the IOT that aim for autonomous and smart behavior.

In the term Internet Of Things ,the **'Things'** are active participants in business, information and social processes where they are enabled to interact and communicate among themselves and with the environment by exchanging data and information sensed about the environment,while reacting autonomously to the real/physical world events and influencing it by running processes that trigger actions and create services with or without direct human intervention. Examples of "Things" include: -

1) People;

2) Location (of objects);

3) Time Information (of objects);

4) Condition (of objects).

These "things" of the real world shall seamlessly integrate into the virtual world, enabling anytime, anywhere connectivity. There are a few examples of how the Internet of Things could change our daily lives:-

1) Smoke Alarm:- You've had your friends over for a dinner party, and of course set the mood with a few candles around the living room. A few too many wines later, your guests have left, and you're off to bed. One of the candles flickers onto the curtains and they go up in flames. The smoke sets off your smoke alarm but you're a heavy sleeper to begin with, and

that third glass of wine means you're not hearing the alarm. Never fear, your smoke alarm sends out a message to the motion detectors throughout your house. They notice the alarm is going off, but there is no movement in the house. They send a message back to the smoke detector, which sends a signal to the local fire bridge, and out they come!

2) Sleep cycle monitor:- Your bed has an in-built sleep cycle monitor. Your new neighbours decided Thursday night was a great time to have a housewarming and play some obnoxious music until 3am. Your sleep was heavily interrupted. Your bed tells your alarm to give you an extra hour of sleep. Your alarm checks your schedule to see if you have any appointments first thing in the morning. You don't, so it lets you sleep.

3) Door lock:- You just walked out the door without your keys in your pocket. *Beep Beep*. Your smart-door delays locking the door for 30 seconds because you just left without your keys, giving you the chance to duck back inside if need be.

4) Shopping trolley:- You're walking down the supermarket aisle, and you get to the milk fridge. Your shopping trolley vibrates, and the screen mounted on the trolley handles displays a message: "There is no milk in your fridge. Would you like to purchase some?"Your fridge has identified that the teenager residing in your house has drunk the 2L milk bottle you bought 2 days ago. The fridge has sent a message to your phone. Your phone knows that you're in the supermarket and has told your trolley. Your trolley knows you're next to the milk fridge and has told you that you're out of milk. So, you buy milk.

5) Healthcare:- You've got a family history of heart disease. So much so that your GP recommends that you get an unobtrusive, internal heart monitor implanted into your arm. It's inserted with a larger-than-you'd-like needle, and is powered by your body's own thermal energy. It constantly monitors your heart rhythm and detects even the smallest arrhythmias. Any alarming changes and it sends a text message to your phone: "This is your heart. Please proceed to a hospital immediately."The Internet of Things is great for consumers and it is most easily understood by examples of how it will affect us as individuals; however, business & government will also be greatly improved by the Internet of Things.

II. Applications of IOT in various industries[3]

1)Food Industry:-In order to maintain food sustainability, we require reliable food systems at each stage of the food cycle from food production and harvesting, during transport and distribution, at the shops we buy at and in the social settings wherever we consume food, and in the management of the resulting bio-waste outputs. Libelium's Waspmote sensors can be used to monitor and control the whole food cycle. Various areas where IOT has been used in food industry are as follow:-

1.1 Environmental Parameters:- The Waspmote Agriculture Board allows monitoring of multiple environmental parameters involving a wide range of applications, from growing development analysis to weather observation. For this, it has been provided with sensors for air and soil temperature and humidity, solar visible radiation, wind speed and direction, rainfall, atmospheric pressure, leaf wetness and fruit or trunk diameter.

1.2 Reduce Resourse Intensity & Labour Requirements:- The Waspmote Agriculture Board monitoring system can be used to reduce resource intensity and labour requirements on site during the food growth stage. Parameters for each crop can be defined in advance and crop cultivation systems automated based on sensor readings at crucial stages of the food production phase. For example, depending on soil humidity Waspmote can send a message (through the ZigBee network or by SMS) to automatically switch off watering or to change water supply, thus contributing towards efficient water management.

1.3 Food Production:- Food production by traditional means is already incorporating new technologies. As an example, residents can 'rent' a plot of land in a rural area and direct their crop cultivation from the Internet in the comfort of their own home. It allows them to share costs with the rest of the users. This is done by updating their Internet site which directs a rural farmer to plant and cultivate crops as requested by each individual crop 'renter'. But Waspmote takes this innovative business model to a more practical – and less resource intensive – level by using sensor networks to maintain monitoring capacity of crop cultivation throughout the production cycle.

1.4 Food Prevention:- By combining sensors such as humidity, temperature, and light, the risk of frost can be detected. Monitoring can ensure prevention of

possible plant diseases or manage watering requirements based on soil humidity. This helps to control conditions in nurseries and to closely monitor high performance or delicate crops, such as vineyards or tropical fruit, where the slightest change in climate can affect the final outcome.

1.5 Transportation & Product Tracebility:- Once ready for transportation, food may become damaged during transport and storage. The technology integrated in Waspmote (GPS, sensors and clock) makes it possible to control in real time what conditions the merchandise is in, where and when.Waspmote can detect and store environmental samples during the product's transport and know therefore whether it has been exposed to high temperatures, damp, or whether it has been contaminated during the journey, or whether the container was opened in an unauthorised fashion or even whether it has been dropped or suffered an impact. Using the GPS and GPRS/3G modules incorporated in Waspmote means food being transported can be located at all times, providing detailed information on its condition. This helps to improve product traceability, and to determine liability where applicable if it becomes spoiled during the logistics phase.

1.6 Public Food Safety:- Waspmote RFID[2] can be used to detect expired food or even to alert a client that a specific product contains food not suitable for him or her because of his or her allergies.
Throughout the food sustainability cycle, Waspmote can improve efficiencies, better inform consumers and reduce risks at each stage of the food cycle. From food production, to eating food and throwing out the garbage, Waspmote offer improvements for consumers to participate in the food cycle and for industry and civic authorities to enhance the use of increasingly limited resources and ensure food security for everyone.

2) Transportation Industry[4]**:-** IoT plays an important role in transportation. IoT is expected to offer promising solutions to transform transportation systems and automobile services. As vehicles have increasingly powerful sensing, networking, communication, and data processing capabilities, IoT technologies can be used to enhance these capabilities and share under-utilized resources among vehicles in the parking space or on the road. Various areas where IOT has been used in transportation industry are as follow:-

2.1 Real-Time Vehicle Tracking:- In automotive transportation, the traffic conditions today are monitored by cameras and motion sensors placed along major road junctions and highways. However, with road traffic growing and land space for road development restricted, these sensing technologies are reaching their limits in providing real-time traffic updates to ease road congestions.

2.2 Optimization for Logistics & Public Transportation:- Miovision's adaptive signal control system coordinates all traffic signals in a traffic control network based on real time demand. Using the power of cloud computing, video detection & wireless communication, Miovision quickly connects traffic intersections to optimize traffic flow in real time. Miovision traffic data solution provides transportation professionals with an end to end data collection and management platform.

2.3 Traffic Management:- There are shifting trends in the automotive industry to equip vehicles with dedicated short-range communication (DSRC) to provide vehicle-to-vehicle (V2V) communications to improve vehicle safety and provide better road visibility for traffic management. For instance, when there is a traffic jam, the first car may tell the cars behind if there is an accident, and this will eventually inform the intelligent navigation systems to re-route the path to another less crowded road. These cars can make breakdown calls when appropriate, collecting data about the surrounding infrastructures such as traffic lights and buildings, and about itself (such as the faulty parts in the vehicle and type of loads it is carrying) in the event of an emergency. Vehicles gradually become smart "things" which can react, based on real-time situations on the roads, and contribute to a safer traffic system.

2.4 Accident Avoidance Detection:- With the use of sensors placed within the vehicles, the application can warn the drivers of accidents or dangers that may lie ahead on the road. Consequently, it can alert and advise the driver on how to drive in such conditions like heavy rain, slippery roads etc. Sensors using infrared (IR) can help to detect the distance between each vehicle or the conditions of the road (e.g., rain levels and fallen debris), feeding the application with the information to alert drivers to avoid and steer clear of a potential accident site.

3) Oil & Gas Industry[5]**:-** Today's oil and gas industry is increasingly looking for new ways to enhance operations through improved industrial control data and expert collaboration. Wireless Refinery solution provides a converged, standards-based architecture for applications that monitor and gather data right down to the sensor level. The

resulting detail helps managers improve operational efficiency, create and adjust business processes, and comprehensively manage the refinery site. Various areas where IOT has been used in oil & gas industry are:-

3.1 Real Time visibility of control systems:- Wireless Refinery solutions allow real-time visibility and access to sensor-level information. This level of detail supports consistent, condition-based monitoring to assure high performance from equipment at all times. They also support comprehensively integrated on-site and remote operations, providing "eyes and ears" on remote sites to validate and resolve issues.

3.2 Forecasting:- Key to improving operational efficiency is managing the location of assets throughout the plant. By tagging equipment, vehicles, and containers with active RFID tags, workers can monitor their location to reduce loss and theft and to help ensure that assets are available when needed.

3.3 Safety Improvements:- People assets are also protected by an automated sensor-based system that monitors and alerts workers regarding their surroundings.

3.4 Environmental Conditions:- Along with a panic button, it provides alerts on environmental conditions, such as dangerous levels of gases or temperature variances.

3.5 Better Management of Resources:- Powerful visibility into every aspect of the refinery operation leads to faster decision making based on real-time information .Flexible implementation of advanced applications, and reduced time to deployment of devices, avoiding expensive cabling. Better management of resources and assets with the enablement of mobility applications over the wireless network.

4) Healthcare Industry[2]**:-** Using IoT in the healthcare service industry, IoT provides new opportunities to improve healthcare. Enabled by its global connectivity, all the healthcare related information can be collected, managed, and shared efficiently.

4.1 Self Monitoring:- In this a patient's heart rate can be collected by sensors from time to time and then sent to the doctor's office. By using the personal computing devices and mobile internet access the IoT-based healthcare services can be mobile and personalized. Such monitoring allows doctors to inform their patients of critical conditions before they happen and subsequently improves the quality of healthcare by untethering patients from tubes and wires.

4.2 Improved quality of life of patients:- Self-monitoring benefits patients by giving them greater freedom and independence in monitoring their health and frees up hospital equipment for the treatment of emergencies.

4.3 Disease Detection and Management:- Diseases can be detected with help of sensors and can be controlled before the critical condition occurs. FCC has also forecast savings of an average of US$12,000 per patient2 by decreasing hospital-acquired infections.

4.4 Medication for infected area:- There are newer trends of developing biodegradable materials for sensors and "lab-on-chip" equipment that can be implanted on or in patients. The sensor chips can detect internal organ responses to new medication and guide the application of drugs to infected areas for better treatment.

4.5 Therapy:- Therapy for a disease can be suggested according to disease detection and by measuring the extent of the disease.

4.6 Smart Pills:- Smart pills are essentially ingestible sensors that are swallowed and can record various physiological measures. They can also be used to confirm that a patient has taken his or her prescribed medication, and can measure the effects of the medication.

5) Retails Industry[6]**:-** In retail, businesses have problems identifying the right customer at the right time to sell them their products. Various areas where IOT has been used are:-

5.1 Accurate knowledge of customer or customer's need:- In this context-aware6 systems to anticipate customer needs and proactively serve the most appropriate products or services. For example, a male shopper, looking to buy business suits for a job interview, will be informed of exact store locations selling suits that match his body size, style and budget.

5.2 Maintaining history about products:- The use of RFID and near field communications (NCF) tags on packages, shelves and payment counters is being gradually adopted by businesses to enhance retail

experiences. Almost every phone will have RFID and NFC readers, meaning that eventually shoppers will no longer need to consult salespersons or floor readers to know the history of a product. They can simply scan the product tags using their mobile phones (or the shelves if the products are sold out).

5.3 Inventory Management:- Radio-frequency identification (RFID) is already widely in use in inventory and warehouse management systems. And in the near future it is likely to be extended with more connected services like smart shelves that send out signals when they are going empty. These signals will then automatically trigger replacements at the store level by communicating it all the way back into the supply chain.

5.4 Drive Business Intelligence:- We can increase efficiency and flexibility in operations and decrease costs — by making devices and systems more intelligent. Smart shelves, refrigerators and vending machines capture usage patterns, automatically request inventory replenishment, and update price labels in real time.

5.5 Increase agility:- Collecting and analyzing data gives you quick insight into consumer trends, so you can adjust product assortment in the stores, personalize service, implement dynamic pricing and optimize marketing campaigns. With the Internet of Things, you can spend less time wondering and more time taking action.

6) Manufacturing[7]:- In the case of manufacturing, high value production equipment has been heavily instrumented for some time in a closed, hard-wired network environment. Industrial standard sensors, controllers and networks are expensive and upgrade projects in existing facilities are not easy. The growth of IoT on the consumer side has driven cost reductions in sensors, controllers, and communications through high volume semiconductor manufacturing. However, industrial standard equipment is constrained by a huge installed base of legacy equipment and standards. Various areas in manufacturing where IOT has been used are:-

6.1 Factor Visibility:- IoT data and IP networks will connect what's happening on the factory floor to enterprise-based systems and decision makers. IoT will provide production line information to decision makers and improve factory efficiency. For example, a plant manager walking the production floor could also use IoT and visibility tools to access the efficiency of each machine, view production from any location, and reduce the time to decision and action.

6.2 Automation:- Once machinery and systems are connected within the plant, manufacturers can use this information to automate workflows to maintain and optimize production systems without human intervention. We can use IoT and IP Networks to connect everything within a plant and provide connectivity and information sharing across multiple locations and business networks.

6.3 Energy Management:- Certain IoT-enabled HVAC systems also offer integrated weather data and prediction analysis to help manufacturers understand expenses and plan energy usage. GE says efficiency improvements of 5% in a small industrial power plant generating 15MW can save over $200,000 on average per year.

6.4 Proactive maintenance:- In this if the manufacturer has equipment that's supposed to operate within a certain temperature range, the company can use sensors to actively monitor when it goes out of range and prevent malfunctions.

7) Coal Mining[8]**:-** The main purpose of coal mine automation system is to provide a comprehensive solution for customers so as to change the original coal mine production system, establish a monitoring system integrating multiple functions such as monitoring, equipment control and system detection, and to construct a monitoring platform, implementing effective monitoring of the operation of many electrical equipments.

7.1 Environmental Conditions:- Sensors of Internet of things in mine can collect data about humidity, temperature, gas concentration, power system state and crustal movement, etc. on the working surface, then it transmits the data to the host computer, which makes real-time display of the working state of the mine through the report, curve and 3D effect graph, etc. and immediately give corresponding warnings before the occurrence of accidents.

7.2 Tracking of Personnel:- The RFID reader in Internet of things is placed at the mine entrance and the main regions to comprehensively collecting information and mobile IDs of underground personnel. Its data is transmitted to the host computer through Ethernet and is stored in the database. Host PC can depict the distribution of underground personnel and track movement of the staff according to information obtained through RFID reader, and then draws corresponding statistical report forms. In this way, there is a clear grasp of the staff attendance,

quantity of staff in the mine and working situation of staff, avoiding sudden situation and loss of relevant information.

7.3 Warning of mine disaster:- To transmit information of seismic intensity, location and frequency to the host computer, use various networking sensor installed within the micro-seismic mining area. Technical personnel also may analyze all kinds of mining activities according to the data, and then investigate the potential threats and timely send out the warning signal in order to ensure the safe production of the mine.

7.4 Emergency rescue & disaster relief:- According to the monitoring data of sensor of Internet of things, taking account of the historical data, mine experts can make corresponding emergency plans after emergency. If there is an emergency, rescue workers can quickly determine the accident location, geological structure and the best route etc. in accordance with the requirements of the plan.

7.5 Maintenance of coal mine information:- In this we maintain the information about analysis of market coverage and coal quality, customer management, contract management, marketing management, human resource management etc.

8) Government[2]**:-** The various areas in which IOT has helped the government are:-

8.1 Crowd Control during Emergencies and Events:- The crowd control application will allow relevant government authorities to estimate the number of people gathering at event sites and determine if necessary actions need to be taken during an emergency. The application would be installed on mobile devices and users would need to agree to share their location data for the application to be effective. Using location-based technologies such as cellular, WiFi and GPS, the application will generate virtual "heat maps" of crowds. These maps can be combined with sensor information obtained from street cameras, motion sensors and officers on patrol to evaluate the impact of the crowded areas. Emergency vehicles can also be informed of the best possible routes to take, using information from real-time traffic sensor data, to avoid being stuck among the crowds.

8.2 Intelligent Lampposts:- The intelligent streetlamp is a network of streetlamps that are tied together in a WAN that can be controlled and monitored from a central point, by the city or a third party. It captures data such as ambient temperature, visibility, rain, GPS location and traffic density which can be fed into applications to manage road maintenance operations, traffic management and vicinity mapping. With the availability of such real-time data, government can respond quicker to changing environments to address citizen needs.

II. CONCLUSION

IoT integrates various devices equipped with sensing, identification, processing, communication, and networking capabilities. In particular, sensors and actuators are getting increasingly powerful, less expensive and smaller, which makes their use ubiquitous. Industries have strong interest in deploying IoT devices to develop industrial applications such as automated monitoring, control, management, and maintenance. Due to the rapid advances in technology and industrial infrastructure, IoT is expected to be widely applied to industries. This can help you innovate new processes and initiatives to increase your organization's business performance, and create customer delight with new products and services. In this we have explained about the Internet Of Things and various industrial applications.

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