INTERNET OF THINGS (IOT) BASED SMART GRID

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Abstract – The present research work is dedicated about the internet of things that has been risen as empowering innovation for the power grids and transformer health monitoring system (THMS) The work is based on the concept that whenever one grid station which transfers the power to consumers is cutoff due to some faults with the help of IOT based technologies we can connect all the loads connected to grid station with some other grid station so that power supplied does not get interrupted. This can be done by a particular software with the help of single click. The IOT performs the function and maintenance by using different type of sensors. The sensors are mainly used for both maintenance and theft prevention.

Key Words: IOT, THMS, grid station, faults, sensors

I. INTRODUCTION

Internet of things is the network that connects physical systems with embedded system to internet. To achieve high quality and reliability of the electricity, the maintenance and monitoring of electric power systems supplied to consumers is becoming the most important responsibilities in today's electrical power corporations. With the help of preventive maintenance technology, the consequent losses and the faults that occurs in electric power can be easily monitoring and reduced. The fault occurrence and consequent losses may lead damage to the equipment, and thus by increases the emergency equipment replacement costsIn the previous years, there have been a few critical advancements on observing innovations for dissemination of power cables. Generally, the mobile or robotic monitoring of electric power systems involves the following matters.

1) **Sensor fusion:** checking and monitoring the condition of power cables needs integration of stylish property-monitoring sensors not withstanding situating, material, and other sensors aimed to support the autonomy of machine or robot movement.
2) **Motion pattern:** the inspection robots used in electric power systems can be subdivided into external and internal. The external machines or robots mobile

over the outer surface of electrical components and may possess a high degree of autonomy whereas the internal units use inner spaces of ducts and pipes and are often used as track-following devices with a predetermined way, and a limited set of operations. The level of autonomy depends on the task. For example, routine inspection and maintenance require a high degree of autonomy for economic reasons.
3) **Power supply:** As we know the cable network is a global distributed concept, it is very restrictive for the inspecting based machines or robots to draw a power cord behind itself. Ideally, the power supply has to be wireless. It is desirable that the platform harvest energy from energized cables. The inductive coupling for a wireless power supply could be a desired method. It has been investigated for vehicles, batteries, microsystems, and numerous consumer applications. Although a low-frequency coupling is less efficient than a microwave mode, direct proximity to the power cable will make it a feasible choice. But the architecture requires an independent backup power source as well.

1.1 Control strategy

The control concept includes tracking of objects, collision avoidance, and stoppage of electrical short circuits. The control system accepts initiating commands from the operator for the different global jobs, and small tasks are often preprogrammed. The most important necessities are the following.

a) The control framework ought to be vigorous as a result of confounded movement prerequisite and the sporadic surface of the link associations.
b) The control system should comprise an efficient optimum algorithm used to locate the sensor array with respect to the inspected system, a path planning algorithm used for tracking the whole network or part of the network with the shortest path, and manage the arrangements adaptively switching operation of sensor from quick shallow investigation mode to a moderate point by point assessment mode.
c) The machine or robot needs significant computational resources to be more adaptive and flexible. This element is extremely problematic because of the machine or robot limited size, especially for underground applications. Accordingly, this strongly claims for the usage of communication and off board intelligence and also involves distribution between local and remote signal processing.

1.2 SMART GRIDS

Smart Grids is the advancement of traditional electrical grid. In traditional electrical grid the generation of energy is done in centralized power plants. It is an unidirectional communication . inorder to achieve high reliability in power systems the smart grids comes into picture. This system equipped with sustainable models of energy production distribution. The smart concept means deployment of technologies to make the system more and more dynamic. As for analysis IOT technology can change the electrical power hubs or grids into a new approach or we can simply the smart grids. It is not simple and easy to deploy IOT technology in existing problematic power grids. To encourage this organization of IOT-based frameworks in local situations, we propose IOT-network, a programmable, little scale matrix that can be effectively executed with low-control equipment with restricted preparing limit.
The proposed network receives moderately shoddy DC-DC converters which give high change productivity as well as oblige existing little scale DC control frameworks (e.g. sun powered boards). We at that point investigate the correspondence parts of IOT-matrix to be specific, control and checking capacities. We observe that processing delays of IOT devices have large impact on IOT-grid, which cause a chain of control commands to take considerable longer time as the number of commands increases. To mitigate this problem, we propose a mechanism based on sending burst commands with scheduled responses. Our experimental results will show that, in the presence of processing delays, this method can significantly reduce the overall response time.To make power systems more efficient and Information Technology enabled, it is very important to incorporate smart concept in Grid Stations. A Smart Grid is simply a combination of electrical and infrastructure using IT service within existing electrical network.

1.3 PROBLEM IDENTIFICATION

Energy generation companies supply electricity to all the households via intermediate controlled power transmission hubs known as Electricity Grid. Sometimes problems arise due to failure of the electricity grid leading to black out of an entire area which was getting supply from that particular grid. This research aims to solve this problem using IOT as the means of communication and also tackling various other issues which a smart system can deal with to avoid unnecessary losses to the Energy producers. Apart from monitoring the Grid it is very important to monitor energy consumption and even theft of electricity to make proper use of electricity. The amount of electricity consumed and the estimated cost of the usage needs to be updated on the webpage along with the Energy Grid information.

1.4 SENSORS

The sensors play a very dynamic role for IOT based projects or applications.
Sensors are modern gadgets that are fundamentally used to identify and react to electrical or optical signs. A Sensor simply transmits the physical parameters like humidity, temperature, blood pressure and speed into a signal that can be measured electrically. For example the mercury in the glass thermometer enlarges and pacts the liquid to change the measured temperature read by a person on the calibrated glass tube.
There are different types of sensors available and are playing and paly a very important role in enabling innovative applications. The smart technologies like ubiquitous keen sensors, information procurement frameworks, enormous information investigation provide key innovative technology building blocks. Incorporated fittingly, they give efficiencies, versatility, and cost .As for the survey they also act as a smart foundation for durable systems to enable meaningful citizen engagement. The potential of these structures will continue to grow, particularly as the trajectory and merging of technologies escalations. A micro-controller is known by as embedded controller. In

market we have number of microcontrollers available with different term lengths such as 4bit, 8bit, 64bit and 128bit microcontrollers. Microcontroller is a compressed mini or microcomputer manmade to control and manage the functions of embedded systems in office machines, robots, home appliances, motor vehicles, and a number of other gadgets. A microcontroller contains different components like memory, peripherals and a processor.

2. SENSOR TRCHNOLOGIES

Sensors play an integral role in numerous modern industrial applications, including food processing and everyday monitoring of activities such as transport, air quality, medical therapeutics, and many more. While sensors have been with us for more than a century, the advanced sensors with integrated information and communications technology (ICT) abilities i.e. smart sensors have been around for minimal over three decades. The remarkable progress has been made in computational capabilities, storage, energy management, and a variety of form factors, network alternatives, and programming improvement situations. These advances have occurred in parallel to a significant change in sensing capabilities. We have witnessed the emergence of bio sensors that are now found in a variety of consumer products, such as tests for pregnancy, cholesterol, allergies, and fertility.

The development and rapid commercialization of low-cost micro electromechanical systems (MEMS) sensors, such as 3D accelerometers, has LCD to their integration into a diverse range of devices extending from cars to smartphones. Affordable semiconductor sensors have catalyzed new areas of sensing platforms, such as those for home air-quality monitoring. The diverse range of low-cost sensors fostered the emergence of pervasive sensing. Sensors and sensor networks can now be integrated into our living environment or even into our clothing with minimal effect on our daily lives. The data from these sensors promises to support new proactive healthcare paradigms with early detection of potential issues, for example, heart disease risk (elevated cholesterols levels) liver disease (elevated bilirubin levels in urine), anemia (ferritin levels in blood) and so forth. Sensors are increasingly used to monitor daily activities, such as exercise with instant access to our performance through smartphones. The relationship between our well-being and our ambient environment is undergoing significant change. Sensor technologies now empower ordinary citizens with information about air and water quality and other environmental issues, such as noise pollution. So, sharing and socializing this data online supports the evolving concepts of citizen-LCD sensing. As people contribute their data online, crowd sourced maps of parameters such air quality over large geographical areas can be generated and shared.

Early sensors were simple devices, measuring a quantity of interest and producing some form of mechanical, electrical, or optical output signal. In just the last decade or so, computing, pervasive communications, connectivity to the Web, mobile smart devices, and cloud integration have added immensely to the capabilities of sensors, as shown in Figure1

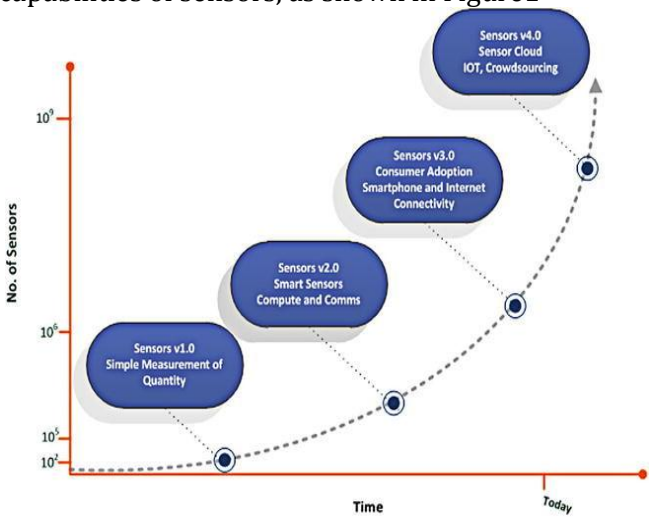


Figure1: Evolution of sensors reflecting the integration of ICT capabilities and consumer adoption

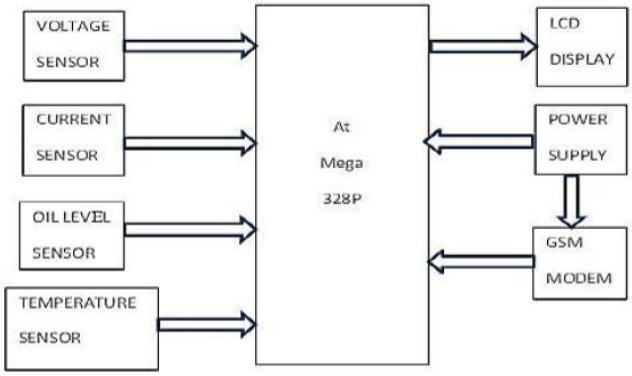
Smart technologies like smart sensors, data acquisition systems, ubiquitous data connectivity, and big data analytics provide building blocks to technology. Integrated properly, they provide efficiencies, scalability, and cost reduction. They can also act as an innovation platform for long-term solutions. So, the potential of these systems will continue to evolve, particularly as the trajectory and merging of technologies increases. You will also see how smartphones and tablets are acting as one such catalyst for innovation through the fusion of technologies. Also, in healthcare centers, the use of sensors will be integrated into daily routine to provide both diagnostic capabilities and routine wellness monitoring. Figure 2 shows how the various technologies can be combined to deliver a smart healthcare sensing solution.

Figure2: Sensors used In IOT Technology

This type of engagement is already playing a greater role in shaping products and services. The smart aspects of our lives will contain a greater element of pull, rather than the push that has been the de facto approach to date. Smart sensors and services need to be insight-driven, prototype-powered, and foresight-inspired, particularly in the domains discussed in this book, as they have direct and tangible connection to human end users. It is important to maintain the balance requirements between the creative and analytical processes. We must ensure that needs are identified and appropriate insights collected to realize the opportunities in a way that makes sense from the perspectives of customers, science, engineering, and economics.

The continued technological evolution of sensors will see increasing levels of miniaturization. Sensors will continue to become smarter, driven by ever- closer integration with ICT capabilities. This combination will provide an exciting platform for future innovation product and services. The sensor used in smart Girds is **ATmega32P**.The high-performance, low-power Microchip 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1KB EEPROM, 2KB SRAM, 54/69 general purpose I/O lines, 32 general purpose working registers, a JTAG interface for boundary-scan and on-chip debugging/programming, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a universal serial interface (USI) with start condition detector, an 8-channel 10-bit A/D converter, programmable watchdog timer with internal oscillator, SPI serial port, and five software selectable power saving modes. The device operates between 1.8-5.5 volts.

A grid system is designed to improve the power quality and reliability of power supply. Using smart grid Based sensors like current, voltage and temperature sensor along with IOT wireless communication.



This system is planned for online monitoring of distribution transformers parameters can give useful Information about the transformers. All sensors are connected to the transformer for mentoring. Voltage sensor is connected to sense the voltage, current sensor is used to sense the current, oil sensor is used to detect the oil level in the transformer, temperature sensor is used to sense the temperature of transformer, display is used to display the values of these all sensors.

3. IMPLETATION OF IOT

The **Internet of things** (**IOT**) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensor, actuators, and connectivity which enables these objects to connect and exchange data.Each thing is uniquely identifiable through its embedded computing system but is able to inter-operate within the existing Internet infrastructure. The IOT allows objects to be sensed or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention. When IOT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, virtual power plants, and smart homes. Intelligent transportation and smart cities.

ARDUINO UNO: Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world.

GSM MODULE : Global System for Mobile Communications originally is a standard developed by the European Telecommunications Standards Institute (ETSI) to explain the protocols for second-generation digital cellular networks used by mobile devices such as tablets, first deployed in Finland in December 1991. As of 2014, it has become the global standard for mobile communications – with over 90% market share, operating in over 193 countries and territories.

WIFI MODULE :Wi-Fi is a technology for wireless local area networking with devices based on the IEEE 802.11 standards. Wi-Fi is a trademark of the Wi-Fi Alliance, which restricts the use of the term Wi-Fi Certified to products that successfully complete interoperability certification testing.

4.CONCLUSION

In this paper, we briefly studied about the main issues and challenges for the Smart Grid, with the help of SG User can check dailyconsumption from any location using internet. Owner can control customer meter from control unit. Smart grid represents one of the most promising and prominent internet of things applications. More efficient transmission of electricity..In future, we will study on the security of a key-component of the Smart Grid, where we center around how we can safely incorporate energy-aware smart home, equipped with smart meters and smart appliances, in the SG, so end-client could effectively and safely take an interest in the energy consumption/production equilibrium.. internet of Things, is the subsequent stage towards an all around and inescapable association with any correspondence and calculation empowered articles/gadgets, in any case their entrance innovation, accessible assets and area. The smart Grid can exceedingly profits by the IOT vision.

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