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The Internet of Things - A Survey

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Abstract: The Internet of Things (Iota) is a new prototype of the modern wireless telecommunications and provides an ability to build robust systems and applications by taking advantage of the growing proliferation of mobile phones, sensors, radio frequency determination and others. In an attempt to understand the development of IOT has been developing a wide and large range of Internet applications using various frameworks and published in recent years. In this paper, we provide a review on IOT which expect to play a major role in the future Internet landscape.

Keywords: The Internet of Things (IoT), Radio-Frequency Identification (RFID), Sensors, Monitoring, Control

1 Introduction

The main idea of IOT is the spread a diversity of things around us like mobile phones, sensors, Radio-Frequency Identification (RFID), and actuators through unique systems that are able to interact with each other to satisfy the main goals (Atzori & Morabito, 2010). Where the IOT is based on smart nodes and self-configuration are strongly interconnected from the infrastructure of the global network.

The IoT is mostly characterized by tiny things, widely distributed, with confined processing capacity and storage, which involve concerns regarding security, privacy, reliability and performance (Botta et al., 2016). There is increasing interest in using these technologies in many industrial domains like security, agriculture, surveillance, environmental monitoring, food processing industry and others (Rajput, 2017). Neural networks have entered into many applications, including recognition (Abdalkafor & AlHamouz, 2016; Abdalkafor, 2017) and prediction (Abdalkafor, Nassar& Owaid, 2018). As well as applied for the purpose of analyzing the threats facing IOT (Hodo et al., 2016).

Security matters such as secure storage of data, access control, privacy and secure communication are becoming important challenges in the field of IoT. Furthermore, every byte that is synchronized and every device that we create, every sensor that we set up in the IoT environment might be subjected to thorough examination in the course of the investigation. (Conti et al., 2018).

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2 Previous works

Recently, several related works have been proposed in the Internet of things environment. Some of these studies focused on several topics such as a survey for the Integration of IOT and Cloud computing, IOT application, a survey of security challenges for IoT and others.

In below some recent studies have been discussed such as:

(Botta et al., 2016). This paper focused on the integration of cloud computing and IOT, including the analysis of the fundamentals of computing and the Internet, the things and methods leading to their integration. Also, this paper focused on the analysis of research challenges related to the subject matter as well as discussed available platforms whether open source or ownership.
(Xu, He, & Li, 2014). This paper focused on the summary of IOT applications and key enabling technologies and contributing to the latest Internet technologies that summarize current things in industries systematically.
(Ammar, Russello & Crispo, 2018). This paper focused on a comprehensive survey of security challenges for IOT from the perspective of the techniques and architecture used in this area. Also This paper focused on the weaknesses and security challenges of different strata.
(Conti et al., 2018). This paper focused on the current challenges of security in human medicine within the field of IOT as well as this paper also focused on special research and advice on challenges in this area.
(Li, Xu, & Zhao, 2018). This paper presented a survey of the latest requirements of the IOT with associated communication technology. Also, this paper presented a survey of emerging technologies and enabling applications with a focus on 5G mobile networks.

3 IOT Technologies

3.1 Radio Frequency Identification (RFID)

RFID is an important technique in IOT to implement digital identification and detection, can provide an automatic identification of bank cards, Identification Documents. Also, it detects the unique digital identities to be integrated into the security network. RFID is similar to barcoding captures the data from a label by a unique device and stores data in a database. RFID has advantages over systems that asset barcode tracking software (Da Xu et al., 2014). The RFID data card can be read and distinguished by human operators, whereas the barcode code can be detected by photo scanning devices only. RFID must be within the scope of the RFID reader. The RFID can detect the identity card from distance ranges from 3 to 300 feet. It should be mentioned, RFID still use barcodes because of their cost and the need to identify each item individually (Weber, 2010).

3.2 Wireless fidelity

Wi-Fi is a wireless networking technology using 2.4 GHz or 5 GHz frequencies sending data over longer distances than Bluetooth or infrared and less energy consumption. It is

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basically waves propagation with Internet data detection and decryption. For mobile devices such as laptops and Palm computers. The complexity of Wi-Fi standards depends on data speeds and power requirements. Thus, 802.11b standard is slower but less expensive. The latest standard is 802.11n, HOLIC, works for longer ranges and higher data transfer. There are many obstacles and challenges for the Wi-Fi operation (Rehman et al., 2016). First, security issues, as the internet is widely available, Wi-Fi is more susceptible to hacking. Also, overloading the device causes to reduce the efficiency and speed. This issue can be solved by using multiple routers to balance the loads with the device limitations. However, this solution increase the expenses (Fernandes et al., 2014).

3.3 Internet Protocol (IP)

IP is a method employed to transmit data from one device to another in the Internet network. Each computer on the Internet has at least one IP address that is fully known by other computers. The protocol is a set of rules govern the communication and work priorities in the networks to insure that all connected devices works integrated and compatible communication (Fall & Stevens, 2011). IP helps to send packets from the source to destination depending on the IP addresses in the headers of data packets. Therefore, IP defines the data packet structures contains delivered data. Furthermore, it determines the addressing methods used for labeling the information of the source and destination. (Montenegro, 2007).

3.4 Machine-Machine (M2M) Communication

In the communication terminologies, machine refers to the computers connected in a network. Thus, M2M communication is referring to the communication between computers, Machine communication is increasing in fast pace since it has several uses and applications in many fields like smart robot, cyber transportation, healthcare systems, smart house technology and electric smart grids. Typical example of M2M is personal area network technologies, such as local networks, ultra-wide band, and Bluetooth (Sreeja & Mondal).

4 IOT Applications:

IOT enables objects to communicate between them and elaborate information gathered in our living environment. Therefore IOT can be deployed in industrial, Agriculture, Healthcare, and Transportation applications. The following subsections describe each of them.

4.1 Industrial Applications:

IOT allow the factory to connect with a wide range of applications used in the production line like to connect the factory with the smart grid. In a smart factory, IOT enables the production logistic stakeholders, supplier of the production tools stakeholders, and maintenance stakeholders to easily interact with the manufacturing system (Vermesan & Friess, 2013). For example, IOT provides real time vehicle diagnostics in the automotive industry. The wireless identifiable technologies fixed on vehicle parts in the production line in order to find the missing pieces of the vehicle components automatically during the

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assembly process (Borgia, 2014). Another application of the IOT in industry is to monitor the filling status of the glass containers by fixing ultrasonic sensors. The ultrasonic sensors provide the information in case the container level reaches to the three quarters. Then, the loading process is automatically started (Said & Masud, 2013).

4.2 Agriculture Applications:

IOT assist farms in their marketing and management products. It reduces the long procedure of the producer-customers sales by enabling the farmers to communicate directly with the customers. Therefore, a suitable mobile application is used to enable the customers to order the real time showing of the offered products (Borgia, 2014). Another application of the IOT in agriculture is to exploit the agricultural resources and reduce the production cost. In this situation, the wireless sensor network technology is adopted to transfer the information like humidity, temperature, wind, PH, and conductivity to control the need of plants like water, temperature, ventilation and fertility (Chen & Jin, 2012). For example, the agricultural production monitoring system was built by (Zhao & Zang, 2010). The system consists of the terminal link and M2M support platform. The terminal is jointed directly with the wired sensor while the M2M support platform communicates by the wireless sensors through RF. The system collects real time data like humidity, soil signals, and temperature and transmit them via SMS gateway to the mobile terminal as shown in Figure 1. As a result, the agricultural production monitoring system can be able to monitor and control accurately and provides good growth condition.

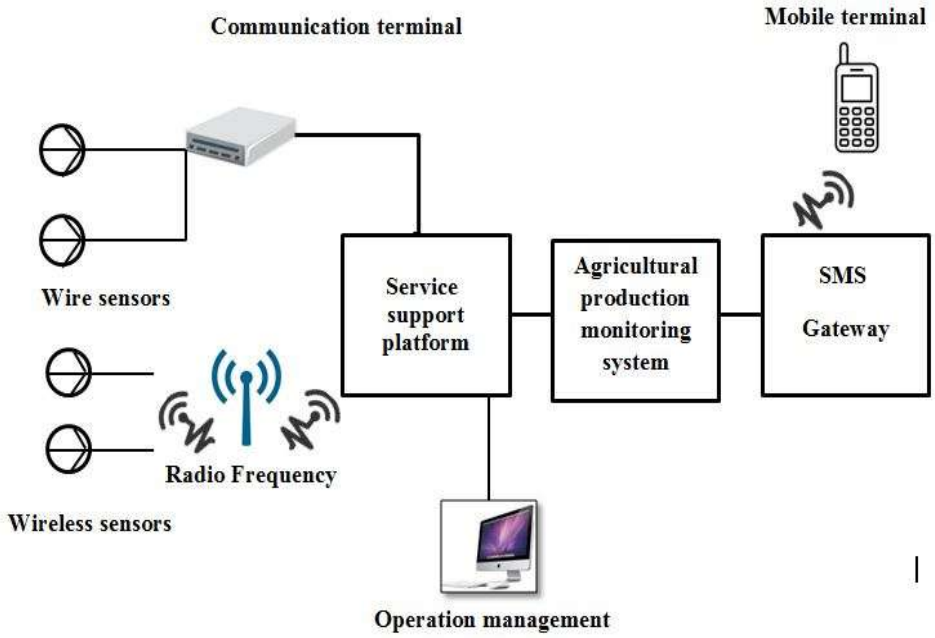

Fig. 1 Agricultural Production Monitoring System

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4.3 Healthcare Applications:

IOT todays are an important sector in healthcare applications. It provides assisting to our living by monitoring blood pressure, temperature, breathing, etc. based on different medical sensors. Therefore, it will preserve the life of people who need permanent support or monitoring and reduce the effort and cost of unnecessary health care. The sensors are fixed or wearable that is used to collect information on patient status and transmit it to the remote medical center. The remote medical sensor is able to respond quickly, for action when needed (Miorandi et al, 2012). IOT also specify identity mark for each patient to avoid the mistake in drug, procedure, and time as well as to prevent the mismatching of the infants (Atzori et al., 2010). Another application of IOT proposed by (Jara et al, 2013) is the interconnection framework for mobile health (mHealth). It provides continuing vital sigh monitoring and access to the patient status from everywhere and give us advice through the internet by using smart phones or tablets. Figure 2 shows an example of Healthcare.

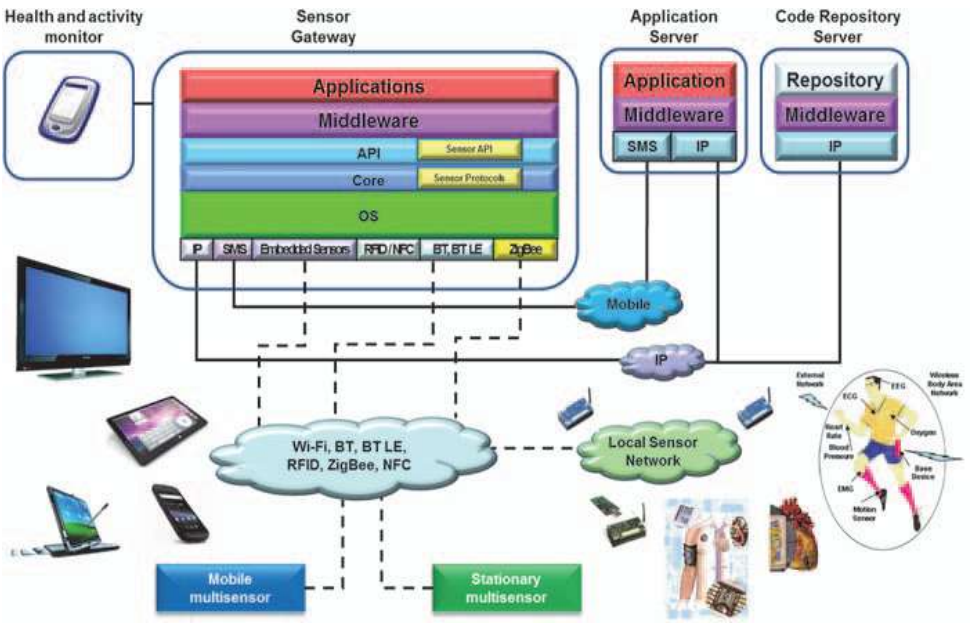

Fig. 2 Example of Healthcare

4.4 Transportation Applications:

The modern transportation todays like cars. Bused, and trails are provided with actuators, sensors and processing power to provide information for the drivers to choose the best road and avoid the traffic jam. The roads itself are also equipped with sensors to control the movement of cars and to avoid the congestion at the traffic light in order to reduce the pollution and greenhouse gas emission. Therefore, the freight companies were adopted

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this technology to deliver the goods to the costumers in a short time based on the information on the movement of vehicles transporting goods (Atzori et al., 2010). The success transportation application of IOT is the Traffic Information Grid (TIG) was established in ShanghaiGrid. TIG collect the traffic information by sensors and actuators and analyze them to provide a best traffic service for the drivers to avoid the traffic jam which can be accessed by mobile phone, PDAs (Abdmeziem & Tandjaoui, 2014).

5 Conclusions

In this paper, a review on IOT has been elaborated. IOT give us the ability to control and monitor devices worldwide. The technologies that have been used by IOT also mentioned. IOT plays an important role in the industrial domain by providing a real-time vehicle diagnostics in the automotive industry. In healthcare domain, IOT provides continuing vital sigh monitoring and access to the patient status from everywhere and give us advice through the internet by using smart phones or tablets.

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