

# *A Survey on: Role of Electronics and Communication Engineering in Present Pandemic Situation*

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## **Abstract**

*The paper presents a survey on the roles played by the Electronics and communication field during the pandemic situation worldwide. The vital role of Electronics and communication to deal with the current scenario is unbelievable. It has become the support system of our regular life during this critical phase whether being directly involved in the medical scenario to the regular house hold things. The functioning of the different sectors has been possible because of the support from the Electronics.*

**Keywords:** - COVID-19, Pandemic, Artificial Intelligence, IoT, Wireless communications

## **INTRODUCTION**

Modernization and automation in most places is the fruit of Electronics. Along with the advent of the communication sector is has become more popular and user friendly. Different types of electronic gadgets are already on the list of our regular life. We have already become habituated with most of those electronic apparatus, devices or gadgets.

This present pandemic situation has changed the conventional regular as a well professional lifestyle of us. The dependencies on technology-based solutions are becoming more relevant in recent times. The social distancing, quarantine of all these terms have become a daily part of our lives. Whether the technological support for the treatment of directly affected COVID patients or the help of other patients during this critical phase everywhere, electronics and communication has played and will play an important role.

Though some application domains in consumer electronics are growing, but the automotive-related electronics segment is badly affected due to reduced demand. The role can be easily supported with the effect on the electronics market worldwide. It has been predicted that looking into the current changing needs, consumer electronics and digitization based electronic industries is expected to further grow in the Asia-Pacific region as per the regional analysis of the Electronics

market [1]. There are many technologies and interdisciplinary subjects which have helped to face the COVID challenge. Few technological approaches for handling the pandemic scenario are also discussed here, such as wireless technology, Artificial intelligence, Robotics.

## **APPLICATION DOMAINS**

The application domain of Electronics and communication in recent times is not limited to only the high-cost medical instruments or mobile phones but very small low cost daily need-based systems which have become essential these days. The requirements of huge production of sanitizers, masks are also handled in an automatic way by designing the application-specific circuitry and processors. Several innovative approaches from the beginners of this field are also incredible. The automatic sanitizer dispensing units [2], low-cost touchless temperature measuring [3] instruments, low-cost ventilators [4],[5] touchless door bells[6] etc., are a few examples of innovation and implementation of the field during the pandemic as per the requirements. Attendance systems based on RFID [7] rather than biometric during these days are gaining more popularity to avoid touch-based elements.

### **A. Medical Sector**

The medical system to support the COVID patients mainly rely on different testing instruments such as automatic blood pressure

measuring[8], digital blood sugar monitors[9], oxymeters [10] for checking the oxygen saturation in the blood, EEG[11], ECG[12], ventilators and other life support systems[13] are blessings of nothing but the biomedical application of electronics. Moreover, the data processing, storage or transfer of the accumulated data from medical instruments is also done by the support of different Embedded systems. The communication system has made it possible to monitor the patients directly or remotely. The sudden huge requirement of the medical system with reduced cost has been possible through the researchers related to this field mainly. The online consultation of the doctors has also been made easier through electronic devices such as mobile phones, tablets and personal computers.

**B. Educational Sector**

The education sector is also vastly affected and handled by the support of Electronics and communication during this pandemic. This has been made possible in a multidisciplinary way, actually where electronics and communication play the lead role. The widespread of ICT based education [14], along with flipped learning [15], has been implanted these days.

**C. Household and Daily Requirement Sector**

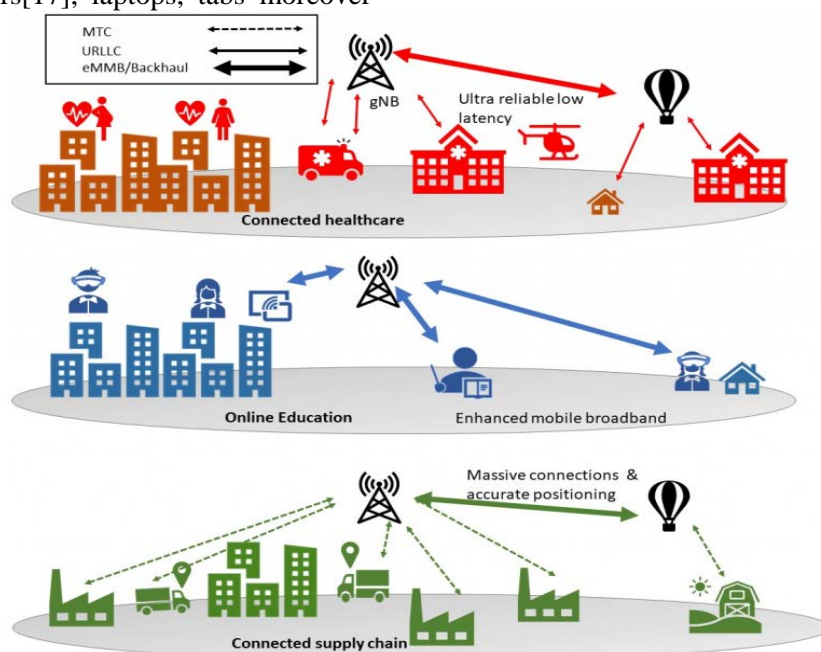
Each and every segment of daily life are stuffed with electronic gadgets and devices. These devices have become an essential part right now of dealing with the present situation, starting from health bands[16], pulse oxymeters, blood pressure monitor equipment, digital blood sugar monitors, electronic vaporizers[17], laptops, tabs moreover

smartphones. Accessibility of electronic media for checking day today's condition worldwide is possible through smartphones as nowadays electronic media is preferred over the newspapers to avoid contamination in many homes. Another increased demand for electronic devices is due to the requirement of daily essentials such as grocery, medicine and food items. Internet, Internet-of-things, embedded systems are gaining popularity to support the increased demand for automation to avoid human intervention. Being in the home quarantine condition during the lockdown days, people are forced to rely on online services. For getting connected with other people by maintaining social distancing, different electronic platforms for video or audio conferencing are gaining popularity; online gaming, online training sessions in a different field, webinars, conferences are being conducted smoothly.

**TECHNOLOGIES FOR COVID-19 PANDEMIC AND POST COVID SITUATION**

**A. Wireless Communication and the COVID-19 Pandemic**

The emerging, as well as existing sensing technologies along with wireless communications, are either adapted or enriched to promptly handle the present pandemic situation due to COVID-19. Telecommunication networks, including mobile and fixed broadband, have played an important role in enabling the fast transition of work to a digital platform from physical offices. This means that internet-based technologies are the requirement for people to work from home.



**Fig. 1: Use of 5G wireless communication technologies for considered verticals such as healthcare, education and retail during a pandemic situation.**

Current smartphones with sensing capabilities are used for supporting mobile crowdsensing from analysing, sharing and extracting data during this critical phase. Here the focus is concentrated on the latest 5G wireless cellular technology [18], which may contribute to handle this pandemic situation. Three important verticals, namely healthcare, education and retail sectors, have been identified, which require mobile communication technologies for supporting the economy, society and socio-economic good during pandemics like COVID-19.

Reliability, availability and resilience of the cellular network are essential during the lockdown situation. Fig. 1 shows the use of the latest 5G technologies in the field of education, healthcare and retail sectors during this pandemic situation.

#### **(i) 5G connectivity for healthcare**

5G mobile technologies can play a very important role in connecting homes and hospitals with ambulance services for providing healthcare service [19] more effectively and efficiently to manage pandemic emergency services. 5G technologies like eMMB, NB-IoT, URLLC, Cloud/edge computing, V2I can serve smart hospitals, remote diagnosis, remote surgery, patient monitoring at home in the healthcare sector. Under ongoing social distancing measures, connected ambulance services with high-quality video call facilities for contacting doctors and specialists in the hospital for patient monitoring remotely is possible with 5G technologies. 5G networks support remote patient diagnoses and monitoring with Artificial intelligence. URLLC (ultra-reliable low-latency communication) and very high data rates are required for 5G supported remote surgeries that facilitate a patient to attend a nearby hospital and get treated by a doctor hundreds of miles away. Robots used in the COVID-19 hospital rooms for patient temperature checking and in the infected wards where health staffs cannot enter, or it is life-threatening for them. The use of 5G technology is essential for positioning and maintaining the robot as it provides fast and reliable connection links. Electric Vehicles (EVs) used to mobilise the stored energy and fulfil the energy demands at the hospitals will also require 5G technologies like V2G (Vehicle-to-Grid) and V2I (Vehicle-to-Infrastructure) communication.

#### **(ii) 5G connectivity for education**

Due to the COVID-19 global outbreak, schools and universities discontinued in-person classes and switched to online classes so that students

could continue their education. But with this approach, there are many techno-socio-economic issues that need to be taken into consideration. For the students and instructors living in rural areas experience limited cellular services as it is much slower than in urban areas. Increased network traffic on the current wired broadband and cellular network may not support good quality video streaming. As socio-economic issues are taken into consideration, low-income families could not afford wired broadband connectivity at home; thus, students from such classes are outside the online class. 5G mobile technology [20] is the promising solution that can be employed for true online education experience and can support multimedia streaming though in most of the countries still, 4G is providing the necessary support. Self-organising networks (SON) can also address traffic created by online meeting platforms. In the education sector, Virtual laboratories, Robotics and Internet of Things embedded applications will also require a high data rate of 5G connectivity. 5G technologies like cloud computing, multi-access edge computing, IoT can serve better online classes and laboratories through Augmented (AR), Virtual (VR), and Mixed Reality (MR).

#### **(iii) 5G connectivity for retail and supply chain**

This Pandemic situation has also affected the retail and supply chain sector greatly as due to deficiency of staff and delay in deliveries; there is a potential scarcity of food and supplies in some zones. In this situation, an efficient order placement and warehouse management system is required for accurate location information of the delivery trucks and delivery time of products. Better route planning and tracking of delivery trucks that carry fresh or frozen products are also required so that they can regularly update the central system with their product temperature and condition through IoT and artificial intelligence-enabled solutions. Connected self-driving cars, robot-based and drone-based delivery can considerably help society through automation in delivery services and decreasing the delivery staff requirements. All the above-mentioned technologies heavily depend on a 5G-based vehicle to vehicle, vehicle to infrastructure, and edge computing.

#### **A. Robotics in COVID-19 Pandemic**

Robotics has helped in many ways to tackle the pandemic situation by providing the provision to monitor severely affected areas and hospital wards without human intervention. Drones[21], robotic arms[22] for patient monitoring, robotics in

remote teaching[23], automation in factories[24] to reduce human resources etc.

## B. Artificial Intelligence and the COVID-19 Pandemic

The concepts of all the fields are accumulated to build the intelligent systems [25] for different applications to cope up with the present situation and the post COVID situation as well. The role of Artificial intelligence [26] is huge for handling the present and future scenario related to the pandemic.

## CONCLUSION

With the help of electronics and communication, it has become possible to eradicate all the barriers and moving forward even during this pandemic. Electronics and wireless communication technologies facilitated us to stay connected, survive and decrease economic loss. The use of artificial intelligence, machine learning algorithms, robotics and IoT also satisfy the necessities of many other innovative and significant verticals and applications.

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