GR-64 — How could IoT assist healthcare system during COVID-19 or future pandemics?

Abstract

The Internet of Things (IoT), a technology built upon sensors and devices, has shown great applicability among various domains, especially healthcare. This pandemic has critically impacted all parts of society including people, health centers, businesses, authorities, etc. Researchers are attempting to adopt different technologies to mitigate this virus faster and save more lives. Regarding the great benefits that Internet of Things (IoT) has brought into different areas within the healthcare domain, this technology has been performing several main tasks including diagnosing, monitoring, tracing, disinfecting, and vaccinating to combat this virus. Our research is conducted of the possible IoT solutions to mitigate the COVID-19 or even future pandemics. We have demonstrated the applicability of IoT technologies in three main COVID-19 phases including "early diagnosis, quarantine time, and after recovery." Along with such applications, we also review the proposed IoT applications for the main tasks of IoT, which could be exponentially helpful for fighting against this virus.

Introduction

The Internet of Things, as an emerging technology, is predicted to grow enormously by 2030 (more than 125 billion devices) [1]. As IoT has gained significant attention from research experts in recent years, one of the major areas for applying this technology is healthcare.

As a result, IoT applications, containing various sensors and devices, have been developed for performing several tasks of detecting, monitoring, tracing, etc., within the healthcare system [1]. Applying such technologies have achieved promising benefits including lower costs, greater quality of services, and better user experiences [2, 3].

The COVID-19 pandemic, caused by the novel Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV2), was first begun in Wuhan, China in late 2019. Since this virus was new, the demand for different applicable technologies was critically increased. Consequently, authorities have been struggling to combat this deadly virus [4]. While COVID-19 could impact different sectors of healthcare system, IoT applications could empower the healthcare authorities by adopting various sensors and devices in order to mitigate this virus faster [5, 6].

Research Questions

1. What are the current IoT state-of-art applications to fight COVID-19?
2. How do IoT applications fit in the different phases of COVID-19?
3. What major tasks could IoT applications, consisting of different sensors and devices, perform?

Materials and Methods

This research project reviews the recent IoT approaches within healthcare domain regarding the mitigation of the COVID-19. It is conducted based on searching specific keywords through various databases of Google Scholar, Elsevier, Springer, ACM Full-Text Collection, IEEE Xplore, PubMed, and arXiv. We hope that this project could guide researchers and professionals in finding the proper solutions for fighting such diseases during different phases.

Results

Implementing IoT technologies in healthcare has demonstrated efficient results, including lower costs of health services, better treatments, etc., towards the mitigation of this virus. As a result, this research is aimed to explore, compare, and present the current IoT applications to better define a roadmap for ending this pandemic. Regarding the main COVID-19 phases, these IoT applications are divided in five main sections, including "wearables, drones, robots, buttons, and smartphones," to categorize the proposed approaches based on the types of devices. On the other hand, we also demonstrate the effective tasks that IoT could perform based on their sensors and communication protocol. As discussed, the main approaches of IoT towards combatting COVID-19 are divided into monitoring, diagnosing, tracing, disinfecting, and vaccinating. The figure below demonstrates the overall roadmap for mitigating COVID-19 based on our two researches.
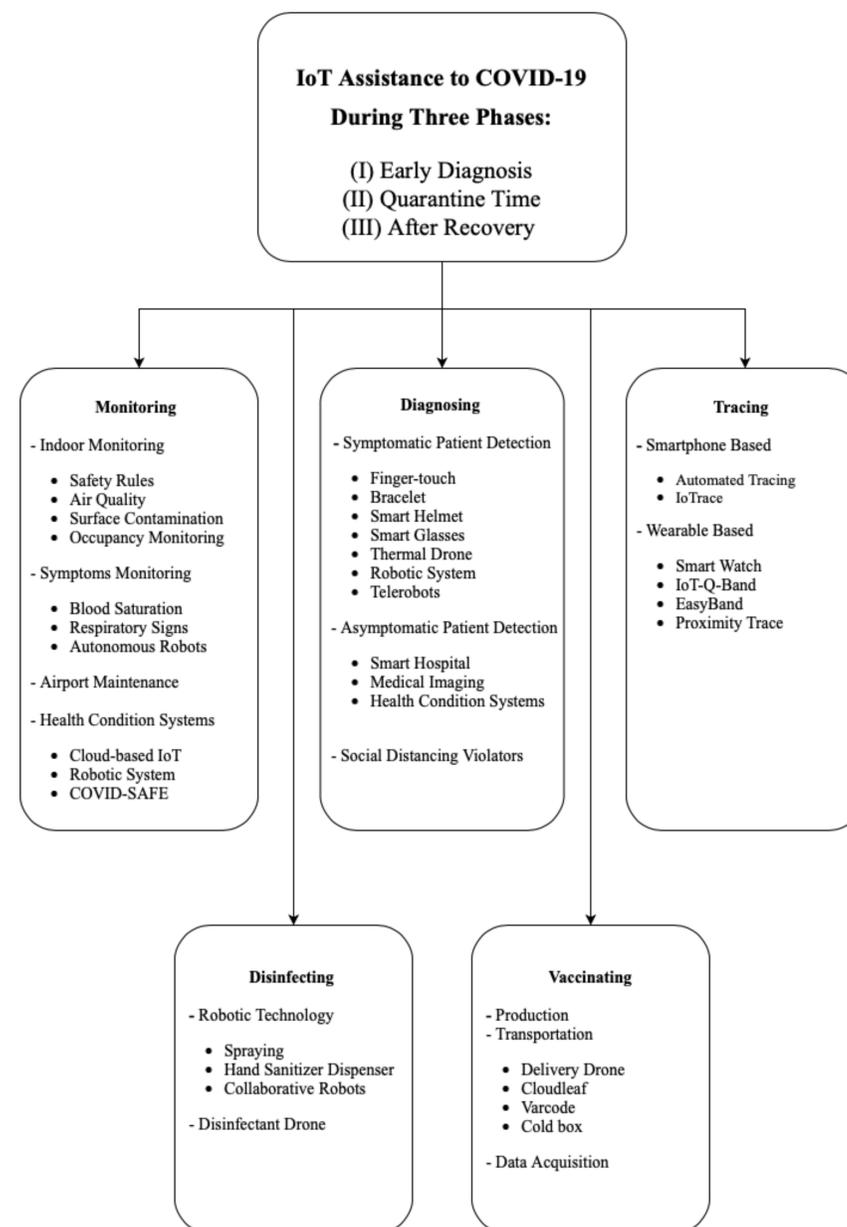
Conclusions

As the world is struggling with the current pandemic, numerous applications have been developed in order to combat COVID-19. Internet of Things (IoT) is considered as one of the major technologies in healthcare domain, which has been applied for COVID-19 widely. Promising results could be achieved by such applications. In this research, we review the state-of-the-art for IoT applications focusing on three main phases of COVID-19 including "Early Diagnosis, Quarantine Time, and After Recovery." In each phase, the IoT applications are reviewed in five main categories including wearables, drones. robots, buttons, and smartphone applications. Additionally, various main tasks performed by IoT technology are discussed. Taken together, this could be used as a roadmap for fighting COVID-19 and future pandemics. Ultimately, it is essential to consider privacy and security challenges in order to build more efficient models. We will focus on this matter in our next pure research.

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