Sensing and Supervising through IOT

Ashwini Kumar Jha
Asst. Professor
Computer Department
MBICT Engineering College,
Anand, India

ABSTRACT
A continuous monitoring of industrial machine, electronic device, biomedical device, human health or any living , non-living objects life have been one of the toughest task encountered till date. Diabetes, Blood pressure and the machinery health require constant observation. The emergence of technology has worth given the society ways to overcome such barriers. Sensor networks with the help of Internet of thing are now capable of providing and cater timely information about the health to the concerned department. This paper deals the case of human health, IOT would require to have live capable devices which can be stitched or implanted in human body , devices such as cochlear implant and pacemakers will sense and send the data to the concentrator or any hand held device like mobile phone carried by man, in turn the collected information will be sent to the cloud for several forms of analysis, the analyzed data will in turn be supplied to the clinics display unit constantly, based on which clinics will be able to take decisions, suggest appropriate actions on the patients health. Over and above devices will also sense each other and act upon data as programmed.

Keywords
IoT, Internet of Things, Prognosis, Diagnosis, Monitoring, Wearable Devices, Sensors, RFID, ZigBee

1. INTRODUCTION
You can't eat bits, burn them to stay warm or put them in your gas tank. Ideas and information are important, but things matter much more. Yet today's information technology is so dependent on data originated by people that the computers know more about ideas than things. If I had computers that knew everything there was to know about things—using data they gathered without any help from us—I would be able to track and count everything, and greatly reduce waste, loss and cost. We would know when things needed replacing, repairing or recalling, and whether they were fresh or past their best. The Internet of Things has the potential to change the world, just as the Internet did. [1]

[The first time the term "Internet of Things" was officially used in a publication back in 1999, where Kevin Ashton published his vision in the RFID Journal]

INTERNET of Things (IoT) has been emerging as the next big thing in Internet. It is envisioned that billions of physical things or objects will be outfitted with different kinds of sensors and actuators and connected to the Internet via heterogeneous access networks enabled by technologies such as embedded sensing and actuating, radio frequency identification (RFID), wireless sensor networks, real-time and semantic web services, etc. Among the array of applications enabled by the Internet of Things (IoT), smart and connected health care is a particularly important one. Networked sensors, either worn on the body or embedded in the living environments, make possible the gathering of rich information indicative of the physical and mental health. Captured on a continual basis, aggregated, and effectively mined, such information can bring about a positive transformative change in the health care landscape [2]. The availability of data at unimagined scales together with a new generation of intelligent processing algorithms can:

a) Facilitate an evolution in the practice of medicine, from the current post-facto diagnose-and treat reactive paradigm, to a proactive framework for forecast of diseases at an initial stage, coupled with prevention, cure, and overall management of health instead of disease.

b) It makes possible, personalization of treatment and management options targeted particularly to the specific conditions and needs of the individual.

c) It helps to reduce the cost of health care while simultaneously improving result. This paper highlights the opportunities and challenges for IoT in realizing this vision of the future health care.

d) Well being (Health) of the Bio medical wearable devices

2. LITERATURE SURVEY
Wearable devices don't get much more conformable than the Biostamp. Developed by Massachusetts-based startup MC10, the Biostamp is a sensor-embedded flexible material that can be applied to the skin like a Band-Aid or temporary tattoo. It can measure body temperature, heart rate, brain activity, hydration levels, and more, and the data can be uploaded to a Smartphone for analysis. Recent years have seen a rising interest in wearable sensors and today several devices are commercially available for personal health care, fitness, and activity awareness Figure1 [3]-[4]. Based on current technological trends, one can readily imagine a time in the near future when your routine physical examination is preceded by a two–three day period of continuous physiological monitoring using inexpensive wearable sensors. For instance Cloud-enabled remote health monitoring application [5] proposes a system that recruits wearable sensors to measure various physiological parameters such as blood pressure and body temperature Sensors transmit the gathered information to a gateway server through a Bluetooth connection.

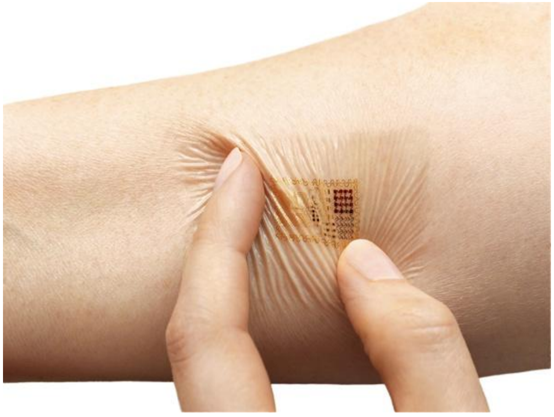

Figure 1: Biostamp

The gateway server turns the data into an Observation and Measurement file and stores it on a remote server for later retrieval by clinicians through the Internet. Utilizing a similar cloud based medical data storage, a health monitoring system is presented in a cloud computing solution for patient's data collection in health care institutions [6] in which medical staff can access the stored data online through content service application.

In addition to the technology for data gathering, storage and access, medical data analysis and visualization are critical components of remote health monitoring systems. Accurate diagnoses and monitoring of patient's medical condition relies on analysis of medical records containing various physiological characteristics over a long period of time. A device utilizing the IoT scheme is uniquely addressed and identifiable at anytime and anywhere through the Internet. IoT based devices in remote health monitoring systems are not only capable of the conventional sensing tasks but can also exchange information with each other, automatically connect to and exchange information with health institutes through the Internet, significantly simplifying set up and administration tasks.

3. STRUCTURAL DESIGN

3.1 Data Acquisition

Data Acquisition is performed by multiple wearable sensors that measure physiological biomarkers, such as ECG, skin temperature, respiratory rate, EMG muscle activity, and gait (posture). The sensors connect to the network through an intermediary data aggregator or concentrator, which is typically a smart phone located around the patient.

3.2 Data Transmission

Data Transmission components of the system are responsible for conveying recordings of the patient from the patient's house (or any remote location) to the data center of the Healthcare Organization (HCO) with assured security and Privacy, ideally in near real time. Transmission Technology Zigbee or low-power Bluetooth, which it uses to transfer sensor data to the concentrator, Sensors in the data acquisition part form an Internet of Things (IoT)-based architecture as each individual sensor's data can be accessed through the Internet via the concentrator [7] [8].

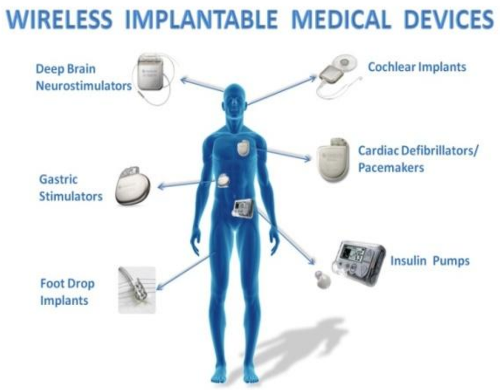

Figure 2: Wearable devices

3.3 Cloud Processing

Cloud Processing have three distinct components: storage, analytics, and visualization. The system is designed for long term storage of patient's biomedical information as well assisting health professionals with diagnostic information Cloud based medical data storage and the upfront challenges have been extensively addressed in the literature[9].

4. ACQUIRING AND SENSING DATA

1. Physiological data is gathered by wearable devices that combine tiny sensors capable of measuring various physiological parameters, slight preprocessing hardware and a communications platform for transmitting the calculated data.

2. The wearing condition, poses physical restrictions on the design of the device. The device must be minute and light, and should not hinder a patient's actions and mobility.

3. The low power operation condition can also create a challenge for the quality of the data aggregated in terms of the realizable signal to noise ratio.

4. An IoT based monitoring architecture facilitates the execution of such schemes for improving energy efficiency adaptively by allowing dynamic utilization of sensors based on the context.

5. Energy restriction of these devices necessitates the use of suitable low power communication protocols, as the communication can account a significant part of the power consumption in sensing devices. ZigBee over IEEE 802.15.4 is commonly used in low rate WPANs.

6. Bluetooth low energy (BLE) is another wireless communication protocol suitable for low power short range communication suitable for the unique requirements of applications such as health monitoring, sports, and home entertainment.

5. STORING AND PROCESSING CLOUD DATA

Data amassed by the concentrator needs to be transmitted to the cloud for long term storage. Offloading data storage to the cloud offers benefits of scalability and accessibility on demand, both by patients and clinical institutions. As previously indicated, smart phones can act as concentrators in IoT infrastructure as today's smart phones can use Wi-Fi as the backhaul network. Data aggregation can be carried in cloudlet (thorough the Wi-Fi connection between concentrator and the cloudlet).

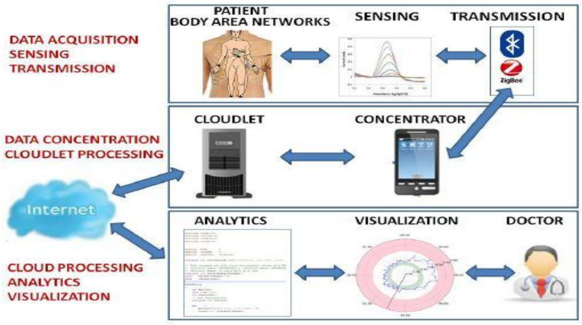

Figure 3: Components of a remote patient monitoring system that is based on an IoT-Cloud architecture

6. ANALYTICS

These rich datasets signify an incredible prospect for data analytics: machine learning algorithms can potentially distinguish connection between sensor observations and clinical diagnoses, and by using these datasets over longer durations of time and by pooling across a large user base, improve medical diagnostics.

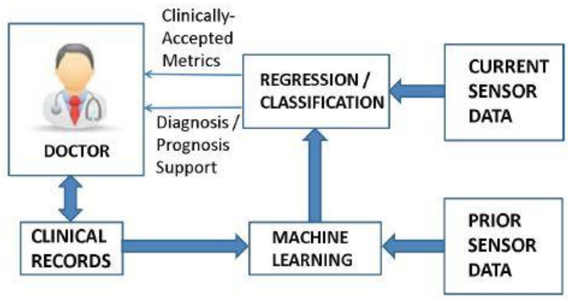

Figure 4: Analytics workflow for systems integrating wearable sensor technology into clinical practice

Analytics on wearable sensor data can abstractly utilize a wide-range of pattern identification and machine learning techniques that have matured significantly and are now normally available as toolboxes in several software packages

This framework for data analytics: the prior sensor data with associated data from the clinical records, mined across many individuals, can form the basis for machine learning where the physician diagnoses that are already part of the clinical record provide the necessary semantic labeling of ground truth once they are appropriately temporally-aligned with the sensor data. The learned classification and regression methodologies can then be used with current data to inform the physician's current prognosis (forecast)/diagnoses

7. CONCLUSION

By analyzing sets of research work it's articulated that the current state and projected future directions for integration of remote health observing technologies into the clinical practice of medicine is possible and effortless. Wearable sensors, mainly those prepared with IoT acumen, offer pretty options for enabling observation and recording of data in home and work environments, over much longer durations that are currently done at office and laboratory visits, apart from primary goal these IoT devices will save time energy and a hefty appointment charges.

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