Research Paper Summary:

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The 10 Research Topics in the Internet of Things

Introduction

IoT is basically how we connect physical objects to the Internet and machine-to-human and machine-to-machine communications. IoT has been the connecting line between the digital and physical entities. There are many hurdles which are being faced and it is under research and development to improvise them. There are mainly 3 layers i) application layer ii) data layer iii) physical layer. physical layer collects data to be processed and modeled in the data layer, which then delivers the data to the application layer.

II. RESEARCH DIRECTIONS IN IOT

A. Energy Harvesting

To overcome the issues like storage, networking capabilities and to access smart services anywhere and anytime. Many IoT sensors were embedded but as they had limited likespan due to batterirs made it inefficient and costly. So energy harvesting came. It is a method for converting easily accessible energy from natural or manmade resources into useful electrical energy is called energy harvesting. It consists of four key stages, including choosing the best and most plentiful energy source, its modification, preservation, and consumption. Thermal energy, light energy, RF energy, electromagnetic energy, chemical energy, and mechanical energy are a few of the energy sources that could be harnessed for IoT. For storage rechargeable batteries and super capacitors were used. Challenges like heavy fluctuations in an object's circuitry, which could be inferior or superior to power requrements of circuitry. And also many other challenges are hindering which are trying to get sourted.

B. Data-driven IoT

A challenge that comes while managing is that when the majority of them are data producers and consumers.

i)Velocity—things produce data in different speed levels.

ii) Scalability—data are expected to be on large scale due to the ability of IoT sensors to continuously generate data together with the foreseeable excessively large number of things.

iii) Dynamics—mobility is one characteristic of IoT things, leading to data generated in different locations under different environments at different times

iv) Heterogeneity—many kinds of things have been and could be connected to the Internet and the data generated could be in different formats using different vocabularies.

Also RFID and sensors produce inaccurate readings so that also leads to challenge. DBMS can be used to store data. storage issue in resource-constrained also play role due to mobility and scalability. Linked data is used to structure data and interlink that datas. CEP focuses on detection and also improves event processing quality. Semantic matching includes semantic selection which evaluates patterns. Data quality and uncertainty remains a challenging problem due to the increasing data volume and heterogeneity.

C. IoT Search

state information of things is dynamic and rapidly changing. We are also applying Web technologies to the Internet of Things to access information and services of physical objects. In WoT, each physical object possesses a digital counterpart. Earlier WoTSE are commonly used to locate physical objects, which are tagged with passive RFID tags or sensor nodes. There are different layers which hsndles different works. The whole system is protected by security, privacy, and trust assessment measures, which are grouped into a vertical layer. The modular architecture provides a reference framework assessing the diverse implementation of the existing WoTSEs. The Index Layer stores and indexes resources with its Collection Manager and Indexer modules. The Ranking Aggregator module is responsible for combining different Q.D and Q.I ranking results into a final score for each resource. Finally, the Result Processor extracts and aggregates the information from matching resources and produces search results. Main ami is is building a search engine that could find anything available on the Web of Things.

D. Security, Privacy, and Trust in IoT

One challenge is limited computation power and minimal resources of most of the IoT devices. Also does not provide a complete security solution. None of them give attack free solution. Scalability is one of the indispensable requirement in the IoT infrastructures. Such a requirement can be met by delegating the expensive cryptographic computations in a secured manner to a cloudlet, edge, or cloud. And also Non-repudiation is another requirement. Group signature techniques can provide conditional anonymity. IoT plays between security and trust if either of them are lost then it will not work. Evaluating trust becomes indispensable in the case of a highly dynamic and distributed network since pervasive infrastructure cannot be guaranteed. Lastly we can conclude that security, privacy, and trust go hand-in-hand for designing a resilient IoT network.

E. Service Computing and IoT

It is important to change the way of design, delivery, and consumption of software applications. RESTful services and service composition methods can help for service computing. traditional service composition models are mostly single-typed and single-layered. IoT components are heterogeneous, multi-layered. There are two techniques for the same which can overcome are semantic annotation and another is to use the textual descriptions associated with IoT devices to locate IoT services.

F. Social IoT

allows objects to establish their own social networks and navigate through the social network structure of the friend objects, allowing discovering other objects and their services.bSIoT can make services discovery more easily and in a distributed manner. And gives reliable and trustworthy networking solutions by utilizing the social network structure.

The current perspective refers to a new generation of IoT objects that have capability to form their own social network of friends without relying on the online human social networks. Relationships exist among smart objects. They establish relationship for different reasons. In the future, IoT will be integrated more into daily life things and will have an interesting role to make decisions for humans.

G. IoT Recommendation

There are 3 main challenges.

i) TOI services have to be dynamic and contextual-aware of their environment to keep track and quantify their IoT devices data sources.

ii) We require new architectures and evaluation measurements regarding the performance of a TOI recommendation system, where the focuses are not only on the accuracy, but also the safety, security, and privacy of the involved entities.

iii) requires new solution for TOI recommendation, and the recent trend is to deploy recommendation models on edgedevices such as mobile or portable IoT devices.

Deep learning methods are very helpful for context-aware TOI recommendation systems. having both proactive and post-active approaches in a recommendation system, users can have better experience when looking for TOI.

H. Edge Computing and IoT

It is a part of the distributed computing topology which has an intent to bring both computation and storage near to the devices. A data shows Automotive Edge Computing Consortium, connected vehicles are anticipated to generate an approximately 5 TB of data for every hour of their driving. security is of the most pressing concerns for the edge. implementing an end-to-end encryption and creating mechanisms for securing edge-based IoT devices with embedding features within them would result into expansive network.

I. Conversational IoT

This uses either text-based or voice-based applications that enable machines to stimulate human conversations. Example is google home.

With this there are number of limitations which are associated are:

SelfDisclosure in a Multi-User Environment

Lack of Complexity and Completeness

Inability to Reason

Lack of Conversational Context

designing agents that keep track of the previous turns is an important way to improve.

J. Summarization in IoT

One of the way of compressing the data over the Internet is Textual data. Summarization is important for the data aggregation. This will lead to save huge amount of time. Moreover data summarization is capable of reducing the energy consumption in various IoT environments and decrease the requirements of the application servers in storage, transmission and processing. Multi-modal data processing enables models to fuse data from different sensors and sources, but it will inevitably incur exponentially increasing data to be processed. With the advantages it also need to know that deep neural network have strong non-linear mapping abilities and traditional approaches.

Conclusion:

From this research paper we have seen 10 key research topics for IoT but there are still many more as all of them are have some of the limitations which need to be overcomed. Along with an exponential growth in connected devices, each thing in IoT communicates packets of data that require reliable connectivity, storage, and security. With IoT, an organization is challenged with managing, monitoring, and securing immense volumes of data and connections from dispersed devices. IoT describes the network of physical objects—"things"—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.

A Study on Internet of Things based Applications

Abstract

This paper gives a detail analysis of various applications based on Internet of Thing (IoT)s. This explains about how internet of things evolved from mobile computing and ubiquitous computing. The properties of Internet of Things (IOT) are product information, electronic tag, standard expressed and uploading information. It utilizes the Radio Frequency Identification (RFID) technology and wireless sensor networks (WSN).

Keywords – Internet of Things, RFID, Electronic Tag, WSN.

i. INTRODUCTION

The third wave of information technology, following the Internet and mobile communication networks, is known as the Internet of Things and is characterized by more interoperability and intelligence. The internet therefore can be connected to any device, including a television and a plant. The information about the thing is accessible from a distance since it is shared globally via the internet. What is the difference between an IOT application and a normal internet application? The way information is uploaded and the type of information that is uploaded and the kind of information that is uploaded. Information about the products is read using RFID readers, which then upload the info on the internet. The information that has been uploaded varies from other applications in some ways. Also, the dynamic sensor readings that the RFID objects generate result in rapid information changes and increase the need for space.

ii. GROWTH OF IOT

The "internet of computers" was the first form of the internet. It is a worldwide platform that might support the implementation of various services, including the World Wide Web. Several social media platforms entered the picture and kept people in frequent touch. Due of this, now there are more people on than information. On the other hand, while technology was entering the mobile computing era, it was improving daily. The size of mobile and other handheld devices has decreased as a result of technological advancement. Ordinary mobile phones and PCs were replaced by smart phones, iPads, tablets, and laptops. As a result, the way that people access the internet has changed. physical objects were configured with identification tags such as bar code and RFID so that they could be scanned by devices like smart phones and upload their information into the internet.

This way of connecting the physical world with cyberspace with the help of a smart device led to internet being called as “Internet of Things”. The International telecommunications Union has pointed out four dimensions of IOT: object identification, sensors and wireless sensor networks, embedded systems and nanotechnology.

iii. TECHBOLOGIES

The main motive of the Internet of Things is to connect everything in the world to the internet, wireless sensor networks (WSN), and smartphones so that they can automatically share information.

iv. Radio Frequency Identification

A wireless technology called radio frequency identification (RFID) is used to identify objects. It is preferable than traditional bar code technology due to its lower cost and enhanced capabilities, such as tracking the position, status of objects, and remote reading. Without physical contact, RFID uses radio waves to detect objects and transmit their data to the RFID reader. RFID tags and RFID readers are the two main parts of the RFID system. RFID tag responses by transferring information to

their EPC to the reader. The reader then transmits this information from EPC to the computer to be shared across the internet.

v. Wireless Sensor Networks

Wireless Sensor Networks (WSN) are important for bridging the gap between the physical and information world. These networks keep monitor the changes happing in environmental and Wireless radio is used by the several independent nodes that make up WSN to connect with one another. The nodes contain a sensor, microcontroller, memory, radio transceiver and battery. Together, these sensor devices data and transmit it to the sink node. The data is redirected to the destination by the sink node.

vi. Embedded System and Nanotechnology

Embedded systems are intelligent and things with embedded intelligence become smart things. These make things perform certain actions automatically. They can process information, self-organize, and make decisions.

vii. Applications

IOT applications are used widely in many domains. Healthcare, agriculture, smart buildings, supply chain management, Transportation and defense.

a. Agriculture
   Internet of Things can be of great use in the field of agriculture. It can be useful for tracking the development of medicinal plants. These plants have sensors and RFID tags installed. The sensors detect sudden or drastic changes in plant growth due to temperature or humidity, the RFID tags transmit this information to the reader for sharing on the internet.

b. Smart Building – School
   A school has many buildings in its campus like Administration block, teaching block, etc. All these buildings have their own ventilation mechanism, AC supply and elevator systems. These facilities must be individually maintained which becomes a tedious process. This scenario can be handled using IOT for better management. Each of the above blocks is fixed with RFID tag that keeps monitoring the ventilation, AC supply behavior. The RFID system keeps sensing the change in environment and collects the data and sends it to the manager present in the respective block. Since the school campus will be sent data to the Central Control system. The control system receiving the data will take actions such as reducing the AC supply or stopping the elevator service.

c. Healthcare – Telemedicine
   IOT is essential to the healthcare industry. It can be utilized in a variety of ways, including tracking the number of patients in a hospital, choosing the correct patient for the proper medication, telemonitoring and checking on a

patient's health from a distance. Technology is available for elderly people who need to be monitored while at home alone during ambient assisted living. Using RFID and sensors, the patient's health status is periodically assessed. Based on the information received, a remote doctor provides medicines.

ISSUES IN IOT

The largest challenges come from privacy, reliability, data confidentiality, and security. There is a problem with the passenger's lack of privacy in a car with an RFID tag. If wireless sensors are found in a war zone, the enemy might use them to generate false data. Increased security and good privacy policies will increase public acceptance.

CONCLUSION

A new internet application called the "internet of things" comes in an era of intelligent technology where things communicate with one another instead of people. Every object in the environment may be identified, connected to other objects, and make decisions on its own thanks to IOT. It has taken its birth from ubiquitous computing and mobile computing. In order to create an IOT application, technologies like RFID, wireless sensor networks, and embedded systems are essential. It has various uses in industries like healthcare, agriculture, and transportation.