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REVIEW PAPER ON SOLAR PANEL MANAGEMENT USING INTERNET OF THINGS FOR DOMESTIC PURPOSE

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Abstract: This is IoT which allows to objects to be sensed & controlled remotely across existing network infrastructure, creating opportunities much direct integration of physical world into computer based systems, & resulting in improved accuracy & economic benefit. IoT is expected to offer advanced systems, & services that is goes beyond machine-to-machine communications & covers a range of protocols, domains, & applications. IoT could assist in integration of communications, control & information processing across various transportation systems. In IoT, things are expected to become active participants where they are able to interact & communicate among themselves by exchanging data & information sensed about environment. For that they react autonomously to real world events & provide services within or without direct human intervention.

Keywords: IOT, Home automation, Machine to Machine, Auto ID Center, Auto ID Labs.

[I] Introduction

There are several planned or ongoing big scale deployments of IoT, to enable better management of cities & systems. Ambient intelligence & autonomous control are not part of real facts of Internet of Things. Ambient intelligence & autonomous control do not important require Internet structures, either.

In future Internet of Things might be a non-deterministic & open network in which auto system or intelligent entities Web services, SOA, virtual objects also known as avatars would be interoperable & able to act freely pursuing their objectives or shared ones depending on context, circumstances or environments. Environmental monitoring applications of IoT typically use sensors to assist in environmental. The objective of this research is Home automation using IOT within integration of Solar based energy system. Integration of actuation systems, connected to Internet, is likely to optimize energy consumption as a whole. It is expected that IoT devices would be integrated into all forms of energy consuming devices & be able to communicate within utility supply company in order to effectively balance power energy usage. Solar Energy System that is properly installed & adequately sized would not really require much in way of management. To make it relationship clear, & for those who might think so solar energy is complicated, I designed & wrote it simulation to demonstrate basic operation of a solar energy electric power system. Only for three things need to be including: First is level of charge on battery bank-(Amp Hour Meter), Second is Amount of charging power coming in-(Solar Amps Meter), Third is Amount of power being used-(AC Amps Meter).

The Internet of things is removing mundane recurring tasks and creating things that are not possible before enabling many people to do more rewarding tasks & leaving machines to do repetitive jobs.

The term 'Internet of Things' was first put by Kevin Ashton as label of presentation he made at Procter & Gamble within 1999. Referred to as The Internet of Everything, it is proposed setup within which existing, day-to-day in animate objects like machines & appliances & also people

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& animals will be connected within network & will be able to exchange data.

Objects & machines will be able to send & receive messages to each other, eliminating intervention of humans. Every device connected to Internet of Things would be uniquely identified by its IP address. The IPv6 (Internet Protocol version 6) have to be used as this kind of network will generate huge requirement of IP addresses & currently used Ipv4 is incapacitated to include them. The brain of these objects is sensors. These sensors are micro electro mechanical systems (MEMS) that will respond to change in temperature, light, time, pressure, motion, sound, humidity, weight, etc. & take necessary action that they are programmed to. This information could also be sent to data center where it could be analyzed.

So, process of controlling or operating various equipment, machinery, industrial processes & other applications using various control systems & also with less or no human intervention is termed as automation. There are various kinds of automation based on application they could be categorized as home automation, autonomous automation, industrial automation, building automation etc. Now let us see some of applications of Internet of things.

[II] LITERATURE REVIEW

Author	John A. Stankovic
Title	Life Fellow, IEEE wrote research on "Research Directions for Internet of Things"
Description	Many technical communities are vigorously pursuing research topics that contribute to Internet of Things (IoT). Today, as sensing, actuation, communication, & control become ever more sophisticated & ubiquitous, there is significant overlap in these communities, sometimes from slightly different perspectives. Then, eight key research topics are enumerated & research problems within those topics are discussed.
Author	Chirag M. Shah, Vamil B. Sangoi & Raj M. Visharia
Title	Smart Security Solutions based on Internet of Things (IoT)
Description	With increasing popularity of IoT (Internet of Things) & devices getting smarter day by day, it paper presents an idea to reform existing access control systems.This approach of enhancing access control system ensures that system is wireless thereby reducing wiring issues. Prototype described in it paper has provision of accepting inputs from a smart card reader (RFID reader) or a biometric sensor.
Author	Armando Roy Delgado, Rich Picking & Vic Grout
Title	Remote-Controlled Home Automation Systems within Different Network Technologies
Description	This paper describes an investigation into potential for remote controlled operation of home automation systems. It considers problems within their implementation, discusses possible solutions through various network technologies & indicates how to optimize use of such systems.
Author	V. Sathya Narayanan1 , S. Gayathri
Title	Design of Wireless Home automation & security system using PIC Microcontroller
Description	The development of new technologies in field of electronics has brought tremendous changes in day to day life of each human being. Proposed system gives overall framework of hardware & software design, & describes ways to implement system.

[III]ARCHITECTURE & DIAGRAM OF ARCHITECTURE

There has been & still is much hype about "Internet of Things". Idea of a globally interconnected continuum of devices, objects & things in general emerged within RFID technology & it concept has considerably been extended to current vision that envisages a plethora of heterogeneous objects interacting within physical environment. Today, a large number of different means are used to enable communication between heterogeneous devices. We see

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these as "Intranet of Things", representing vertical silos that do not support interoperability. However, it balkanisation of efforts would lead to a predictable slowdown in devising a viable global solution. Furthermore, existing solutions do not address scalability requirements for a future Internet of Things, they provide inappropriate models of governance & fundamentally neglect privacy & security in their design. IoT-A, European Lighthouse Integrated Project has addressed for three years Internet-of-Things Architecture, & created proposed architectural reference model together within definition of an initial set of key building blocks. Together they are envisioned as foundations for fostering emerging Internet of Things. Using an experimental paradigm, IoT-A combined top-down reasoning about architectural principles & design guidelines within simulation & prototyping in exploring technical consequences of architectural design choices.

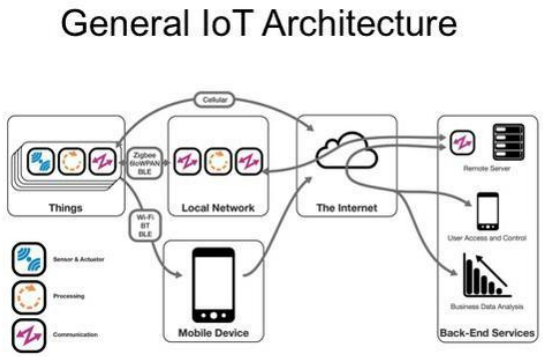

Fig. 1 Architecture of IOT

[IV] APPLICATIONS OF IOT

Medical & healthcare systems

IoT devices could be used to enable remote health monitoring & emergency notification systems. These health monitoring devices could range from blood pressure & heart rate monitors to advanced devices capable of monitoring specialized implants, such as pacemakers, Fitbit electronic wristbands or advanced hearing aids. Specialized sensors could also be equipped within living spaces to monitor health & general well-being of senior citizens, while also ensuring that proper treatment is being administered & assisting people regain lost mobility via therapy as well. Other consumer devices to encourage healthy living, such as, connected scales or wearable heart monitors, are also a possibility within IoT. More & more end-to-end health monitoring IoT platforms are coming up for antenatal & chronic patients, helping one manage health vitals & recurring medication requirements.

Building & home automation

IoT devices could be used to monitor & control mechanical, electrical & electronic systems used in various types of buildings (e.g., public & private, industrial, institutions, or residential) in home automation & building automation systems.

Transportation

The IoT could assist in integration of communications, control & information processing across various transportation systems. Application of IoT extends to all aspects of transportation systems (i.e. vehicle, infrastructure, & driver or user). Dynamic interaction between these components of a transport system enables inter & intra vehicular communication, smart traffic control, smart parking, electronic toll collection systems, logistic & fleet management, vehicle control, & safety & road assistance.

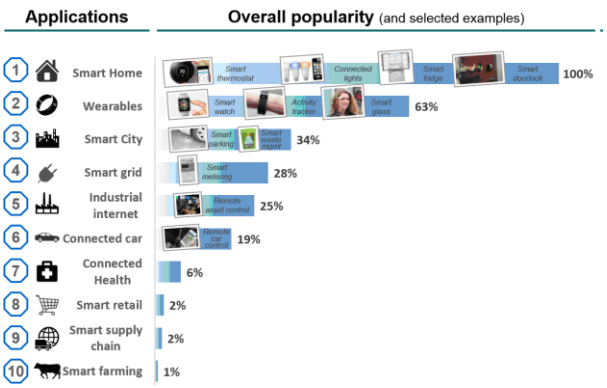

Fig. 2 IOT APPLICATION

Large scale deployments

There are several planned or ongoing big scale deployments of IoT, to enable better system of cities & systems. For example- Songdo, South Korea. Nearly everything in it city is planned to be wired, connected & turned into a constant stream of data that would be monitored & analyzed by an array of computers within little, or no human intervention. Another application is a currently undergoing project in Santander, Spain. For it deployment, two approaches have been adopted. it city of 180,000 inhabitants, has already seen 18,000 city application downloads for their smartphones. This application is connected to 10,000 sensors that enable

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services like parking search, environmental monitoring, digital city agenda among others. City context information is used in it deployment so as to benefit merchants through a spark deals mechanism based on city behavior that aims at maximizing impact of each notification.

With wireless network in place, NY Waterway is able to take control of its fleet & passengers in a way that was not previously possible. New applications could include security, energy & fleet management, digital signage, public Wi-Fi, paperless ticketing & others.

Unique addressability of things

The original idea of Auto-ID Center is based on RFID-tags & unique identification through Electronic Product Code however it has evolved into objects having an IP address or URI.

An alternative view, from world of Semantic Web focuses instead on making all things (not just those electronic, smart, or RFID-enabled) addressable by existing naming protocols, such as URI. Objects themselves do not converse, but they might now be referred to by other agents, such as powerful centralized servers acting for their human owners.

The next generation of Internet applications using Internet Protocol Version 6 (IPv6) would be able to communicate within devices attached to virtually all human-made objects because of extremely large address space of IPv6 protocol. This system would therefore be able to scale to large numbers of objects envisaged.

A combination of these ideas could be found in current GS1/EPCglobal EPC Information Services (EPCIS) specifications. it system is being used to identify objects in industries ranging from aerospace to fast moving consumer products & transportation logistics.

(i) Trends & characteristics

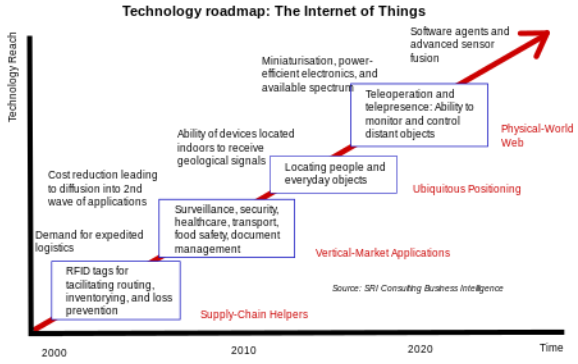

Fig 3 Technology Roadmap: Internet of Things

(ii) Intelligence

Ambient intelligence & autonomous control are not part of real facts of Internet of Things. Ambient intelligence & autonomous control do not necessarily require Internet structures, either. However, there is a shift in research to integrate concepts of Internet of Things & autonomous control, within initial outcomes towards it direction considering objects as driving force for autonomous IoT.

In future Internet of Things might be a non-deterministic & open network in which auto-organized or intelligent entities (Web services, SOA components), virtual objects (avatars) would be interoperable & able to act independently (pursuing their own objectives or shared ones) depending on context, circumstances or environments. Autonomous behavior through collection & reasoning of context information as well as objects ability to detect changes in environment, faults affecting sensors & introduce suitable mitigation measures constitute a major research trend, clearly needed to provide credibility to IoT technology. Modern IoT products & solutions in marketplace use a variety of different technologies to support such context-aware automation but more sophisticated forms of intelligence are requested to permit sensor units to be deployed in real environments.

[V] TECHNOLOGY BENEFITS & DRAWBACKS

(i) Advantages

There are many advantages of incorporating IoT into our lives, which could help individuals, businesses, & society on a daily basis. For individuals it new concept could come in many forms including health, safety, financially, & each day planning. Integration of IoT into health care system could prove to be incredibly beneficial for both an individual & a society. A chip could be implemented into each individual, allowing for hospitals to monitor vital signs of patient. By tracking their vital signs, it could help indicate whether or not serious assessment is necessary. Within all of information that is available on Internet, it could also scare people into believing they need more care than what is really needed. Hospitals already struggle to assess & take care of patients that they have. By monitoring individual's health, it would allow them to judge who needs primary attention. Internet of Things could also assist people within their personal safety. ADT, which is a home security system, allows individuals to monitor their security systems at home through their phones, within ability to control it. Also, another technology that has already been released is GM OnStar. It is a system that is embedded in GM cars that could

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detect if a crash has occurred & it automatically calls 9-1-1. It could also track movement of car.

IoT could also function as a tool that could save people money within their households. If their home appliances are able to communicate, they could operate in an energy efficient way. Finally, IoT could assist people within their everyday plans. A very interesting example that was given in a video was communication between many devices that automatically adjusted to let an individual sleep in. Although it might sound unimportant, misusage of time costs us "$135 billion a year" (Koreshoff, 2012). By allowing physical devices to communicate, it is taking data that is individually collected, sharing it & then translating information into ways to make our current systems more efficient.

Businesses could also reap many benefits from Internet of Things. IoT could be useful in many different categories including asset tracking & inventory control, shipping & location, security, individual tracking, & energy conservation. As mentioned before, IoT allows for communication between devices, commonly referred to as Machine-to-Machine (M2M) communication within it being possible, physical devices are able to communicate to people letting them know their condition & where it is located. Devices such as trucks or ships allow for maximum capacity to be filled by communication amongst devices & then relaying that information to a person to capitalize on data supplied. All of these combined maximize revenue by cutting cost of inefficiencies within business. A specific example from "A Successful 'Internet of Things' Hinges on M2M" article, is operation of Nestles Nespresso Coffee Machine, which has "the ability to monitor factors such as temperature setting, vibration & pressure helps ensure quality output, potentially leading to greater customer satisfaction & continued repeat business" (Frenzel, 2012). Although idea seems quite simple, it could be very advantageous for a company to utilize IoT to ensure quality service is given to their customers.

Another advantage of IoT is ability to track individual consumers & targeting these consumers based on information supplied by devices. In a way, it provides a more "personalized" system that could potentially increase business sales & increases their demographic. Additionally, within increased amount of devices connected to Internet Smart Grid expands, conserving more energy (Frenzel, 2012). Devices could make decisions & adapt without human guidance to reduce their energy usage. IoT has many advantages to businesses, individuals, consumers, environment, & society, but as within any technology, there are always repercussions & controversies that arise.

(ii) Disadvantages

Three of main concerns that accompany Internet of Things are breach of privacy, over-reliance on technology, & loss of jobs. When anything is put on internet it would always be there. Of course there are security measures that are taken to protect information, but there is always possibility of hackers breaking into system & stealing data. For example, Anonymous is a group of individuals that hacked into federal sites & released confidential information to public. Meanwhile government is supposed to have highest level of security, yet their system was easily breached. Therefore, if all of our information is stored on internet, people could hack into it, finding out everything about individuals lives. Also, companies could misuse information that they are given access to. It is a common mishap that occurs within companies all time. Just recently Google got caught using information that was supposed to be private. Information, such as data collected & stored by IoT, could be immensely beneficial to companies.

Privacy issues also leads to question of who would control Internet of Things. If there is only one company, that could potentially lead to a monopoly hurting consumers & other companies. If there are multiple companies that are given access to information acquired, doesn't that breach consumers privacy? Also, where is information going to be stored? Phone service suppliers such as Verizon & AT&T are no longer offering unlimited data usage for mobile phones because it is too costly, yet by 2020 it is expected that 50 billion devices would be connected, collecting & storing data (Evans, 2011). Another argument against IoT is over-reliance on technology. As time has progressed, our current generation has grown up within readily availability of internet & technology in general. However, relying on technology on a day to day basis, making decisions by information that it gives up could lead to devastation. No system is robust & fault-free. We see glitches that occur constantly in technology, specifically involving internet. Depending on amount that an individual relies on information supplied could be detrimental if system collapses. More we entrust & more dependent we are on Internet could lead to a potentially catastrophic event if it crashes.

Finally connecting of more & more devices to Internet would result in loss of jobs. Automation of IoT "will have a devastating impact on employment prospects of less-educated workers" (Schumpeter, 2010). For

example, people who evaluate inventory would lose their jobs because devices could not only communicate between each other, but transmit that information to owner. We already are witnessing jobs being lost to automated machines, such as checkout line in supermarkets & even ATM's. These disadvantages could be largely devastating to society as a whole, as well as individuals & consumers.

[VI] FUTURE SCOPE & CONCLUSION

The system would likely be an example of event-driven architecture bottom-up made (based on context of processes & operations, in real-time) & would consider any subsidiary level. In order to program & control flow of information in Internet of Things, a predicted architectural direction is required. It is being called BPM. Everywhere that is a blending of traditional process management and special capabilities to automate control of large numbers of coordinated devices. In an Internet of Things, significance of an event will not necessarily based on a deterministic approach but would instead be based on framework of event itself: this is also be a semantic web. Consequently, this will not necessarily require common standards that will not be able to prefer every context or use: some actors (services, components, avatars) accordingly be self-referenced and if ever needed, adaptive to active common standards (*predicting everything* no more than defining a global finality for everythig is just not possible with any of *top-down* approaches and standardizations). Some researchers give that sensor networks are most essential component of Internet of Things.

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