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Role of Internet of Things (IOT) In Pandemic Covid-19 Condition

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ABSTRACT
Covid-19 disease caused by large family Corona viruses which cause illness in human and some time in animal also. As per WHO, the spread of this virus is so enormous that in a less time it has infected more 46 lakh people and more than 3 lakh death globally. IoT embedded system has variety of application domain one of them is healthcare system. IoT includes sensing of information (Data), transmitting this information over internet and processing of sensed information for further decision. Implementation of IoT healthcare applications provide the real time monitoring of the patient and result in speedy recovery of the patient. It can be effectively used for the prevention and control of COVID-19. IoT applications are well-proven and help to tackle the pandemic COVID-19 conditions. In this study, we are discussing the impact of Covid-19 and role of Healthcare IoT applications to overcome or face this pandemic using technology elegantly.
Keywords - Covid-19, IoT, Embedded systems, WHO

I. INTRODUCTION

Pandemic situation is accorded due to Covid-19 disease caused by one of the type of Corona. As per World Health Organization (WHO), around 200 plus countries are experiencing this pandemic situation [1]. This virus's belongs to large family of viruses which may cause illness in animals or humans and in some cases death also. In humans, several Corona viruses cause respiratory infections ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). The most recently discovered Corona virus causes Corona virus disease COVID-19. It is was named as ''2019-nCoV''(nCoV), by the World Health Organization on January 12, 2020. Till the date there is no vaccination available for Covid-19[1]. More than 50 countries are taking the clinical trial of the vaccine. When any patient infected with Covid-19 is under observation/admitted in hospital, his body temperature, pulse rate, oxygen level in the blood is monitored continuously. These are some of the important parameters which are observed. Spread of this disease in the community is from the positive Covid-19 patient. Even if you're taking every care, like washing your hands and maintaining social distancing, you may still find yourself in a situation where you're concerned you've been exposed to the virus. You might come across COVID-19 positive patient. Then self-quarantining is only necessary if you're sensibly doubtful that

you're contaminated with the virus. WHO recommends that contacts of patients with COVID-19 positive be quarantined for 14 days from the last time they were exposed to the patient.

Till the date there are many IoT application developed for monitoring the heath condition of the patients remotely. As in this case, IoT can more useful as hospitals can monitor self quarantine patient condition without visiting his place. The spread of this Covid-19 can be restricted [5][6].

In the following section we have described the causes of spread of Covid-19, need/ Role of IoT, its different application and challenges for IoT to handle the pandemic.

II. SPREAD AND IMPACT OF COVID - 19

Covid-19 disease comes in a picture at the end of 2019 year. As per WHO, the spread of this disease start in Wuhan city of China. As shown in FIG.1, this disease spreads from person to person through small droplets from the nose or mouth. As per WHO, these droplets are relatively heavy, do not travel far and quickly sink to the ground [1]. People can catch COVID-19 if they breathe in these droplets from a person infected with the virus. These droplets can stay on objects or any surfaces around the person such as tables, doorknobs and handrails. The Corona virus can live on the surface for long time depending upon the material of the surface. People get infected when they come in contact with Covid-19 patient, surface or objects.

Therefore it is suggested to stay at least one meter away from others in this pandemic situation [2].
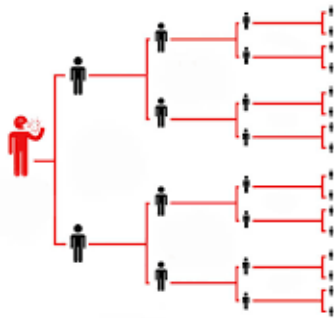

Fig.1: Person to person Spread of Covid-19

Covid 19 has a very painful impact on the mankind. It has destroyed the living of mankind. It has changed the way we interact with each other in the society. Almost all the sectors like industry, education etc were affected because of it

III. IMPACTFUL UNIQUENESS OF IOT ASSOCIATED WITH MEDICAL FIELD

There are various features of the IoT application. Here we can taking into consideration of those features because of which IoT applications are strongly recommended in medical filed shown in FIG.2. With seamless connectivity provided by IoT applications/devices, medical staff can monitor Covid-19 patient as well as self quarantine persons remotely[2][3]. As number of the medical staff are not available compared to the total number of infected or suspected Covid-19 virus. With data security provided by IoT applications, medical staff can collect the necessary parameter these patients at one place and decide further action[4]. IoT applications are easy to use so the patients can handle these applications on their own. With less implementation cost, IoT application provides great level of accuracy. IoT application will effectively restrict the person to person contact which will ultimately reduce the spread of the Covid-19. Also with use of such applications we can save a life of our medical staff, polices and municipality servants. As these are the real heroes in this pandemic situation.
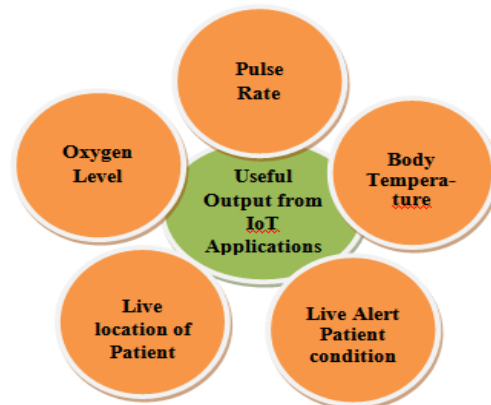

Fig.2 Why IoT in Covid-19 Pandemic situation

IV. USEFUL IOT APPLICATION IN THIS PANDEMIC SITUATION

The main parameter which are monitored in the hospital for the speedy recovery of the patients are body temperature, pulse rate and saturated oxygen level[5][6][10]. As shown in fig. 3, use of the IoT applications for monitoring different parameters will result in effective use of technology for speedy recovery of Covid-19 patient. It is also helpful for monitoring the self quarantined person by the health station. The health parameters which are monitored by IoT device are uploaded on cloud which will be useful for any doctor to analysis the patient history[11]. Along with monitoring health parameter, IoT provides the emergency services which include tracking the location (GPS) of patient by health station, establishing commutation between doctor and patient, sending ambulance from nearest hospital to patient.

For monitoring this parameter, different biosensors will be interfaced with different boards like Node MCU, Android and Raspberry Pi. Also we can set an alarm system for patient reminding him to monitor his health parameters which will be send to the medical officers and nearby health station. For sensing the heart rate in the IoT based system applications ROHM's BH1790GLC Optical sensor monitors, Pulse rate Sensor, BM-CS5R heart rate monitor, Wearable heart monitoring inductive sensor

WHMIS sensors are used[13] [14] [15] [16][17].
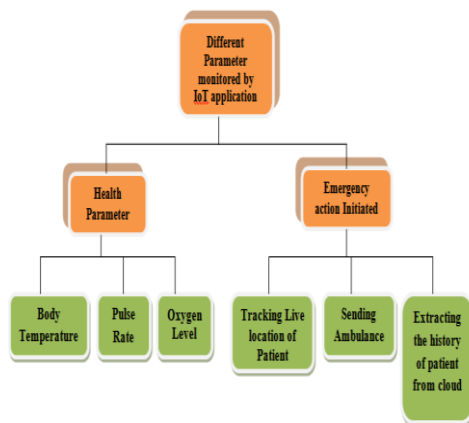
Fig.3. Different parameters monitored by IoT application

For sensing the body temperature in the IoT based healthcare application LM 35, MAX30205, G-TPCO-033, NTC thermostats and RTD sensors are used [15][16][17][18] [20].One of the IoT application is developed to collect Healthcare information which is based on ontology method.

Doctors will build the ontology for the treatment of the patient at remote place. This method proved to be easy for all the doctors in emergency time[11].These data can be stored on the cloud for further analysis by the experts. With use of IoT, we can provide emergency services like ambulance, blood and doctor on call etc.

V. SIGNIFICANT IOT APPLICATIONS IN THIS PANDEMIC

Internet of Things (IoT) has proved to be one of the growing technologies which helps in not only discover of new drugs but also in medical treatments. IoT develops networks of the devices such as sensors and board which result in healthcare management system. The data which is uploaded on the cloud are made secured. The accuracy increases as it captures the data and information of the patient without any human interaction. This data is useful for deciding the treatment of patient in emergency situation. In the Table1 we have listed such IoT application which are useful in this Covid-19 pandemic situation [5][6].

Table1. Impactful Applications of IoT in Covid-19 Pandemic situation

Sr.No.	Application	Description
1	Monitoring the Health Parameter	IoT application will take record the reading and send it to Healthcare center
2	Storing the patient data on cloud	Patient health and personal data will be automatically uploaded on the cloud for quick access.
3	Establish the Communication	IoT application can establish the emergency communication with the patient if the readings are beyond the threshold ratio.
4	Availability of the Ambulance	By tracking the live location of the patient, ambulance will be made available from nearest hospital.
5	Blood bank facility	IoT can keep the record of the blood donor and track the nearest donor through SMS in emergency
6	Marking Read, Green and Orange Zone	Received cloud data will be analyzed to decide the zone
7	Monitoring Self quarantine persons	Using IoT device, live location of the Self quarantining persons can be tracked to activate alert system if they live their home.
8	Health Care System	IoT based system can developed which will guide the people regarding proper diet in this pandemic situation

VI. CHALLENGES FOR IOT TO HANDLE THE PANDEMIC

As per data provided by WHO, the age group which is at the high risk is above 65 age [1]. Also the persons who are having heart disease and Diabetic are also the high risk in this pandemic situation created because of Covid-19. At this age, it difficult for these people to handle the IoT devices. They need the help of the person for correct reading. This will be the biggest challenge for IoT. As in this situation, sectors like Electricity Power supply is handled by only 30 to 40% peoples. Any kind of power failure will requires time to be get repaired. Power failure will result in loss of internet connection. So it may possible that data will not be uploaded or communication in time. The people at a rural area are not educated to handle the IoT devices. In India nearly 60% people lives in rural area. So we need to educate these people for handling these devices.

VII. CONCLUSION

IoT provided a smart dedicated gateway to fight ageist the Covid-19 Pandemic. For this, IoT uses its strong integrated network. With this strong interconnectivity, healthcare monitoring devises are connected to the internet. All the data is monitored at the healthcare center remotely. In any emergency situation, it can automatically send a message to the doctors at hospital/healthcare center. Covid-19 patient and Self quarantine persons can be monitored properly at remote location with IoT devises. IoT proves to be an outstanding way to monitor the infected patient which will restrict the spread of Covid-19. In healthcare, IoT applications are helpful to maintain real-time information on the cloud. With this data, different statistical analysis can be done to predict upcoming circumstances of Covid-19. We can create a better positive environment with the proper usage of IoT applications.

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