A Study on Public Health Surveillance Using Internet of Things and Its Applications

T. Madhuri[1], P. Sowjanya[2]

Assistant Professor, Dept. of Computer Science, Vignan's Institute of Information Technology, Duvvada,

Visakhapatnam, Andhra Pradesh, India[1]

M.Tech 2 year, Dept. of Computer Science, Vignan's Institute of Information Technology, Duvvada, Visakhapatnam,

Andhra Pradesh, India[2]

ABSTRACT: Internet of Things (IoT) is the most emerging Technology in the present days. In this paper we want to present the concept of health care surveillance using the Internet of things with few Applications where it can be implemented in the real life. Already the health Care surveillance manually is present and the people get more advantageous by using them through IoT devices. We are giving our views to get those implemented in an efficient and effective manner. We have shown the Integration of Public Health care surveillance and applications of IoT in it. We have given some brief Suggestions such as Fall Detection of Elderly People Who stay in Home Alone, Health condition of Military Persons, Heavy vehicle Drivers Health Check, Patients Surveillance using IoT, Welfare of Blind, Dumb, and Physically Handicapped people using IoT.

KEYWORDS: Emerging Technology, Health Care, Internet of Things, Surveillance.

I. INTRODUCTION

Internet of Things (IoT) is a leading communication paradigm that makes a great future, in which the objects of our life we use every day will be containing electronic controllers, transceivers for digital communication, and some protocol stacks that will help them able to communicate with each other and with the users, becoming an essential part of the Internet. The IoT concept has already made the need of Internet even more important and mandatory to use IoT devices. IoT has enabled easy access and also interaction with a wide variety of devices such as, home appliances, safety cameras, monitoring sensors, actuators, live displays, vehicles position, and so on, the IoT will dramatically improve the development of a number of applications that make use of the potentially a huge amount and variety of data generated by such objects to provide new services to people, organizations, and government. This IoT find application in various domains, such as automation in home and industry, medical surveillance, healthcare by mobile, old people assistance, smart energy management and smart grids, waste management, automotive industry, traffic management, and lots [1].
Health surveillance is a system of frequent health checks of children, students, elderly people and patients. These health checks may be required mainly for employees who are exposed to noise or vibration, pollution, radiation, solvents, fumes, dusts, biological agents and other substances those are extremely hazardous to health, or work. [2]
Public health surveillance is a type of survey that continuously collects systematic analysis and collection of public health-related data that is needed for the planning, implementing, and evaluating public health practice. Such type of surveillance can: help the public health organizations to get an early warning for most of public health emergencies; document the impact of any health problem, or can easily track progress towards specific goals; so they can check and clarify the epidemiology of health problems, to set priorities and to inform public health policy and strategies. [3]
The main aim of this paper is to combine the concepts of IoT and Public Health Surveillance so that this Technology will be more useful and lifesaving. IoT has a main motto to help people in their daily life in home automation, industrial applications in industry automation, safety cameras in banks, homes and ATMS's, vehicle automation, and so on. Internet of Things is not only limited to these but also has hundreds of applications.

II. INTEGRATION OF INTERNET OF THINGS WITH PUBLIC HEALTH SURVEILLANCE

Internet of Things (IoT) and Public Health Surveillance both are successful individually and if they are integrated it will be more helpful to the people. Interestingly, Internet of Things (IoT) has evolved as one of the recent advances in information, digital and communication technologies, and it also has great impact when integrated with health services, especially E-Health. IoT technology connects us with the Internet with various kinds of objects in our daily lives such as sensors and working devices (medical devices, home appliances, etc.) due to their communication and computing capabilities, and this has improved the interaction with our environment. It is anticipated that billions of sensors and actuators will be connected to the Internet via heterogeneous access networks enabled by technologies such as Radio Frequency Identification (RFID), wireless sensor networks, embedded sensing, real time and semantic web services. IoT is going to be applied in areas such as smart city, home monitoring and automation, healthcare, manufacturing, energy and utilities, smart grid, intelligent transportation system, waste management and traffic management.

The use of this new technology, IoT, in healthcare services will bring comfort to patients and physicians because of its vast applications such as real-time monitoring, patient information management system, and health Management system. In E-Health, medical devices such as wearable devices such as smart bands or smart chains can be connected to IoT technology for remote monitoring, real-time monitoring and on-line medical consultations [4].

However, for the dramatically developing world, IoT brings new innovative delivery model for healthcare industry with good quality at affordable level. Proposal of IoT healthcare devices for the developing world are remote consulting, handheld diagnostic devices for detecting contagious diseases. These IoT devices shall have the far wider growth compared to the traditional primary care healthcare systems. It is evident that IoT will facilitate new business models and new healthcare delivery models in the future for both the developing and developed worlds, irrespective of some of the challenges faced at the current time [6].

III. APPLICATIONS OF INTERNET OF THINGS (IOT) AND ITS CAPABILITIES IN PUBLIC HEALTH SURVEILLANCE

IoT has much number of applications such as Smart Homes, Wearable's, Smart City, Smart grid, Industrial automation, Vehicle sector, Health care, Agriculture and so on.
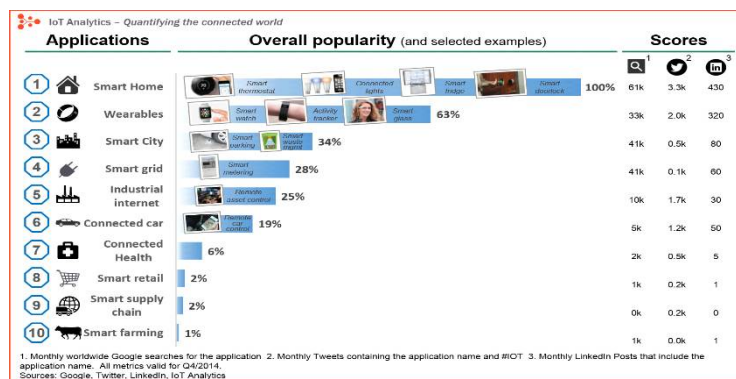

Fig.1: Internet of Things Applications

The above Figure is from a website named IoT Analytics showing the overall popularity of various applications in IoT. There are only 6% people using or known about the medical applications in IoT [9]. Health is the most important aspect of the human life and definitely we should protect our own health condition. These IoT devices will definitely help and also prevent many types of health condition problems.

Smart sensors are the combination of both sensor and a microcontroller which are used in IoT to make accurate measuring possible. They can also help in monitoring and analyzing a various types of indicators for health status.

These can also analyze some basic vital signs such as heart beat and blood pressure, and also levels of glucose or oxygen saturation in the blood.

For smart sensors to work effectively there are many limitations and the microcontroller components must satisfy several essential capabilities such as:
• Low-power operation is essential for extending battery life, and that help make IoT devices as usable as possible. Battery-free devices that utilize solar energy techniques will be so useful.
• Integrated precision-analog capabilities for sensors should be kept and that makes possible to achieve high accuracy at a low cost.
• Graphical user interfaces (GUIs) improve large usability by enabling clear display devices to deliver information in detail and by making it easy to access that information.
Gateways are the information hubs that collect the data from the sensors, analyze it and then communicate it to the cloud via wide area network (WAN) technologies. Gateways can be designed for clinical settings, and later they may be part of larger connectivity resource that also manages energy. Medical device designers can also use the platform to create remote-access devices for remote monitoring.
Wireless networking removes the physical limitations on networking imposed by traditional wired solutions like Ethernet and USB. [10]

Purposes of Health Surveillance
1. Protection to the individual employee health condition.
2. Detection at an early stage and identify if there are any adverse health effects
3. Evaluation of control measures and assisting them.
4. Data can also be used for detection of hazards and risk assessment
5. Other purposes e.g. immune status assessment [4]

IV. MY VIEWS

Health surveillance is useful in detecting minor and major hazards in health condition. So, if it is done through Internet of Things it will be more useful and beneficial to know about health condition of people faster.
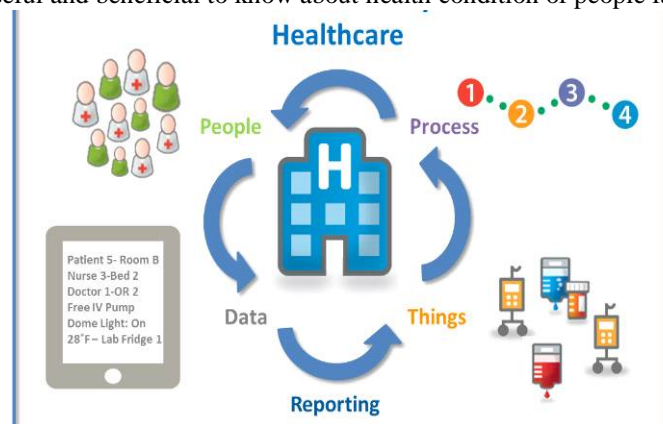

Fig.2: Health surveillance using Internet of Things.

Case 1**:** Fall Detection of Elderly People who stay in Home Alone:
   By using Internet of Things we can detect Health Conditions Such as Fall Detection, Rise in Blood Pressure, Fainting, Heart Attack, Diabetes and any kind of health disorders can be detected and can send the alert sms and intimate the condition to the nearby relatives and even to the ambulance.
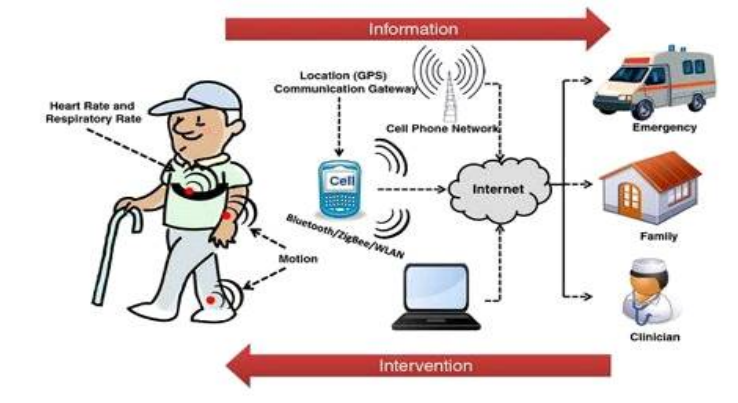
Fig.3: IoT devices assistance to the elderly people

Case 2: Health condition of Military Persons:
By using Internet of Things we can detect health Condition of the army people and intimate to the campaigns nearby.
Indian Army soldier was found alive six days after being buried under 35 feet of snow on Siachen glacier and presumed dead.
    If we use IOT in this situation it might be helpful to get the information of the soldier who is alive for 6 days.
In these types of conditions IOT may be extremely useful.
Case3: Heavy vehicle Drivers Health Check:
  By using Internet of Things we can detect health of the Drivers who drive the Vehicles by having Alcohol and also we can apply automatic breaks if he is sleeping or even suffering from severe health problems such as Heart Attack etc.
4 students killed, several injured in road accident. Initial reports suggest that the driver was inebriated.
   By using smell sensors if IoT detect the Driver if he is drunk then it can intimate it directly to the travels office and they can be alerted.
Case4:Patients Surveillance using IoT:
   By using IoT health condition of the patients can be intimated directly to the concerned doctor or the staff in the hospital and to the relatives.
Case5**:**Welfare of Blind, Dumb, and Physically Handicapped people using IoT:
   By using Smart devices in IoT we can help blind people and alert them if any obstacles are there in their way and intimate them by Bluetooth speaker. Dumb persons can be benefited in order to call anyone nearby.
   In the same way Handicapped can also be useful by creating their schedule and also fall detection can be used here.
In this way Smart Health can be acquired by the people and be more secured. We can use Internet of Things by using Smart Health bands or chains and develop a mechanism in order to save life of people.
      IOT is not limited to these few applications, there are many more examples and these are few important and useful applications.

VI. CONCLUSION

 In this paper we have given some basic introduction of Internet of Things its applications, uses, integrating both IoT and Public Health surveillance and Future developments in the IoT devices in medical field. Internet of Things have wide applications now a day in all fields and coming to the public health surveillance system it becomes more advantageous in saving lives of the people. There are very few medical IoT devices used now a day's compared to other field of the IoT. The ideas in the project are given for the future purpose of development in the particular field. We still have more work to do; we hope this paper will be considered as a starting point identifying opportunities for future.

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BIOGRAPHY

T. Madhuriis presently working as Assistant Professor, Department of Computer Science in Vignan's Institute of Information Technology, Duvvada, Visakhapatnam, Andhra Pradesh, India. Her research interests are Internet of Things, Big Data, Software Safety etc.

P. Sowjanya is doing M.Tech 2 year, Department of Computer Science in Vignan's Institute of Information Technology, Duvvada, Visakhapatnam, Andhra Pradesh, India.Her research interests are Internet of Things, Big Data, Software Safety etc.