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Role of Internet of Medical Things (IoMT) and Block Chain Technology for the Prevention of COVID-19 Pandemic Effect

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Abstract:

Now a days, COVID-19 spreads everywhere and has severely affected across the globe. As COVID-19 spread in a fast manner, it creates an alarming situation all over the world. The health sector has faced more problems as compared to other sectors due to thousands of people reported per day, so the demand for oxygen pumps, masks, and sanitizers has also increased. In this situation both public and private sectors plays an important role to make the country COVID-19 free. Both private and public sectors worked hard and developed a number of IoT and Blockchain technologies, adopting different methodologies to deal with COVID-19. This paper presents the number of IoT and Blockchain technologies like (IoT Buttons, Robots, Reporting and testing ways, telemedicine) are used in COVID-19. Furthermore, it is also elaborated that how these techniques are useful with the help of case studies.

Keywords: Telemedicines, Disinfectant, COVID-19, IoT, Blockchain

1. Introduction

Coronavirus disease-19 has not only affected the health care system but also affect the Economic, Educational, and Public Sectors.COVID-19 is continuously attacking or increasing worldwide, the Environment is falling down under the weight of collapsing economic system and stacked up fatalities[1]. Regretfully many individuals are still fear of contamination. The condition which seems today is unlikely to improve. A wide range of technological methods to resolve the effect of COVID-19 worldwide are emerging [2]. Digital automation Internet of Things (IoT), IoMT telecommunication networks such as 5G were among those at the forefront. According to the WHO and the CDC, digital automation has an important part in enhancing medical care due to the COVID-19[3]. This paper presents the several aforementioned techniques that play important role in reducing the devastating effects of the COVID-19 worldwide [4].

The Internet of medical things (IoMT), also

known as health care IoT, is a combination of medical devices and software applications that provide comprehensive health care services related to healthcare IT systems. There is a huge increase in IoT and IoMT applications now a days [5]. This increase is because of growing the number of mobile devices that are configured by the use of Near Field Communication (NFC) that allow these devices to communicate with IT systems. Different types of applications has been developed such as observing patients from a distant area, Utilization of wearable devices to transmit medical information to the concerned experts, etc. [6]. Resultantly, these devices store, observed, break down, and transmit health information efficiently.[7].However, the number of IoMT techniques have been developed to prevent the COVID-19 pandemic situation. Furthermore, these techniques are utilized by various technologists, clinical associations, and government agencies to reduce the load of the health care system [8].Following are the IoT and IoMT technologies that have a wide range of contributions to tracking and ultimately managing the effect of COVID-19 pandemic.

2. Smart Thermometer

Eight years ago, a US health technology company named Kinsa had distributed internet connect smart thermometers to household peoples for high fever[9]. A smart thermometer is a medical thermometer that ables to transmit readings, that can be gathered, stored, and observed. These smart thermometers are initially designed to monitor flu. Now a days, it is used in the detection of COVID-19 concentration throughout the United States. Due to the COVID-19 eruption Kinsa Health Technology Company has distributed a wide range of technological thermostats to the household in many regions of the United States [10]. That smart instrument is connected to a cell phone device, that enables them to automatically send their data to the application, so the users easily check their report online via phone. However, by using this application, users can also check their medical history. Once this data has been received Kinsa adapts this data and develops a daily graph that shows which of the US region has a high fever rate [11]. Over a couple of years, Kinsa communicating maps have shown itself to be highly accurate in predicting the quick breaking out flu around the United States [12].

3. Robots

While government and medical institutions around the world are struggling to control the COVID-19 outbreak, robots are being introduced to support patient recovery, thus reducing the burden of healthcare workers. They worked as a nurse in the health system. Robot-based non-contact UV surface decontamination techniques are also used to reduce the virus transfer via infected surfaces [13]. On the other hand, manual workout can also increase and spread the infection, also requires the deployment of disinfecting workers that may cause the risk of getting the disease. Integrated decontamination robots can cause quick and efficient disinfection. However, the number of robots are deployed worldwide to manage the effect of COVID-19 and reduce the stress of People work in healthcare institutes [14].

As the COVID-19 worldwide continues to

spread, Asimov Robotics a Kerala based company has built up three-wheel robots that are used to support patients staying in isolation. The three-wheeled robot is capable of doing different functions such as carrying food and services to the patient as well as giving medication and clinical equipment [15]. A trained medical researchers of US Company also created automatic robots to reduce the number of Healthcare-associated Infections (HAIs). These are Light Strike Disease-Zapping UV robots that can rapidly kill all diseased or germs like viruses and bacteria [16]. Danish Robotic Company, also introduced UVD Robots that can be served as a worldwide in healthcare institute. UVD robots are distributed among various regions of China, several in Asia and the US. These robots release strong UV rays to sanitize the external surface by breaking the virus strains. These robots can also run on a single charge for around 2.5 hours and about to sanitize the nine or ten rooms [17].

4. IOT Buttons

Several healthcare organizations in Vancouver have installed several battery powered IoT controller to measure the condition of healthcare. These buttons are also know Wanda Quick touch that can be used in any risk of alarming situation and also able to deploy at any private as well as public premises.

5. Autonomous Vehicles

Autonomous vehicles (AVs) use to reduce the burden on current medical methods and also reduce the risk of transmission of viruses. China takes responsibility for using autonomous vehicles (AVs) in a pandemic situation. China is the only country in the world that develops AVs in COVID-19 to mitigate the effect of COVID-19[19]. White Rhino Auto Company based in Beijing in association with the (ITPO) of UNIDO has deployed two AVs in China healthcare centers. These AVs are extremely helpful for performing many tasks such as services of healthcare and food. These vehicles decreased the burden of workers and also minimize the threat of contamination of viruses.

6. Telemedicine:

Telemedicine is a technique of using IoMT automation to enable remote monitoring of patients. This approach helps physicians to diagnose, identify, and treat the patients without physical communication. However, there is a rapid increase in the development of IoMT software and telemedicine platforms after infectious COVID-19. The US (CMS) has to revoke many healthcare rules that allow physicians to provide remotely check their patients via telehealth platforms [20].

Following are the advantages of implementing telehealth strategies:

1) It reduces the pressure on the healthcare worker.

2) It reduces the spreading rate of infection.
Some of the aspects in which telemedicine is used to control the COVID-19 effect are listed below:

- Many telemedicine techniques, involving video calls and live Facebook webinars have been introduced in the United States to offer remote medical professionals to a

number of peoples [21].

- In India government has established telemedicine equipment to allow rapid COVID-19 patients to communicate remotely with medical professionals.
- Israel's healthcare center used number of telehealth care technologies to track 12 Israeli travelers who were quarantined in japan for many weeks. Similarly, the Sheba healthcare center used telemedicine techniques to make sure limited human interaction.

Many telemedicine devices such as telemedicine cart, tele-discussion app, and handheld medicine have gained importance against COVID-19 in recent months. Telemedicine systems are also much helpful by integrating with IoT technologies such as 5G networks will the high speed of telemedicine [22]. A large number of use cases that are aforementioned showing the importance of IoT and IoMT's regarding COVID-19[23]. The number of IoT automation technologies that plays an essential role in Covid 19 are discussed below:

7. Drone Technology

At the moment of public health emergencies, such as COVID-19 around the globe, Uncrewed Aerial Vehicle (UAV) usually referred to as a drone which is an airplane without a human pilot. It includes a ground base administrator and a way of communication between devices. It can bring many benefits; they can not only ensure reduced human contact but can also be used to enter the remoteness area[24].Firstly the Chine inspect the region of COVID-19 with the help of drone technology to overcome the epidemic of COVID-19. Inspired by this, many regions over the global environment have combined their forces with various analyzers and developers to find innovative ways to use drones to combat COVID-19[25]. Some of case studies regarding usage of drone technology in COVID-19.

7. Case Study 1: Crowd Surveillance

In an attempt to reduce the spreading of COVID-19, governments across the world are adopting all the required actions to make sure social distancing. Toward this end, several countries across the world involving China and India, have used drone technology for community surveillance and to track the unwarranted regions [26]. MicroMulticopter, the global manufacturer of drones based in Shenzhen, China, has implemented more than 100 drones in many regions of China to observe regions and effectively analyze crowds. Drones configured with sky speakers can also be used to give information to people who do not comply with the regulations provided by the Chinese Government. In India, a leading global technology company called Cyient has offered an autonomous unmanned aerial spectrum with monitoring technology that helps and control the COVID-19 lockdown [27].

8. Case Study 2: Screening Crowd

Below are the following COVID-19 epidemic, the Chinese government has agreed to identify COVID-19 cases as quickly as possible. For this reason, they used drones fitted with thermal sensors to conduct large-scale temperature measurements in many populated

regions [28]. In India, the New Delhi authority deployed a multi-functional drone to control the outspread of this COVID-19. Drone termed as "corona weapon", it is configured with thermodynamic and scotopic vision cameras, with compact healthcare devices for important medical supplies, an advertising speaker system, and 10-liter antibacterial pumps for sterilizing public regions [29].

Apart from infrared sensors that test only person temperature. In contrast to these actions, analysts at the USA, in collaboration with Canada Commercial UAV developed dragonfly, are creating a "pandemic drone" for automatically tracing and detecting people with contagious respiratory disease. These drones shall be fitted with a sophisticated detector and digital sensor system capable of tracking the temperature and heart rate of humans. These drones are also supposed to be able to identify breathing problems in public sectors [30].

9. Case Study 3: Scattering Disinfectant:

Drones can be used to penetrate the coronavirus in infected areas, spray antiseptics, and mitigating the risk of more disease transmission while also reduce forefront employee's exposure to the virus. Although many regions have regularly deployed drones when the coronavirus at the initial stage like Spain [31].

10. Distribution of Healthcare Supplies and Other Essentials

Experts at the National University of Ireland (NUI) were enable to use a UAV in September 2019 to send Galway's diabetic medicine to a distant region on the Aran Islands. This was the first effective above visual range of sight drone operation for diabetic, and it proved to the world that how drones can efficiently bring healthcare supplies[32]. Throughout the present situation of problems, this versatility will tend to be especially useful in reducing the load of medical centers and healthcare employees. Drones may be used for quick distribution of medicine and equipment 1) with one healthcare enter to other healthcare center or 2) from healthcare enter to patient cared for at home (in case of mild form of COVID-19). In China used a drone to transport healthcare equipment from the Xingchang County Infection Control Panel to the public healthcare centers in Xingchang without leading humans to contamination[33]. Marut Drones, a company established in Hyderabad managed by an alumni team from the Indian Institute of Technology (IIT), has early started a whole range of drones to counter the COVID-19 pandemic in India. The organization has drones for sterilizing, distributing medication, temperature analysis, activity tracking, and public monitoring[34]. In the United States the destructive effect of COVID-19, many US peoples are taking numerous measure to bring drone techniques into the region [35]. Zipline, a healthcare device provides services to develop an appropriate healthcare supply chain network. Aside from becoming a secure way to distribute healthcare equipment, drones can enable the provision of food stuff, as observed in few regions of world [36]. In the meantime, Google Corporation has seen a major rise in the number of suppliers that produced automated drone distribution systems called Wing in the United States. Although drone technologies hold tremendous effort for

medical assistance, many countries have not utilized full capacity during the COVID-19 pandemic. At this end, policy agencies will gather and review information on current UAV programs closely, and bring further resources into design and technology in UAV [37].

11. Blockchain

In recent years Blockchain technology and IoT has been under intense research among analysts and manufacturer. The Blockchain is expanding its existence in many fields such as banking, traveling, drone communication, and healthcare sectors [38]. Now a days, health issues regarding COVID-19 are neither regional nor autonomous. The COVID-19 pandemic spread all over the world, so people need to stand together and take the action on it. The essence of the pandemic itself is centralized, so centralized technologies such as Blockchain and IoT are much helpful during this situation. Blockchain technology is described as a decentralized distributed system that records the origin of a digital commodity. Similarly, IoT includes computing devices with unique identifiers can also transfer information all over the networks. Blockchain technology and IoT allow people and institutions to be a part of a common integrated system that enables them to exchange and transfer data safely. The Blockchain reduces the vulnerabilities as well as reduces the risk for fake data distribution and information [39]. Blockchain-based software can be used for remote tracking and supervision of Coronavirus-infected people, to alleviate the pressure on workers in the healthcare sector.

Some of the Blockchain and IoT-based helpful key points to deal with the COVID-19 are discussed below:

- Improved monitoring and documentation should be provided.
- Properly reported the infected patients.
- Lockdown Policies.
- Avoid sharing fake news.
- Authorized Donation platform.
- Reduce Supply chain interruptions.

12. Testing and Reporting

Many countries such as America, China, Italy, Pakistan, etc. are focused on curbing COVID-19. However to make the world COVID-19 free, experiments need to be conducted smartly and reliable records must be preserved on the number of tests performed[40]. An IoT and Blockchain technologies are required that help set up checkup websites to monitor the patient with COVID-19 related symptoms, tracking the area highly affected areas, reduce the stress of healthcare sectors and workers, reduce the contamination of virus from the COVID-19 patient to worker. In Blockchain technology the healthcare centers coordinate as the nodes within the distributed Blockchain networks. These nodes continuously monitor the number of tests conducted on specific networks and also indicated the confirmed cases along with checkup time. These reviews can also assist healthcare sectors to make a strategy to reduce disease in specific regions according to the number of positive COVID-19 cases [41]. Blockchain technology act as a source for updating and retrieving data by all users. IoT also plays an important role during this critical outbreak of COVID-19. It can provide vital

support to the healthcare sector.

12. Recording Patient Details

Blockchain and IoT technologies that are also viable approach for storing details of COVID-19 patients. Once a person has tested positive for COVID-19 all details of the patient must be recorded including their age, health condition, the intensity of the disease, the side effects of the disease, and standard medical line may be available[42]. Apart from this, a Cloud-based database is required that stores all the patient details safely.

13. Managing the Lockdown Implementation

Staying under lockdown situations is an enormous condition for people in many regions all over the world. The people basic need to explicitly observe the prohibitions on lockdowns by staying at home. People from high authorities, NGOs, to work in tandem with the government to effectively reach the expected results of lockdown [43]. Now there is numerous example of people that are living in readily accessible regions using various services while people living in rural areas are deprived of essentials things. Towards this Blockchain and IoT technology can help governmental and non-governmental monitor peoples that need in various sectors of the country and effectively lead the enactment of lockdown. All mandated persons aligned with enacting the lockdown may act as nodes in the Blockchain technology and may enroll the community needs on the network within their specified place [44]. All the network devices in the Blockchain can view the requirements listed by the nodes according to their regions. Similarly, many IoT devices are used in homes, buildings that are capable to sense and transmit warnings in regards to a critical situation in a building or home [45]. These devices are also useful in COVID-19 situations and perform very well with little modification like automatically sense the temperature and condition of the patient, in case of having affected inform it via message or in case the number of affected people beyond the defined limit then produce alarm.

14. Conclusion

The COVID-19 has affected globally not just only the health sector but industrial and business sectors as well. However, entire world is facing such issue and also try to reduce the effects of COVID-19. The number of IoT and Blockchain devices have been developed to reduce the pressure of worker and also to reduces the human intervention. This paper discussed these technologies and also explained their effectiveness in health sector. Also these indicated how these technologies can reduces the pressure of worker in current situation and makes the environment more secure, smooth, safe and reliable.

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