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IoT ACTION IN HEALTH CARE

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ABSTRACT: In the Internet of Things (IoT), devices gather and share information directly with each other and the cloud, making it possible to collect, record and analyse new data streams faster and more accurately. That suggests all sorts of interesting possibilities across a range of industries: cars that sense wear and tear and self-schedule maintenance or trains that dynamically calculate and report projected arrival times to waiting passengers. But nowhere does the IoT offer greater promise than in thefield of healthcare, where its principles are already being applied to improve access to care, increase the quality of care and most importantly reduce the cost of care. Our embedded technologies being used in applications like tele health systems that deliver care to people in remote locations and monitoring systems that provide a continuous stream of accurate data for better care decisions.Embedded technologies for use throughout IoT-driven healthcare systems, including:

- *Sensors that collect patient data*
- *Microcontrollers that process, analyse and wirelessly communicate the data*
- *Microprocessors that enable rich graphical user interfaces*
- *Healthcare-specific gateways through which sensor data is further analysed and sent to the cloud*

INTRODUCTION:

The Internet of Things (IoT), sometimes referred to as the Internet of Objects, will change everything including ourselves. At present theimpact of Internet already has had on **education, communication, business, science, government, and humanity**. Clearly, the Internet is one of the most important and powerfulcreations in all of human history. Now consider that IoT represents the next evolution of the Internet, taking a huge leap in its ability to gather, analyse, and distribute data that we can turn into information, knowledge, and ultimately, wisdom. In this context, IoT becomes immensely important. Already, IoT projects are under way that promise to close the gap between poor and rich, improve distribution of the world'sresources to those who need them most, and help us understand our planet so we can be more proactive and less reactive. Even so, several barriers exist that threaten to slow IoT development, including the transition to IPv6, having a common set of standards, and developing energy sources for millionseven billionsof minute sensors. However, as businesses, governments, standards bodies, and academia work together tosolve these challenges, IoT will continue to progress. The goal of this paper, therefore, is to educate you in plain and simple terms so you can be well versed in IoT and understand its potential to change everything we know to be true today.

IoT is simply the point in time when more "things or objects" were connected to the Internet than people.In 2003, there were approximately 6.3 billion people living on the planet and 500 million devices connected to the Internet.By dividing the number of connected devices by the world population, we find that there was less than one (0.08) device for every person.

WHY IS IOT IMPORTANT?

Before we can begin to see the importance of IoT, it is first necessary to understand the differences between the Internet and the World Wide Web (or web)terms that are often used interchangeably. The Internet is the physical layer or network made up of switches,routers, and other equipment. Its primary function is to transport information from one point to another quickly, reliably, and securely. The web, on the other hand, is an application layer that operates on top of the Internet. Its primary role is to provide an interfacethat makes the information flowing across the Internet usable. Evolution of the Web Versus the Internet. The web has gone through several distinct evolutionary stages:

STAGE 1.

First was the research phase, when the web was called the Advanced Research Projects Agency Network (ARPANET). During this time, the web was primarily used by academia for research purposes.

STAGE 2.

The second phase of the web can be coined "brochureware." Characterized by the domain name "gold rush," this stage focused on the need for almost every company to share information on the Internet so that people could learn about products and services.

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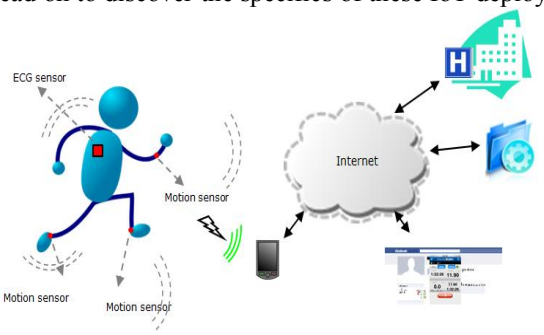
STAGE 3.
The third evolution moved the web from static data to transactional information, where products and services could be bought and sold, and services could be delivered. During this phase, companies like eBay and Amazon.com exploded on the scene. This phase also will be infamously remembered as the "dot-com" boom and bust.

Stage 4.
The fourth stage, where we are now, is the "social" or "experience" web, where companies like Facebook, Twitter, and Groupon have become immensely popular and profitable (a notable distinction from the third stage of the web) by allowing people to communicate, connect, and share information (text, photos, and video) about themselves with friends, family, and colleagues.

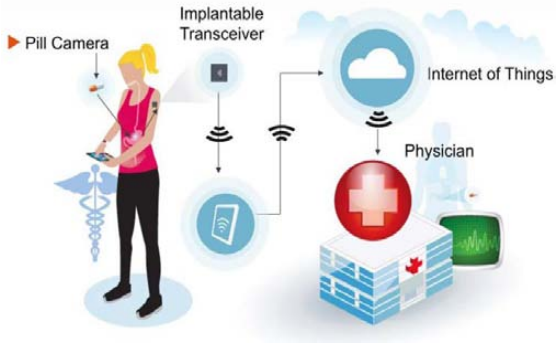
IOT IN ACTION IN HEALTHCARE:

Smart healthcare plays a significant role in healthcare applications through embedding sensors and actuators in patients and their medicine for monitoring and tracking purposes. The IoT is used by clinical care to monitor physiological statuses of patients through sensorsby collecting and analysing their information and then sending analysed patient's data remotely to processing centres to make suitable actions. For example, Masimo Radical-7 monitors the patient's status remotely and reports that to a clinical staff. Recently, IBM utilized RFID technology at of OhioHealth's hospitals to track hand washing after checking each patient. That operation could be used to avoid infections that cause about 90 000 deaths and losing about $30 billion annually. Generally in the case of accidents someone has must intimate to the hospital for getting ambulance, but in the case of IoT whenever accidents are takes place, the wearable devices automatically gives signal to nearest Wi-Fi router and then hospitals to get the ambulance, based upon her health conditions like heartbeats. IoT can be used to supplement patient treatment through remote monitoring and communication, and to keep track of patients as they move through a healthcare facility. Read on to discover the specifics of these IoT deployments.



HELATH CARE USING IOT

Hospitalized patients whose physiological status requires close attention can be constantly monitored using IoT-driven, non invasive monitoring. This type of solution Employs sensors to collect comprehensive physiological information and uses gateways and the cloud to analyze and store the information and then send the analyzed data wirelessly to caregivers for further analysis and review. It replaces the process of having a health professional come by at regular intervals to check the patient's vital signs, instead providing a continuous automated flow of information. In this way, it simultaneously improves the qualityof care through constant attention and lowers the cost of care by eliminating the need for a caregiver to actively engage in data collection and analysis. There are people all over the world whose health may suffer because they don't have ready access to effective health monitoring. But small, powerful wireless solutions connected through the IoT are now making it possible for monitoring to come to these patients instead of vice-versa. These solutions can be used to securely capture patient health data from a variety of sensors, apply complex algorithms to analyze the data and then share it through wireless connectivity with medical professionalswho can make appropriate health recommendations.



Remote Patient Monitoring

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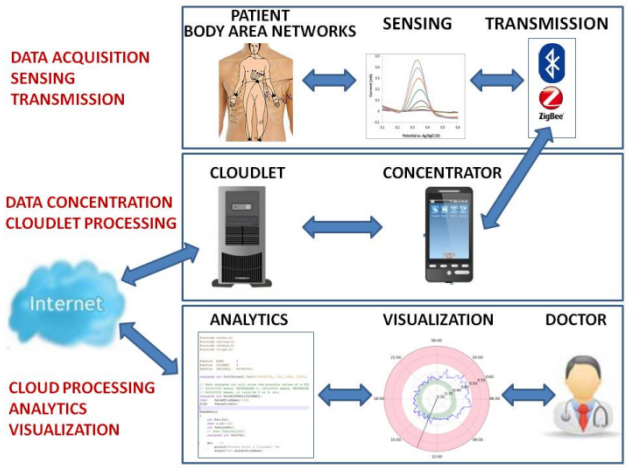
Smart sensors, which combine a sensor and a microcontroller, make it possible to harness the power of the IoT for healthcare by accurately measuring, monitoring and analysing a variety of health status indicators. These can include basic vital signs such as heart rate and blood pressure,as well as levels of glucose or oxygen saturation in the blood. Smart sensors can even be incorporated into pill bottles and connected to the network to indicate whether a patient has taken a scheduled dose of medication.

SYSTEM ARCHITECTURE:

The system architecture for a remote health monitoring system, whose major components described below:



COMPONENTS OF A REMOTE PATIENT MONITORING SYSTEM THAT IS BASED ON AN IOT-CLOUD ARCHITECTURE.

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 though an intermediate data aggregator or concentrator, which is typically a smartphone located in the vicinity of the patient.

Data Transmissioncomponentsofthesystemare responsible forconveying 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. Typically, the sensory acquisition platform is equipped with a

Short rangeradio such as Zigbeeor lowpower Bluetooth, which it uses to transfer sensor data to the concentrator. Aggregated data is further relayed to a HCO for longterm storage using Internet connectivity on the concentrator, typically via a smart phone's WiFi or cellular data connection. Sensors in the data acquisition part form an Internet of Things (IoT)-based architecture aseach individual sensor's datacanbeaccessed through theInternet viatheconcentrator [20],[21].

Often astorage/processing device invicinity ofamobile client,sometimesreferredtoasacloudlet,isusedtoaugment its storage/processing capabilitywheneverthelocalmobile resources do not fulfill the application's requirements [22]. The cloud let can be a local processing unit (such as a desktop computer) which is directlyaccessiblebytheconcentrator through WiFinetwork. In addition to providing temporary storage prior to communication of data to the cloud, the cloudlet can also beused for running time critical tasks on thepatient's aggregated data. Moreover, thecloudlet canbe used totransmit theaggregated datatothecloud incaseof limitationsonthemobiledevicesuchas temporarylackof connectivity orenergy.

Cloud Processing has three distinct components: storage, analytics, andvisualization. The system isdesigned forlong term storage ofpatient's biomedical information aswell assisting health professionals with diagnostic information. Cloud based medical data storage and the upfront challenges have been extensively addressed in the literature[23],[24].*Analytics* that use the sensor data along with e-Health records that are becomingprevalentcanhelpwithdiagnosesandprognoses foranumberofhealthconditions anddiseases. Additionally, *Visualization*isakeyrequirementforanysuchsystembecause it isimpracticaltoaskphysicianstoporeoverthevoluminous dataor analysesfromwearablesensors.Visualizationmethods that make the data and analyses accessible to the mina readily digestible format are essential if the wearable sensors are to impact clinical practice.

IOT HARDWARE DEVICES:

Different type sof Single Board Computers (SBCs)integrated with sensors and built-inTCP/IP and security functionalities are typically used to realize IoT products (e.g.,ArduinoYun, Raspberry PI,Beagle Bone Black,etc.).Such devices typically connect to a central management portal to provide the required data bycustomers.One of the key learning platforms for IoT is the Raspberry Pi. The RasPi is a popular platform because it offers a complete Linux server in a tiny platform for a very low cost. In fact, one of the most difficult parts of using Raspberry Pi for learning about IoT is picking the right

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projects with which to begin. The following figure shows the viewofRaspberryPi2–MODB.

RaspberryPi2-MODB

Windows 10IoT Coreisanew edition of Windows targeted towards small embedded devices and maker boards such as Raspberry Pi2.IoTcoreisdesignedtoworkwithlow-level bus interfaces suchasI2C,SPI,andUSB.Youcanwritea Universal Windows Application using a variety of programming languages in Visual Studio to rapidly create maker projects. You can use Windows 10IoTC or eto read sensor data, control actuators, connect to the cloud, create IoT applications and much more. The Starter Pack from Adfruit includes parts to get you started. Some other boards are also available to perform IoT operations; those are PanStamps, Tiny Duino,RFD uino,Intel Edision,UDOO etc.

CONCLUSION:

In summary, one vision of the future is that IoT becomes a utility with increased sophistication in sensing, actuation, communications, control, and in creating knowledge from vast amounts of data.This will result in qualitatively different life styles from today. What the life styles would be is anyone‘sguess. It would be fair to say that we cannot predict how lives will change. We did not predict the Internet, the Web, social networking, Face book, Twitter, million soap’s for smart phones, etc., and these have all qualitatively changed societies‘lifestyle. Especially for healthcare system, it is most useful to every human. So health problems are easily predicted at the beginning stage based on IoT health care’s system.

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