A Survey on: IoT Based Intelligent Surveillance and Alert System with Fault Prediction

Gondaliya Gopi Dineshbhai
M.E. (I.T.) Student
Dept. of Information Technology
170430723004
SSEC (GTU Affiliated), Bhavnagar, India

Nishant Sanghani
Assistant professor
Dept. of Information Technology
SSEC (GTU Affiliated), Bhavnagar, India

Abstract : The Internet of Things (IoT) makes good objects the building blocks within the development of cyber-physical good pervasive frameworks. The IoT incorporates a kind of application domains, together with health care. The IoT revolution is redesigning trendy health care with promising technological, economic, and social prospects. This paper surveys advances in IoT-based health care technologies and reviews the progressive network architectures/platforms, applications, and industrial trends in IoT-based health care solutions.

Index Terms **- Smart healthcare, Internet of Things, Smart health care network management, Smart healthcare contexts, Smart health care remote monitoring**

I. INTRODUCTION

With the internet of Things (IoT), during which objects sense, and use IPs to speak among themselves and share data regarding their surroundings anytime from anywhere. Wireless sensors network (WSN) is taken into account together of key technologies of IoT and it's wide employed in numerous areas like aid systems, surrounding observance systems, structural health monitoring (SHM) systems, etc. As novel plan, IoT has quickly become a gorgeous topic for researchers and industries. Its integration into observance systems like SHM are going to be advantageous to Industries, businesses, consumers, environment, people, and society. the concept behind SHM is to gather information from multiple sensors put in on structures so as to method and extract helpful data regarding current state of the structure for maintenance and safety purpose.

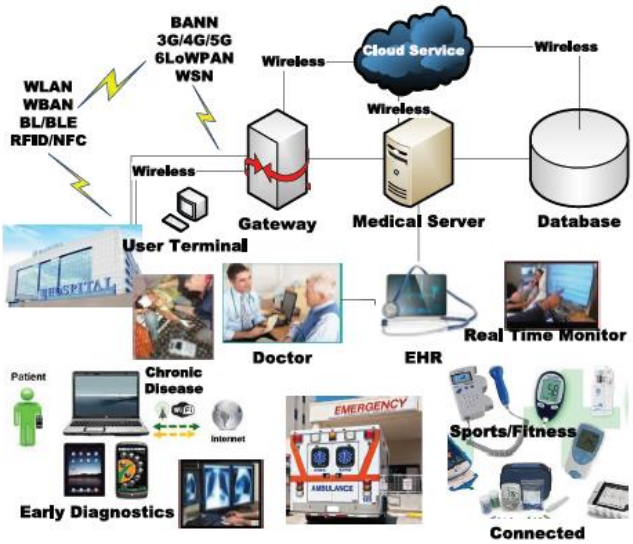

Fig. 1 Healthcare trends [2]

Apart from the potential behind the combination of IoT into such systems, the quantity information of (knowledge of information) sampling which will be collected from sensible structures are thus massive and complicated that it'll become troublesome to use the standard information management systems to handle and method such data, thus the emergence of massive information technologies, which might be wont to store and method massive amounts of observance information.

II. EXISTING METHODS

In the medical IoT, there are an outsized variety of sensors accustomed monitor patients, the atmosphere of hospitals, and also the conditions of medical devices. the quantity and kind of those sensors are significantly giant. additionally, most devices use battery power, the capability of that is proscribed thanks to the restrictions of size and alternative aspects. Medical IoT devices have the characteristics of low power consumption to make sure them work for an extended time as a result of they can't replace the battery or charge frequently [2].

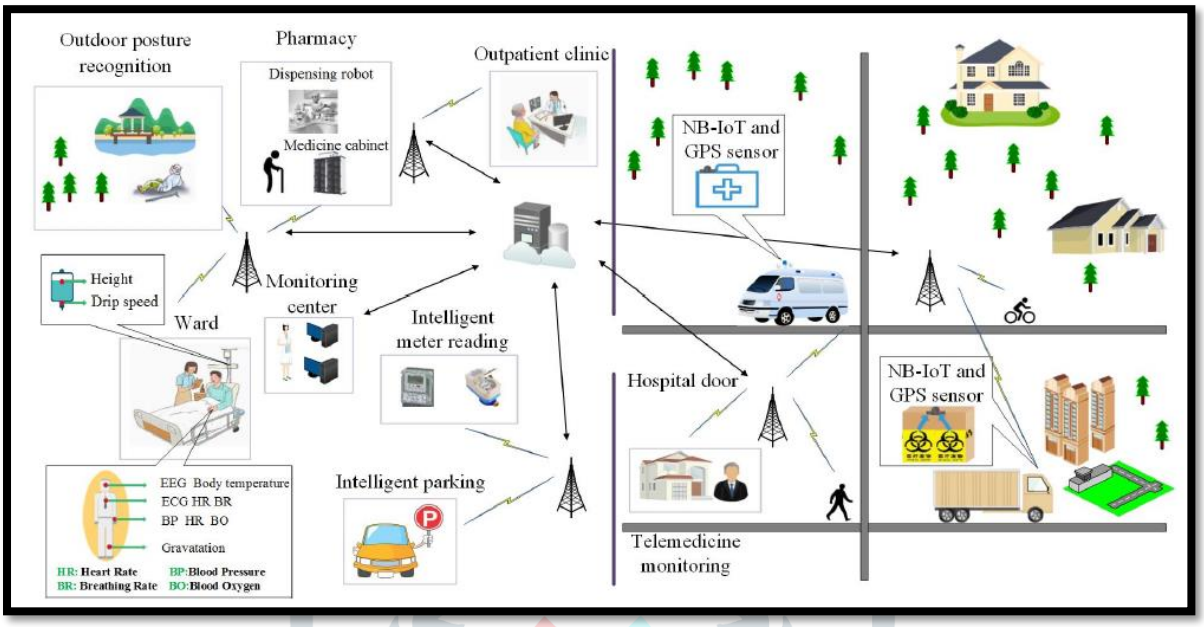

Fig 2 Smart Hospitals exploitation NB-IoT [4]

There are many blessings of exploitation NB-IoT in sensible hospitals. (1) the upper capacity: NB-IoT will give billions of connections and connect tens of thousands of users in an exceedingly single neighborhood, which may meet the association necessities of kit in sensible hospitals. (2) the broader coverage: scrutiny with the present mobile network, NB-IoT will increase a 20db+ link budget, that considerably enhances its penetration ability and allows it to be terribly appropriate for the instrumentality association of hospitals' buildings and basements. (3) The lower power consumption with A battery life over ten years, that is incredibly appropriate for the devices like wearable devices that have little sizes. (4) The lower cost: the value of every module is a smaller amount than five greenbacks, which may considerably scale back the value of disposable instrumentality.

IoT applications consume information regarding each physical and virtual system entities. This data, from heterogeneous sources as well as sensors, social media, and even manually submitted by users is raw and yelling needs process by applications to be filtered and distilled into usable data.

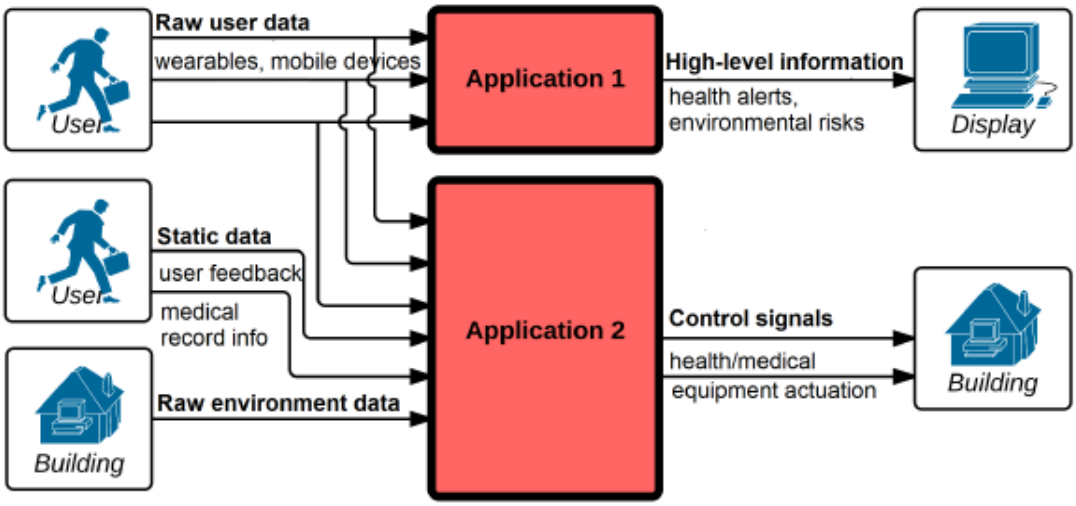

Fig 3 Monolithic MIMO implementation [2]

Additionally, from the computer file, applications got to extract context: high-level abstracted information. In the IoT, context tends to be human-centric classifications (e.g. location, activity) that are necessary to several totally different applications [1]. Black-box implementations of applications from data to output mask each styles of process output (preprocessing and customary intermediate context) from alternative applications, that results in redundancy in computation. Our proposal of a hierarchy of

purposeful units in situ of monolithic implementations trades off compactness for skillfulness. A gradable approach breaks down one application into multiple purposeful units, increasing structure complexness. though serializing the method will increase latency if a extremely compact rule was distended, it also can expose intermediate output for utilize by alternative applications, therefore reducing cipher redundancy within the system. we have a tendency to antecedently tried that such AN approach decreases overall cipher complexness and improves system quantifiability for processing that exceeds 2nd-order complexness (please see our previous work for a lot of details [13]). As we have a tendency to show in our case studies later during this paper, even the only applications exceed quadratic complexness once machine learning is concerned. we have a tendency to additionally give a close analysis of conserving the accuracy exploitation our approach in our previous study [13]. to boot, rending single-step applications into little purposeful units (each with fewer inputs, less complicated logic) facilitates a generalized information transformation through machine learning.

In 2016, Ahmad et al. [4] projected a framework for attention referred to as Health Fog during which fog layer is employed as a mediator layer between cloud and also the finish users. Authors principally focused on enhancing and flexibly dominant the info privacy problems in attention systems. to boost the system security, cloud access security broker (CSAB) is integrated with Health Fog. Moreover, crypto logic primitives were additionally outlined to extend the utility of the Health Fog. In 2016, Nandyala and Kim [5] bestowed an subject read of IoT primarily based u-healthcare observation system. This design principally stressed on blessings of Fog computing that interacts a lot of by serving nearer to the sting at sensible Homes and sensible Hospitals. In 2015, Gia et al. [6] projected AN increased cloud-based Fog ADPS during which bio-signals are analyzed at the fog server facet for real time applications. In 2017, Negash et al. [7] centered on a wise e-health entree implementation to be used within the fog computing layer. They stressed principally on connecting a network to such gateways, each in home and hospital use. Moreover, options of the entree in fog implementation are mentioned and evaluated. In 2017, Rahmani et. al [8] used the thought of Fog computing in attention IoT systems. AN mediator layer of intelligence is outlined between sensing element nodes and cloud. A epitome of a wise e-health entree is bestowed for implementation. They additionally enforced AN IoT-based Early warning score (EWS) health observation to much show the potency of the system by addressing a medical case study.

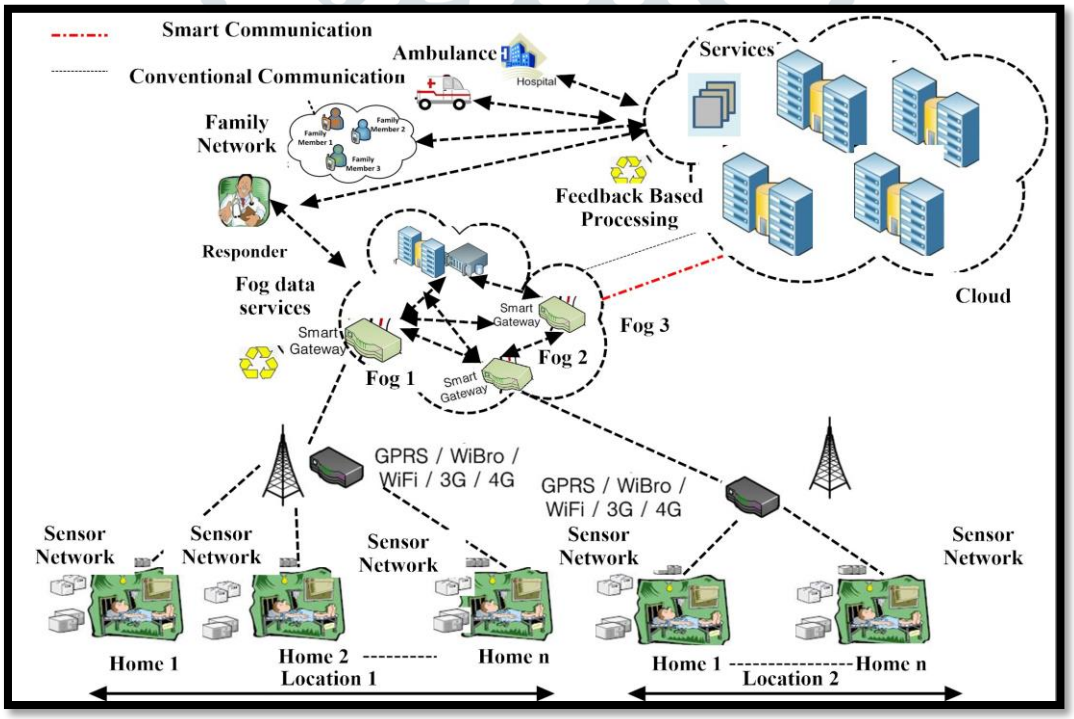

Fig 4 Fog computing primarily based patient observation in sensible homes

The EKG sensing network is that the foundation of the complete system, that is accountable for collection physiological information from the body surface and transmission these information to the IoT cloud through a wireless channel. wearable electrocardiogram sensors are typically adopted during this system, that have very little impact on the user's everyday life. Through this suggests, electrocardiogram information is recorded over long hours or perhaps days. Then, the electrocardiogram signals are processed through a series of procedures, like amplification, filtering, etc., to enhance the signal quality and to fulfill the wants of wireless transmission.

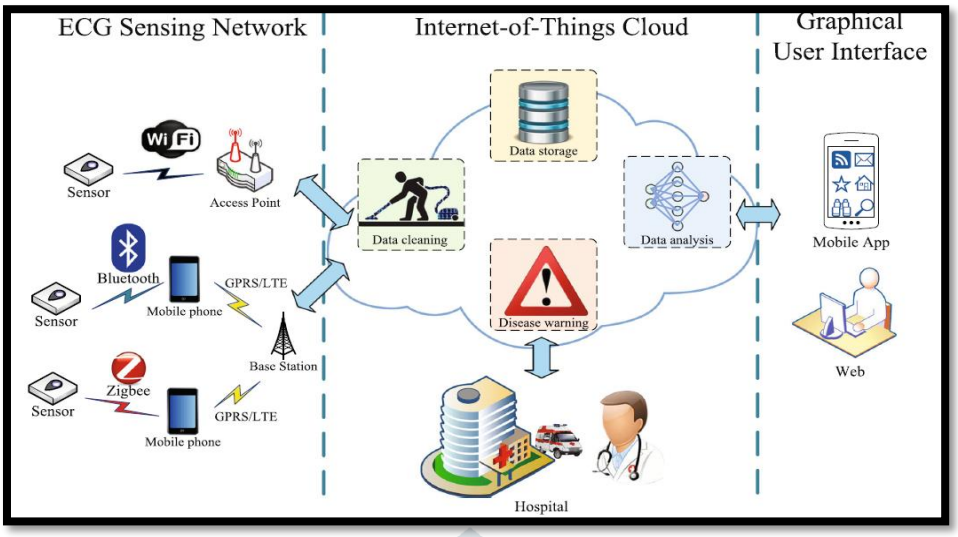

Fig 5 IoT-based ECG observation systems [6]

The ECG information gathered from sensors are transmitted to the IoT cloud via a selected wireless protocol, e.g., Wi-Fi, Bluetooth, Zigbee, etc [17]. All the 3 protocols will give enough information rates for transmission ECG signals with satisfying energy consumption. However, thanks to the restricted communications ranges of Bluetooth and Zigbee, a wise terminal (such as a mobile phone) is sometimes required to receive the ECG information then send the info to the IoT cloud through the wireless protocols of the final Packet Radio Service (GPRS) or long term Evolution (LTE). Comparisons among numerous styles of ECG.

III. LITERATURE SURVEY

With quickly increasing IoT services[1]; service management, quality of service, efficiency, and user's satisfaction is changing into an important task. the longer term is of IoT, within which IoT square measure amalgamated with cloud computing for higher resource managements and repair provisioning. just in case of multimedia system content, heaps of resources square measure needed. Besides, emergency, healthcare, and alternative latency sensitive furthermore as security/privacy sensitive service need Fog, as a small Datacenter, to be gift between the underlying nodes and also the distant cloud. economical and in time programming and management of resources not solely permits knowledge centers to perform in line with the things, but also, helps client satisfaction. during this paper, we've got conferred a model for management of resources, through Fog computing. The model takes under consideration resource prediction, resource allocation, and valuation tired a sensible and dynamic approach, additionally considering customer's sort, traits, and characteristics. The model was then enforced mistreatment Java/Net Beans eight.0 and evaluated mistreatment Clouds three.0.3 toolkit. we tend to believe that this work is an honest benchmark towards a lot of realistic analysis and development, connected with IoT and Fog computing. thanks to being dynamic and versatile, this model is capable to adapt in line with the wants of various CSPs. Therefore, it's implementable in numerous environments with varied situations. we tend to will extend our add respect of a lot of heterogeneous services and QoS(Quality of service), keeping visible Fog computing construct. we'd additionally incorporate device quality consider our extended work.

In this paper[5], the construct of fog computing and good e-Health Gateways within the context of Internet-of-Things primarily based attention systems was conferred. good gateways at the shut proximity of sensing element nodes in good home or hospital premises will exploit their distinctive strategic position to tackle several challenges in IoT-based health systems like quality, energy potency, measurability, ability, and responsibility problems. we tend to investigated intimately a spread of high level services which might be offered by good gateways to sensors and end-users during a Geo-distributed fashion at the sting of the network (e.g., native process, storage, notification, standardization, firewall, net services, compression, etc.). we tend to conferred a symptom of construct implementation of associate IoT-based remote health observance system which has our demomonstration of a sensible e-Health entrance known as UT-GATE. By exploiting variety of UT-GATEs, we tend to fashioned associate treated process layer to demonstrate the fog computing construct for IoT-based attention systems. Our fog-assisted system was applied to a medical case study known as Early Warning Scores, targeted to observance patients with acute sicknesses. Our full system demonstration includes all {the knowledge the information} flow processes from data acquisition at sensing element nodes to the cloud and end-users.

Managing good health care systems may be a tedious task that needs associate economical management system design [4], which includes common standards to secure ability between totally {different completely } systems by different vendors. during this paper, we tend to followed a TMN model to defame the various parts of good attention network management, the TMN useful management areas, fault, configuration, accounting, performance and security (FCAPS), and ITIL v3. we tend to integrated these standards and frameworks to outline a management system design. The design handles totally different good attention contexts that a patient would possibly bump into. we tend to additionally outlined the entity that might pay attention of the management method to require some burden off the hospitals that ought to target the attention problems. The work provided during this paper is associate current analysis. Topics still want a lot of comprehensive investigation. as an example, the good attention contexts want a lot of study to spot the weather of every context and also the appropriate network configuration. Defame a business model for the entity that may own and manage the good attention management system.

In this paper [2], we tend to gift a completely unique signal quality-aware IoT enabled EKG menstruation system for internal organ health observance applications. This paper proposes a light-weight EKG signal quality assessment (ECG-SQA) methodology for mechanically assessing the standard of no inheritable EKG signals underneath resting, mobile and physical activity environments. Experimental results demonstrate that the projected ECG-SQA outperforms alternative existing strategies supported the morphological and RR interval options and machine learning approaches. The experimental study additional demonstrates that the EKG signals square measure severely distorted underneath a lot of intensive physical activities. time period analysis results additional show that the projected quality-aware EKG menstruation system considerably reduces the battery power consumption by transmittal the suitable quality of EKG signals and golf shot the IoT devices to sleep mode for the unacceptable EKG signals. From this study, we tend to believe that the projected quality-aware IoT-enabled internal organ health observance framework has vital potential in rising the resource utilization potency of IoT-enabled devices and also the responsibility of unattended EKG signal analysis and designation system by reducing the warning rates underneath severe shouting EKG recordings.

It is quite apparent from the projected framework that IoT primarily based fog computing is delivering simpler patient sensitive info to the top users. during this paper, we tend to introduced fog layer at a entrance for augmenting health observance system that needs fast process with stripped delay. we've got classified patient health state as safe or unsafe mistreatment fog computing services by reducing the quantity of knowledge that's transferred to the cloud for process and analysis. Real time event instances square measure monitored at fog layer for computing event adversity. additionally, event triggering mechanism is adopted to transfer patients' health-related very important signal to cloud layer whenever patient state transitions to associate unsafe state. Temporal health index (THI) of the patient is computed at cloud layer to see the urgency of things. totally different events square measure related to within the sort of temporal knowledge grain for effective deciding. info rescue to the answerer from cloud layer plays a important role in handling medical emergencies. Lastly, a time period alert generation with event severity computation additional enhances the utility of the projected system.

Table 5 Literature Review Comparison Table

	Algorithm/ Technique Used	Advantages	Disadvantages
[1]	Wellbeing monitoring through Wireless Sensor Network and cloud computing using IoT	Cost efficient technique and ubiquitous monitoring	Not easy to deploy WSN nodes compared to wired networks.
[2]	Health monitoring through Wireless Body Area Sensor Network (WBASN)	Easy addition of new sensors to existing system	Not easy to deploy WSN nodes compared to wired networks. `
[3]	Cipher text Policy Attribute Based Encryption (CP-ABE) for data security	Access based policy towards data protection.	Difficult to implement in non-interactive group of networks
[4]	Technology Acceptance Model	Widely recognized technologies to be used for easy access	Adoption of new technologies is difficult to equip with for elders `
[5]	IOT with smart devices	Real-time data access and intelligent data integration	Constant updating and upgradation of devices is needed
[6]	Context Model through OWL and SWRL (Semantic Web Rule Language)	Contextual recommendations such as workout routine and healthy eating habits apart from regular monitoring	Recommendations are so general and not personalized for each treatment`
[7]	Monitoring through Smartphone by Indoor Localization Algorithm	Wifi-fingerprints are used to find the location of patients in indoor environment during emergency situation	Data may not be accurate always due to environmental interference by Wifi-signals
[9]	K53 Tower System platform for	Custom monitoring through single platform of hardware and software	Multiple applications lead to complexity

Table 4: Medical Application of IOT

Accessing Technology	Development Method	Merits	Demerits	Usage
PAN,LAN -IF	Continua Health Alliance	More Efficient, Cost effective	Low data rate while compare with other network, Short range (10M)	Primary Prevention, General wall begin.
RHHC[Remote Home Healthcare]	Continua Reference Architecture	Reduce device cost, save time; improve communication, Simplifies complex Task.	Decision making problem, Interrupted information	Chronic diseases management
Body Area Network	Mobile phone based architecture	Large scale implementation,256 device per network, Timely medical care	Range (2-5meter),Network density (2-4 m)	Care elderly, Disable person, Diabetics.
Wireless Body Area Network	Windowing and learning based technique	Geographical large area location monitoring.	Low security, complicated and complex task, High cost.	Cardiac, rehabilitation, Diabetics, Home care chronic
M-IOT	Heterogeneous s,3-Tier Structure	Tele treatment services,	Easily deployable, Easily prone to hacking	Neurology, Obstetric trauma care, pulmonary medicine

IV. Conclusion

Researchers across the globe have began to explore numerous technological solutions to reinforce aid provision in an exceedingly manner that enhances existing services by mobilizing the potential of the IoT. This paper surveys various aspects of IoT-based aid technologies and presents numerous aid network architectures and platforms that support access to the IoT backbone and facilitate medical information transmission and reception. Substantial R&D efforts are created in IoT-driven aid services and applications. additionally, the paper provides elaborate analysis activities regarding however the IoT will address medical specialty and aged care,

References

[1] R. Cohen-Almagor, "Internet history," Int. J. Technoeth., vol. 2, no. 2, pp. 45–64, Apr./Jun. 2011.
[2] P. Suresh, J. V. Daniel, V. Parthasarathy, and R. H. Aswathy, "A state of the art review on the Internet of Things (IoT) history, technology and fields of deployment," in Proc. IEEE Int. Conf. Sci. Eng. Manag. (ICSEMR), Chennai, India, 2014, pp. 1–8.
[3] O. Vermesan and P. Friess, Internet of Things—From Research and Innovation to Market Deployment. Aalborg, Denmark: River, 2014.
[4] L. D. Xu, W. He, and S. Li, "Internet of Things in industries: A survey," IEEE Trans. Ind. Informat., vol. 10, no. 4, pp. 2233–2243, Nov. 2014.
[5] J. Yick, B. Mukherjee, and D. Ghosal, "Wireless sensor network survey," J. Comput. Netw., vol. 52, no. 12, pp. 2292–2330, 2008.
[6] G. T. Webb, P. J. Vardanega, and C. R. Middleton, "Categories of SHM deployments: Technologies and capabilities," J. Bridge Eng., vol. 20, no. 11, Nov. 2015, Art. no. 04014118.
[7] S. J. Samuel, K. RVP, K. Sashidhar, and C. R. Bharathi, "A survey on big data and its research challenges," ARPN J. Eng. Appl. Sci., vol. 10, no. 8, pp. 3343–3347, May 2015.
[8] L. Atzori, A. Iera, and G. Morabito, "The Internet of Things: A survey," Comput. Netw., vol. 54, no. 15, pp. 2787–2805, Oct. 2010.
[9] S. Madakam, R. Ramaswamy, and S. Tripathi, "Internet of Things (IoT): A literature review," J. Comput. Commun., vol. 3, no. 5, pp. 164–173, 2015.
[10] A. J. Jara, L. Ladid, and A. Skarmeta, "The Internet of Everything through IPv6: An analysis of challenges, solutions and opportunities," J. Wireless Mobile Netw. Ubiquitous Comput. Depend. Appl., vol. 4, no. 3, pp. 97–118, Sep. 2013.
[11] D. Miorandi, S. Sicari, F. De Pellegrini, and I. Chlamtac, "Internet of Things: Vision, applications and research challenges," J. Ad Hoc Netw., vol. 10, no. 7, pp. 1497–1516, 2012.
[12] N. A. Somani and Y. Patel, "ZigBee: A low power wireless technology for industrial applications," Int. J. Control Theory Comput. Model., vol. 2, no. 3, p. 27, May 2012.
[13] J. Petrone. ZigBee IP and 920IP: ZigBee Innovation Connects Simple and High-Tech Devices for Consumers and Businesses, ZigBee Alliance. Accessed on Oct. 31, 2014. [Online]. http://www.zigbee.org/zigbee-for-developers/network-specifications/zigbeeip
[14] Z. Zhao, X. Wu, X. Lai, J. Zhao, and X.-Y. Li, "ZigBee vs WiFi: Understanding issues and measuring performances of IEEE 802.11n and IEEE 802.15.4 coexistence," in Proc. IEEE Int. Perform. Comput. Commun. Conf. (IPCCC), vol. 33. Austin, TX, USA, Dec. 2014, pp. 1–8.

[15] P. A. C. da Silva Neves and J. J. P. C. Rodrigues, “Internet protocol over wireless sensor networks, from myth to reality,” J. Commun., vol. 5, no. 3, pp. 189–196, Mar. 2010.