

INTERNET OF THINGS FOR SMART HEALTHCARE: A REVIEW ON A POTENTIAL IOT BASED SYSTEM AND TECHNOLOGIES TO CONTROL COVID-19 PANDEMIC

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ABSTRACT:

Healthcare is an important part of life. Sadly, the spread of Covid-19 has strained the majority of health systems and the demand for resources from hospital kits to doctors and nurses have become extremely high. However, the significant advancement in the computing sector have led to the emergence of Internet of Things (IoT) which has now become one of the most powerful information and communication technologies due to its capability to connects object such as medical kits, monitoring cameras, home appliances and so on... Capitalizing on the efficiency of data retrieval from smart objects in the health sector, it is clear that a solution is necessary and required to improve the health sector in the era of Covid-19 pandemic while continuing to provide a high-quality care to patients. In this paper, a real-time covid-19 monitoring system is introduced in a form of an IoT based bracelet that measures body temperature and blood oxygen level, which are essential factors for determining the patient's condition and whether he needs a quick intervention to enter ICU room. The bracelet also has a GPS tracker to determine the patient's commitment to quarantine and social distancing. Based on the study conducted with more than 50 medical stuff, the IoT based bracelet was identified as a promising tool that can help control the spread of the covid-19 virus, by providing a modern access to medical healthcare services anywhere and anytime which is useful for the patient and hospital management stuff.

1. INTRODUCTION

The Internet of Things (IoT) has been globally known as one of the most potential solutions to enhance and boost healthcare systems to a new level. It can be defined as a huge network, in which physical objects/devices are interconnected and can be controlled or monitored remotely. These objects are connected to the Internet and can interact with each other without human intervention. Therefore, they are considered intelligent objects.

There are different types of IoT devices (portable devices, smart thermostats, IP cameras, robots, health monitoring devices ...), and the majority of them have sensors which can automatically detect event and transmit these data to servers. A large amount of this data is collected from different devices, then transmitted using network protocols to servers (cloud) for analysis purposes, and finally the results are shared with other devices in order to improve the user experience.

Several studies have shown novel designs for smart healthcare solutions using IoT based systems. An in-depth study is presented in (Islam, Kwak, Kabir, Hossain, and Kwak, 2015), focusing on some of the available solutions, well known applications and remaining problems. Each subject is considered separately, rather than as a part of an overall system. In (Dimitrov, 2016), the exploration, storage and analysis of data are considered, with little mention of their integration into a system. The types of sensors are compared in (Poon, Lo, Yuce, Alomainy, and Hao, 2015), with a certain emphasis on communications. Finally, in (YIN, Zeng, Chen, and Fan, 2016),

the detection and management of big data is considered, with little consideration for the network which will take charge of the communications.

This article therefore provides a survey of IoT based systems in the health sector and showcase one of the most relevant solutions to the pandemic we're currently facing (COVID-19) that can help the overcrowded hospital to reduce the strain on resources while controlling the spread of this virus.

This paper is structured as follow: At first, we present in section 2 the general three-layer architecture of IoT. Then in section 3, we highlight the important role of smart healthcare based IoT systems focusing on some of the IoT devices that are used in the healthcare field. Afterwards, we present in section 4 an overview of the new global virus (Covid-19). Finally, we project a digital solution in a shape of a bracelet that helps authorities prevent further spread of COVID-19, while also tracking those that are unfortunately infected

2. THE THREE-LAYER ARCHITECTURE OF IOT

If Internet is connecting the people, the Internet of Things (IoT) is connecting all the objects. These interconnected objects (controlled by the people) have data regularly collected, analysed and used to initiate action, providing a wealth of intelligence for planning, management and decision making.

The Internet of Things (IoT) also called the Internet of Everything or the Industrial Internet is a new concept in the technology and communication world which provides the capability of transferring data for anything (human, animal, or

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