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Technology fights Covid-19: A brief overview on rapid inventions.

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***Abstract*— Human species had come across various pandemics in the past. During every such occurrence, mankind fought for their survival using various invention to handle, resist and overcome the spread of disease. As the history repeats itself, the current COVID-19 pandemic has paved way for more intense research and development of technologies to help us overcome the impact of this disease. In this article we have highlighted the key areas of technologies that had rapid inventions throughout the globe to fight the spread of corona viruses and areas that needed more attention. This helps in sharing concentrated insights on recent trends in technical innovations to encourage local community researchers and student inventions.**

Keywords — COVID-19, Technology, Inventions, 3D-printing, Robotics, Telemedicine, Mobile applications.

I. INTRODUCTION

Technology is becoming an integral part of our lives these days. It has finely improved over the course of years in all aspects, facilitating our day today lives. It did not stop with that. It is becoming lifesaving on the occasions of unprecedented pandemics. Technology is an important sector that has significant impact on society during epidemics.

Innovative approaches is the best way to respond an epidemic. Technology can greatly be used for reducing the impact of the disease by warning and educating people, most importantly controlling the spread of disease. It is during these pandemics technology is taking a steep advancement and it becomes a new normal hence forth in regular lives of people.

During the 2014 Ebola outbreak, telecommunication played a major role in delivering the reliable information to nook and corners of the area under threat in West Africa. This helped local community activists and volunteers to reach the people and educate them on how to survive the outbreak. Later the telecommunication industry has grown largely, leading to improved awareness, literacy and economy thereby improving better quality of life throughout African continent.[1][2]

The Influenza pandemic in 1918, the most severe pandemic in the history of mankind, infecting over 500 million people with huge mortality of approximately 50 million people. It was at this time the technology for common man slowly got its attention. It was at this time airplanes was used for carrying passengers to avoid infections during road traffic which later became commercialized.[3]

Present day, the Covid-19 pandemic had infected over 9.1 million people and the numbers are raising every day. We are aware of the circumstances and are taking advantage of current technology to get through this pandemic using various technological advancements such as Social media to create awareness to all age groups of people, Autonomous vehicles for delivering medicines and essentials, remote virtual office for social distancing, AI predicting the extent , duration and vulnerable population for the disease using big data , Robotics in healthcare to reduce conduction of corona among healthcare professionals, 3-D printing for cost-effective and rapid manufacturing of pandemic specific products are to name a few. Researchers and students troughout the world are developing products that helps different groups of people based on their needs. Few of such rapidly developed products for Covid-19 are discussed in this article.[1][4]

II. 3-D PRINTING AND MOBILE APPLICATION

A. Door openers

Welshmen Wyn Griffiths created a 3D hands free door opener which can be a game changer in the places, where there is a need of hand sanitizer. These hands free door openers are operated by our forearm, which are fitted onto the door handles. According to Epidemiologists the viruses can live in the stainless steel for nearly 3days, to prevent the virus infection during this pandemic these door openers were created. These door openers plays a major role in public places, as it helps to make our hands free from virus infections. Welshmen Wyn Griffiths distributed the 3D design in the online and those who have the 3D printer can use it in the nearby public places to prevent the infections.[5]

B. Face shield

In Mumbai, Anatomiz3D develops the cost effective face shield which plays the pivotal role in the spread of COVID 19.In this pandemic period the total world is suffering in the shortage of protective equipment's. As we know the viruses are mostly spread to the peoples through the droplets from the infected person, so this face shields is created in way to cover the entire head up to the neck to reduce the virus infection. These face shields severe as the primary protective for the coronavirus warriors, as it provides end to end protection. This also created the new benchmarks in medical 3Dprinting, as it produces the depth of medical 3D printing. They are working in a higher rate to produce more face shields. They have also distributed from face shields to corona warriors in Mumbai.[6]

C. Mobile Application

A mobile app called "Indore 311" was created by the members of the Indian Medical Association (IMA) to monitor the covid 19 patients. This was an already existing app, in which they have added some features to monitor the patients and provide treatment during their home isolation. The home isolated patients are provided with a pulse oximeter to check and report their oxygen level and pulse rate in mobile app. The doctors at IMA control room will monitor the given details and consult them according to it. If they are at higher risk they can also press the red color button available in the top of the app for emergency situations, if it to be hospitalized, then they will be shifted to the hospital immediately. It also useful in tracking the patients with GPS, if they steps out 100 meters away from the home an alarm will ring in IMA control room. They will be tracked and sent home back. This mobile app lends the hand for both the doctors and the home isolated patients under treatment.[3]

III. ROBOTICS, AI AND TELEMEDICINE

The Covid-19 outbreak has now became a great pandemic, this leads to the great development of robotics, artificial intelligence and telemedicine.

A. Robot HCARD

Robot HCARD is invented by Durgapur CSIR lab Central Mechanical Engineering Research Institute. As we know virus infection are spread from the infected persons, this robot HCARD reduces the risk of spreading virus infection from the patients to the workers at the hospital. This robot can be operated both in manual and automatic mode. This robot have features such as navigation, providing medicines and food to patients, collects sample from patients and audio visual communication. It is controlled and monitored by the nurse station in every hospital. This robot costs less than Rs.5 lakh and weighs about 80 kg. It totally replaces the manual power into robots. CSIR-CMERI are working a lot to minimize the impact of covid 19 by some technical robots.[7]

Fig. 1. Robot HCARD (*P.C Google images*)

B. AI to predict covid 19

H An artificial intelligence (AI) model was developed to predict whether the person is affected with corona virus. This was developed by data collected from 2.5 million peoples, comparing the symptoms and the results of covid-19 affected persons. The researchers at king's college at London collects the data from both symptomatic and asymptomatic individuals and tracks their health condition for developing this AI model for covid-19 test. The data collected includes symptoms, hospitalization, test outcomes, demographic data and pre-existing medical condition. From the collected data they analyzed that majority of people who tested positive have anosmia. Thus anosmia have included as the symptom of covid 19. Based on the key symptoms such as anosmia, cough, fatigue and loss of appetite they developed a model to predict whether the person have covid 19. The researchers have suggested that this model will help to identify the covid 19 in the early stage. They also asked the WHO to add the anosmia as one of the symptom of covid 19 and also in routinely screening for covid 19. [8]

C. AI for CT imaging in covid-19

P Artificial intelligence (AI) analysis of chest scans have reduced the growing burden on radiologists. Reverse transcription polymerase chain reaction (RT-PCR) is used for covid 19 diagnosis. It is not available universally as it has some limitations. The CT of lung is found to be more sensitive to covid 19 diagnosis. The CT images of the covid affected persons were taken, with the help of RESNET50 they created the COVNet to differentiate the lung affects between the pneumonia patients and the covid patients. Grad-cam technique was used to produce visual explanation and allow to capture heat maps of COVID associated tissues. Icolung is the first CE marked AI based quantification tool. It found the abnormalities in COVID 19 and quantifies the result in the easy way. The results are available to the radiologists, they report the complete status of the lungs. Using the details given by the radiologists, the doctors can able to predict the type of treatment given to the patients. They can also able to detect whether the patient needs ventilator or not. This also saves the ICU beds availability. [9]

D. Telemedicine

Telemedicine have become the best thing during this pandemic period. After the long struggle telemedicine starts to play a major role in the healthcare community. Telemedicine allows to connect the patient and the doctor by video calls, emails, calls, messages etc. Right now, in this hazardous period we are not able to visit the hospitals for our regular visits for treatment. Telemedicine prevents the breaking of bridge between the doctors and the patients. This always paves the way for some tools such as Artificial Intelligence (AI) with Machine learning robotics and Natural language processing. One of the best facets of AI is robotics. RAS (Robotic Assisted Surgery) is seen as the next step of evolution of surgery. They have many patients using wearables and transmits data, they can see the data through cloud and can communicate with the doctors. Thus telemedicine have proved as a tool to open up our minds.[10]

E. Healthcare Assistbots.

In this Covid-19 situation, social distancing was the important one which should be followed by everyone. This corona virus spreads only when there is a contact between the affected patients. The invention of robots replaces the manual work that reduces the risk of spreading of disease. Robots will do the work such as sanitizing hospitals, delivering foods and medicines. In China, at Hongshan sports center in Wuhan opened with 14 robots in the nearby hospital to reduce the doctor works. The robots developed in Beijing can deliver medicine, clean, disinfect and measure their temperature. In India, the government hospital in Rajasthan conducting a trial robot to deliver the medicines and food for the Covid-19 patients. Asimov robotics developed in Kerala is a three wheeled robot is used to assist patients in isolation wards. Medical workers are working day and night to treat the

patients, this pushes them to the hazardous situations. In such a situations the robots replaces them and performs the works done by the doctors. [11][12]

IV. DISINFECTANTS AND PERSONAL PROTECTION

The most important necessity for minimizing infection spread is by killing the virus by using disinfectants and by protecting ourselves with proper shielding. This is achieved by developing automated disinfectants and innovation in Nano technology.

A. Nano-filter face mask

KAIST(Korea Advanced Institute of Science and Technology) is a national research university located in Daedeok Innopolis .the research team in KAIST announced that they have invented a Nano-filter face mask that maintains perfect filter efficiency even after hand washing through the develop of proprietary technology it aligns nanofibers with a diameter of 100~500 nanometer in unidirectional directions. This product is reusable and rinse washable full face mask thus it controls the shortage issue that arises in highly affected regions, during these epidemics19.[13]

B. Automated disinfection chamber

Defense Research and Development organization discovered a full body disinfection chamber and also face mask for medical staff handling and caregivers affected corona virus patients. Full body disinfection chamber and face mask was developed in DRDO lab in Hyderabad full body disinfection is designed as a walking through decontamination chamber. This is a portable system equipped with the sanitizer and soap dispenser. This decontamination is start by a WAV pedal at the entry by entering the chamber an electrically operated pump create a disinfectant mist of Sodium hypochlorite (NaOCl) is used on large scale for surface purification, bleaching, odor removal[14][15]

V. AREAS THAT NEED MORE ATTENTION

As per a local survey conducted by few volunteers residing at different states of Tamilnadu, India, we collected information regarding the necessity of technology in day today lives of people of all categories. Among them the most repeated areas of technological assistance were needed in applications such as real time monitoring of people under high risk and tracking the health of suspected population requires much attention that seeks innovations. Due to lack of affordable real time health monitors and quick pathogenic detection modalities makes early detection of affected individuals difficult, creating a setback in the fight against the disease. Healthcare professionals have difficulty using the PPE kits for long duration of time. Research can be focused on developing a PPE kit consisting proper ventilation support with disinfecting filters may be considered. Medical fabrics can be improved for self-sanitation and to reduce discomfort during long time usage. More reliable autonomous vehicles can be developed for delivering essentials door to door, reducing human-human contact. Mobile applications that show crowd in a specific location may be developed to avoid vercrowding and monitor the movement of population for better management of social distancing norms.

V. CONCLUSION

Technology keeps evolving and there is always a hope for improvement. As the saying goes, Necessity is the mother of invention, this Covid-19 pandemic has halted our routine lives and opened new opportunities for further improvisations in the aspect of technology.

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