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A COMPREHENSIVE STUDY OF IOT IN HEALTH CARE

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Abstract

IoT in health care has a goal of empowering people to live healthier life by wearing connected devices. Health care industry has perpetually been on the forefront in the adoption and utilization of information and communication technologies (ICT) for the efficient health care administration. Recent developments in wireless sensors, communication and information network technologies have created a new age of the Internet of things (IoT). Connected health care is a key factor application of the Internet of Things. The concept of connected health care system and smart medical devices bears large potential not just for association, but also for the well-being of people in general. Hospitalized patients whose physiological status requires large attention can be constantly monitored using IoT-driven monitoring. This type of solution operate sensors to collect extensive physiological data and uses gateways and clouds to analyze and restore the data and then send the analyzed information wirelessly for further analysis and review technique. It replaces the process of having a health professional come by at regular days of intervals to check the patient's important signs, instead of providing a continuous automated flow of information. The main goal of this work is to give a extensive overview of this area of research and sensors used in health monitoring device, how the wearable health monitoring systems works, capture the data and generate different reports based on different parameters.

Index Terms**:** *Monitoring device, Connected health care, Wearable, Automated information*.

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1. INTRODUCTION

The world is undergoing an remarkable technological transformation, evolving from isolated systems to ubiquitous Internet-enabled 'things' capable of generating and exchanging vast amounts of valuable data. This novel paradigm, generally referred as the Internet of Things (IoT), is a new reality that is enriching our everyday life, increasing business productivity, and improving government efficiency. In the IoT era, daily usage objects are becoming smarter, and start to play a key role in surrounding infrastructures. From a simple smart street lamp to a complex smart city or from a simple industrial controller to a complex smart factory, this flourish of interconnected devices promise to drive a plethora of applications with technological, economic, and social excess. Medical care as well as health care represent one of the most attractive application areas for the IoT. The IoT has the potential to give rise to many medical applications such as remote health monitoring, fitness programs, chronic diseases, and elderly care. Agreement with treatment and medication at

house and by healthcare providers is another important potential application. hence, different medical devices, sensors, and diagnostic and imaging devices can be viewed as smart devices or objects constituting a core part of the IoT. IoT-based healthcare services are expected to minimize costs, improve the quality of life, and enrich the user's experience. From the point of view of human services suppliers,the IoT has the potential to reduce device downtime through remote provision. In addition, the IoT can correctly identify optimum times for fill supplies for various devices for their smooth and continuous operation. Further, the IoT provides for the ef_cient scheduling of limited resources by ensuring their good use and service of more patients. Fig. 1 illustrates recent healthcare trends Simplicity of financially savvy collaborations through consistent and secure availability crosswise over individual patients, facilities, and medicinal services associations is a critical pattern. State-of-the-art human services systems driven by remote advances are relied upon to help endless ailments, early determination, ongoing checking, and medicinal crises. Gateways, medical servers, and health databases play vital roles in creating health records and delivering on-demand health services to authorized stakeholders.

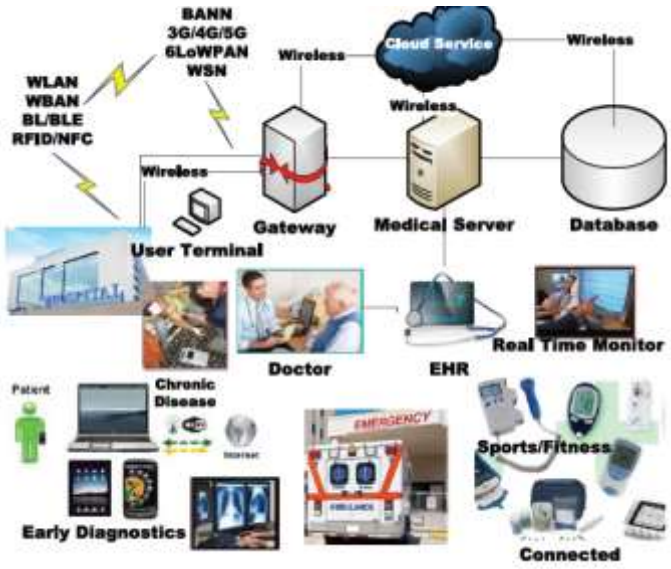

Fig-1:Healthcare Trends.

1.1 IoT and Healthcare

To become better human health and well-being is the last goal of any economic, technological and social development. The concept of the IOT entails the use of electronic devices that capture or monitor data and are connected to a private or public cloud, enabling them to automatically trigger certain events. Nowhere does the IOT offer quality promise than in the field of healthcare. McKinsey Global Institute in its report presents forecast and economic feasibility of IOT powered healthcare, which states that by 2025 the largest percentage of the IOT incomes will go to healthcare Internet-connected devices, introduced to patients in various forms, enable tracking health information what is vital for some patients. This creates an opening for acute devices to deliver more valuable data, lessening the need for direct patient-healthcare professional interaction. With faster, better insights, providers become better patient care, chronic disease management, hospital administration and supply chain efficiencies, and provide medical services to more people at reduced costs. The IOT has already brought in significant changes in many region of healthcare. It is rapidly changing the healthcare scenario by attention on the way people, devices and applications are connected and interact with each other. Hence, it can be concluded that the prominent technology breakthrough of the IOT will offer promising solutions for healthcare, creating a more revolutionary archetype for healthcare industry developed on a privacy/security model. A seprate technologies and architectures of IOT for healthcare can be found in various papers , but next building elements are usual for all of them:

- Sensors that gather data (medical sensors attached with the patient to measure vital parameters, and the environmental sensors which monitor the surroundings of the patient);
- Microcontrollers that action, examine and wirelessly communicate the data;
- Microprocessors that allow rich graphical user interfaces; and
- Healthcare-specific gateways through which sensor data is further examine and forword to the cloud.

2. RELATED WORK

Providing the healthcare services is very important for people especially who have chronic diseases. These people need continuous healthcare which cannot be provided outside the hospital. There are many reasons which motivate to carry out the work:

- Making the healthcare more accessible for all the people who do not have access to healthcare providers and for people who do not have access to public transportation in order to go to hospitals;
- Giving medical staff more time to attend the patients who need more care;
- Preventing the delays in arrival of the patients' medical information to the healthcare providers, particularly in any accident or emergency situations;
- Reducing manual data entry for patients' data which allows medical staff to monitor their patients efficiently.

3. IOT HEALTHCARE SERVICES

1) AMBIENT ASSISTED LIVING (AAL)

To the greatest extent, neither a smart home nor a typical IoT-based medical service is inescapably supposed to offer specialized services to elderly individuals. That is, a separate IoT service is obligatory. An IoT platform powered by artificial intelligence that can address the health care of aging and bedridden individuals is called ambient assisted living (AAL). The purpose of AAL is to extend the independent life

of elderly individuals in their place of living in a convenient and safe manner. Solutions provided by ambient assisted living services can make elderly individuals confident by ensuring greater sovereignty and giving them human-servant-like assistance in case of any problem. Several studies have discussed ambient assisted living based on the IoT. A modular architecture for automation, security, control, and communication is proposed for IoT-based AAL, in This architecture basically serves as a framework for providing healthcare services to elderly and incapacitate individuals. As the underlying technology for implementing this framework, 6LoWPAN is used for the active communications, and the radio frequency identification (RFID) and near held communications (NFC) are used for the passive communications. This framework has been extended by incorporating algorithms based on medical knowledge to detect the problems facing elderly individuals.

2) THE INTERNET OF m-HEALTH THINGS (m-IoT)

As shown, m-health is nothing but mobile computing, medical sensors, and communications technologies for healthcare services. In theory, m-IoT familiarizes a novel healthcare connectivity model that connects the 6LoWPAN with evolving 4G networks for future internet-based m-health services. Although m-IoT characteristically represents the IoT for healthcare services, it is worth mentioning that there exist some specific features intrinsic to the global mobility of participating entities. This leads to the conceptualization of m IoT services. The use of m-IoT services has been examined based on the potential of m-IoT for the noninvasive sensing of the glucose level, and the m-IoT architecture, implementation issues and challenges are addressed in. Context-aware issues and m-IoT ecosystems are two different challenges in m-IoT services.

3) ADVERSE DRUG REACTION (ADR)

An unpropitious drug reaction (ADR) is an injury from taking a medication. This may happen after a single dose of a drug or its lenghten administration or as a consequence of a combination of two or more drugs. Because the ADR is inherently generic, that is, not specific to the medication for a particular disease, there is a need to separately design certain common technical issues and their solutions (called ADR services). Here the patient's end identifies the drug by means of barcode/NFC-enabled devices. With the help of a pharmaceutical intelligent information system, this information is then coordinated to sense whether the drug is compatible with its allergy profile and electronic health record. The iMedPack has been developed as part of the iMedBox to address the ADR by making use of RFID and controlled delimitation material (CDM) technologies.

4) COMMUNITY HEALTHCARE (CH)

Community healthcare monitoring comes with the concept of establishing a network covering a region around a local circle. This may be an IoT-based network around a municipal hospital, a residential area, or a rural and urban community. The sequence of several such networks can be realized as a cooperative network structure. In this regard, a specialized service called community health care (CH) is inevitable for meeting collective technical requirements as a package. A cooperative IoT platform for rural and urban healthcare monitoring has been proposed and found to be energy-efficient. Here a different authentication and authorization mechanism should be incorporated because it is a cooperative network. This network amalgamate multiple wireless body area networks (WBANs) to materialize CH. The anatomy of a community medical network can be viewed as a ``virtual hospital." A resident health information service platform based on a functional framework of a four-layer anatomy has been considered

5) CHILDREN HEALTH INFORMATION (CHI)

Raising awareness around children's health and cherish the general public as well as children themselves on needs of children with emotional, behavioral, or mental health problems and their family members are crucial. This has motivated developers to enlarge a specialized IoT service called children health information (CHI) to address this need in an effective manner. In this view, an interactive emblem placed in a pediatric ward atonement CHI services and goal at educating, amusing, and legitimize hospitalized children is proposed , and an IoT-based m-health service that can inspire children to acquire good nutritional habits.

6) WEARABLE DEVICE ACCESS (WDA)

Various nonintrusive sensors have been developed for a diverse range of medical applications, particular for WSN-based healthcare services. Such sensors are approching enough to deliver the same services through the IoT. On the other hand, wearable devices can come with a set of desirable features appropriate for the IoT framework. Therefore, the integration of aforementioned sensors into wearable products is ostensible. However, the amalgamate nature of wearable products and medical sensors discovers diverse challenges for researchers and developers working toward the said integration. In this situation, a dedicated service called wearable device access (WDA) is required. This method introduces a prototype system that can be used in a wide variety of healthcare applications through various mobile computing devices such as Smartphone and smart watches.

7) SEMANTIC MEDICAL ACCESS (SMA)

The use of semantics and ontology’s to share large amounts of medical information and knowledge has been widely considered. The wide potential of medical semantics and ontology’s has received close attention from designers of IoT-based healthcare applications. Placing medical semantics and ontology’s on the top of the IoT calls for a separate service called semantic medical access (SMA). IoT healthcare applications employ medical rule engines to analyze massive amounts of sensor data stored in the cloud. Ubiquitous data-accessing methods that can collect, integrate, and interoperate IoT data for emergency medical Services. Several studies have

discussed semantic medical issues in the context of the IoT environment.

8) INDIRECT EMERGENCY HEALTHCARE (IEH)

There are many serious condition where healthcare matter are a heavily involved, including adverse weather conditions, transport (aviation, ship, train, and vehicle) accidents, earthen sites collapse, and fire, among others. In this context, a dedicated service called indirect emergency health care (IEH) can be offer a bundle of solutions such as information availability, alter notification, post-accident action, and record keeping. To the authors' knowledge, no major study has addressed these issues in serious health care based on IoT networks. In this regard, there is a need to address the question of how proper healthcare systems can be envisioned.

9) EMBEDDED GATEWAY CONFIGURATION (EGC)

The embedded gateway configuration (EGC) utility is an architectural service that connects different network nodes (to which patients are directly connected), the Internet (to which required servers and clients are directly connected), and other medical apparatus. From a service perspective, although a gateway may emerge with different characteristics, this requires some common integration features depending on the specific purpose of the deployed gateway. It is in this regard that the notion of the EGC service becomes compatible. As part of a ubiquitous healthcare system, a good example of an EGC service is found . Here the service grant for automated and intelligent monitoring.

10) EMBEDDED CONTEXT PREDICTION (ECP)

To build context-aware healthcare applications over IoT networks, third-party developers require generic architecture with suitable mechanisms, which can be called the embedded context prediction (ECP) service. Such a framework is developed in the context of ubiquitous health care. A number of research challenges in context-aware omnipresent healthcare systems have been discovered. More or less similar research challenges need to be addressed for context-aware healthcare pertinence over IoT networks.

4. ADVANTAGES

- Facilities and evaluation in the practise of intensive medicine to a protective framework for prognosis of dieses at an incipient stage, Coupled with prevention ,cure and overall management of health instead of diseases.
- Enable personalization of treatment and management options targeted particularly to the specific circumstances and needs of the individuals.
- Helps to reduce the cost of health care while simultaneously improving outcomes and improve significantly the monitoring system in ICU.

CONCLUSION AND FUTURE SCOPE

The world is grasp an unprecedented technological trend for connecting billions of devices. The Internet of Things is a new paradigm that is enriching our daily life, and promises to drive significant changes and cause a huge impact in modern healthcare, by allowing a more personalized, preventive and collaborative form of care. In this paper we presented We-Care, an IoT-based health care system designed to monitor and collect vital data of people. The system is able to detect faults, as well as the absence of vital signs, triggering alerts in case of emergency situations. The wearable device, to be integrated on a easy, discrete and comfortable wristband, offers a suitable solution to be used by any elderly person at home. The developed web application gathers all the data retrieved and sent by the wristband to the server, and is also able to remotely alert the caretaker or medical staffs in the case of emergency events. The stored data can later be used for examine, which may help medical staff to trace the evolution of their patients. The adopted IoT architecture enables the WE-Care system to co-exist with existing technology, since it follows a standardized protocol stack.

In future this work can be extended by adding the ECG sensors to the existing set-up. This work is done based on single person's data collection and in future this can be extended to multiple people.

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