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Evolution of Robotic Technology in the Medical Care System and Corona Virus Risk Administration

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Abstract

This paper depicts the importance and growth of advance robotic technology in the medical care system, rise of medical robotic market with the administration and control of the spread of the novel coronavirus disease in global. In the midst of extraordinary strain on the medical care framework, for example, during the COVID pandemic, usage of mechanical frameworks can essentially decrease the danger of irresistible ailment transmission to cutting edge medical care labourers by causing it conceivable to emergency, to assess, screen, and treat patients from a sheltered separation. The expectation of the current exploration is to feature the significance of clinical robotic technology as a rule and afterward to associate its use with the viewpoint of COVID-19 administration so the medical clinic the executives can guide themselves to amplify the utilization of clinical robots for different clinical methods. This is regardless of the ubiquity of telemedicine, which is additionally eff ective in comparable circumstances.

Keywords: COVID-19, Medical services, Robotic technology, Mechanical frameworks

1. INTRODUCTION

Coronavirus is a tempting infection brought about by a newfound COVID-19. A significant percentage of individuals who have been infected with COVID-19 can experience mellow, direct respiratory illness and recurrence without needing exceptional care. More well-established individuals and individuals with key clinical problems, such as cardiovascular infection, cancer, diabetes andchronic respiratory sickness are more likely to develop serious complaint. Coronaviruses are a family of viruses which can cause diseases such as SSR, Respiratory Disease and Common Cold [1]. A reason for a sickness epidemic that has been begun in China was a new coronavirus in 2019. The infection is currently known as severe acute coronavirus 2 syndrome (SARS-CoV-2). This condition is known as coronavirus disease in 2019. (COVID-19). In March 2020 the World Health Organization declared the outbreak of COVID-19 a pandemic. Public health organizations such as the United States WHO and CDC track pandemics and publish updates in their websites CDC Disease Control & Prevention Centre.This virus infection seems to spread effectively among individuals, and more keeps on being found after some time about how it spreads. Knowledge has shown that it spreads between individuals and people in close contact (inside around 6 feet, or 2 meters).Coronavirus spreads through the respiratory beads provided when someone with coronary artery infection coughs, sniffles, or speaks. These beads can be breathed in or in the nose of a person or land in the mouth nearby. It may also spread on the off chance that an individual will contact the surface of the coronary artery virus and, at that point, contact the mouth, eyes or nose in the face of the statistic that this is not seen as the main way it spreads. Dry cough, tiredness and fever are commonly known as COVID-19.

A few patients may have a throbbing painfulness, nasal blockage, runny nose, sore throat or diarrhoea. These symptoms are usually mild and begin gradually. Some people become infected but don't develop any symptoms and don't feel unwell. The vast majority (about 80%) recoup from the sickness without requiring extraordinary

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therapy. Around 1 out of each 6 individuals who gets COVID-19 turns out to be genuinely sick and creates trouble relaxing. Older people, and those with fundamental medical issues likeheart issues, hypertensionor diabetes, are bound to create genuine disease. Persons withcough, fever and trouble breathing should look for seriousclinical consideration.According to the WHO's report, as of 2:15pm CEST, 26 September 2020, there have been 32,429,965 confirmed cases of COVID-19, including 985,823 deaths registered in Global.Global situation report of Covid-19 shown in table.1.

Table 1. Covid-19 situation analysis report of global

Name	Cases - cumulative total	Cases - cumulative total per 1 million population	Cases - newly reported in last 7 days	Cases - newly reported in last 24 hours	Deaths - cumulative total	Deaths - cumulative total per 1 million population	Deaths - newly reported in last 24 hours
Global	3,24,29,965	4,154.33	20,27,248	3,16,884	9,85,823	126.285	5,786
India	59,03,932	4,278.20	5,95,918	85,362	93,379	67.67	1,089
Brazil	46,57,702	21,912.47	2,02,316	32,817	1,39,808	657.74	831
Russian Federation	11,43,571	7,836.20	46,320	7,523	20,225	138.59	169
Colombia	7,90,823	15,542.02	46,878	6,555	24,924	489.83	178
Peru	7,88,930	23,927.38	38,832	6,235	31,938	968.64	68
Spain	7,16,481	15,324.23	58,641	12,272	31,232	668	114
Mexico	7,15,457	5,549.07	31,344	5,408	75,439	585.1	490
Argentina	6,78,266	15,007.29	76,553	13,467	14,766	326.71	390
South Africa	6,68,529	11,272.02	10,902	1,480	16,312	275.04	29
France	4,89,813	7,504.01	82,423	15,613	31,475	482.2	150
Chile	4,53,868	23,742.58	11,041	2,234	12,527	655.31	58
Iran	4,39,882	5,237.13	23,684	3,563	25,222	300.29	207
UK	4,23,240	6,234.57	37,300	6,873	41,936	617.74	34
Bangladesh	3,56,767	2,166.30	10,962	1,383	5,093	30.92	21
Iraq	3,41,699	8,495.22	30,009	4,593	8,867	220.45	68
Saudi Arabia	3,32,329	9,545.88	3,609	472	4,625	132.85	26
Turkey	3,11,455	3,692.89	11,645	1,665	7,858	93.17	73
Pakistan	3,09,581	1,401.50	4,550	566	6,451	29.2	7
Italy	3,06,235	5,064.93	11,303	1,912	35,801	592.13	20
Philippines	2,99,361	2,731.87	19,835	2,606	5,196	47.42	69
Germany	2,82,730	3,374.51	12,660	2,507	9,452	112.81	9
Indonesia	2,66,845	975.58	30,326	4,823	10,218	37.36	113
Israel	2,14,071	24,732.27	28,388	8,022	1,395	161.17	26
Ukraine	1,95,504	4,470.32	22,792	3,833	3,903	89.24	76

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As of September 21, 2020, India has confirmed a total of 5,400,619 cases and 86,752 deaths[2]. In the last 24 hours alone, 86,961 new cases were reported, with 90% of new confirmed cases focusing on 15 states / UT. Maharashtra alone donated more than 20,000, Andhra Pradesh donated more than 8,000 [3].Figure.1 shows that status of Covid-19 in top 15 states and union territories in india.

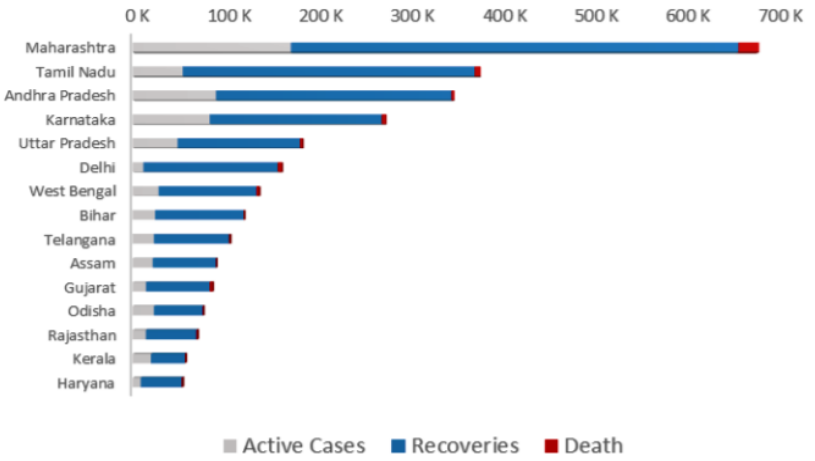
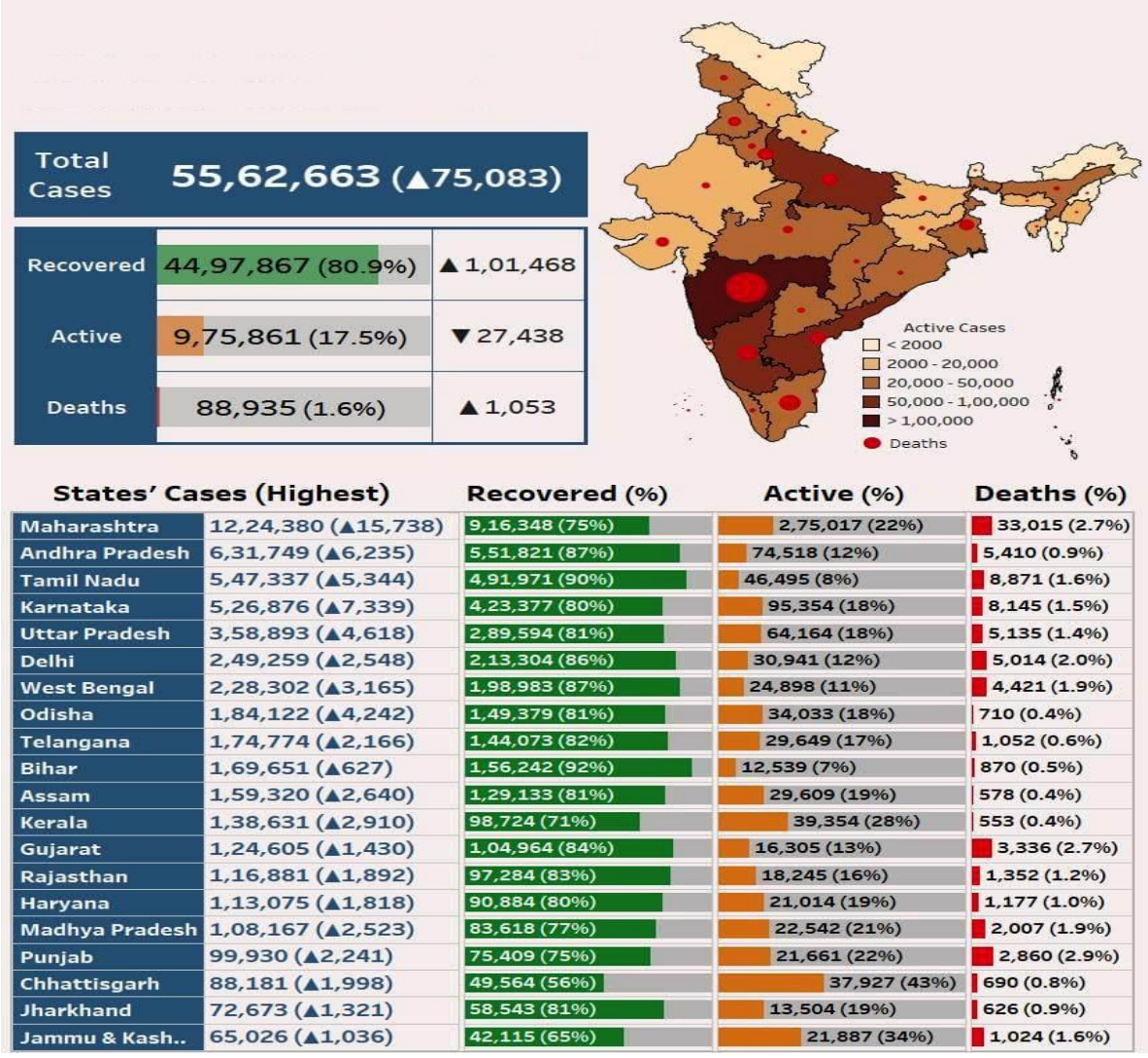


Figure 1: Status of covid-19 in top 15 states and union territories in India



States' Cases (Highest)		Recovered (%)	Active (%)	Deaths (%)
Maharashtra	12,24,380 (▲15,738)	9,16,348 (75%)	2,75,017 (22%)	33,015 (2.7%)
Andhra Pradesh	6,31,749 (▲6,235)	5,51,821 (87%)	74,518 (12%)	5,410 (0.9%)
Tamil Nadu	5,47,337 (▲5,344)	4,91,971 (90%)	46,495 (8%)	8,871 (1.6%)
Karnataka	5,26,876 (▲7,339)	4,23,377 (80%)	95,354 (18%)	8,145 (1.5%)
Uttar Pradesh	3,58,893 (▲4,618)	2,89,594 (81%)	64,164 (18%)	5,135 (1.4%)
Delhi	2,49,259 (▲2,548)	2,13,304 (86%)	30,941 (12%)	5,014 (2.0%)
West Bengal	2,28,302 (▲3,165)	1,98,983 (87%)	24,898 (11%)	4,421 (1.9%)
Odisha	1,84,122 (▲4,242)	1,49,379 (81%)	34,033 (18%)	710 (0.4%)
Telangana	1,74,774 (▲2,166)	1,44,073 (82%)	29,649 (17%)	1,052 (0.6%)
Bihar	1,69,651 (▲627)	1,56,242 (92%)	12,539 (7%)	870 (0.5%)
Assam	1,59,320 (▲2,640)	1,29,133 (81%)	29,609 (19%)	578 (0.4%)
Kerala	1,38,631 (▲2,910)	98,724 (71%)	39,354 (28%)	553 (0.4%)
Gujarat	1,24,605 (▲1,430)	1,04,964 (84%)	16,305 (13%)	3,336 (2.7%)
Rajasthan	1,16,881 (▲1,892)	97,284 (83%)	18,245 (16%)	1,352 (1.2%)
Haryana	1,13,075 (▲1,818)	90,884 (80%)	21,014 (19%)	1,177 (1.0%)
Madhya Pradesh	1,08,167 (▲2,523)	83,618 (77%)	22,542 (21%)	2,007 (1.9%)
Punjab	99,930 (▲2,241)	75,409 (75%)	21,661 (22%)	2,860 (2.9%)
Chhattisgarh	88,181 (▲1,998)	49,564 (56%)	37,927 (43%)	690 (0.8%)
Jharkhand	72,673 (▲1,321)	58,543 (81%)	13,504 (19%)	626 (0.9%)
Jammu & Kash..	65,026 (▲1,036)	42,115 (65%)	21,887 (34%)	1,024 (1.6%)

Figure 2: Corona cases as on 22 September in India

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Figure.2 shows that corona cases as on 22 September in India. Thinking about the current grievous circumstance, robots are appropriate for thinking about the prosperity of COVID-19 patients hence supplanting or possibly sharing the outstanding task at hand of the clinical staff in clinics under oversaturated conditions. Various automated frameworks are utilized for clinical help in clinics today. In China, robots have been allotted different errands to limit the spread of COVID-19, for example, using them for cleaning and food arrangement occupations in tainted territories perilous for people. This examination is one of the first considers, which highlights the importance of robotics in hospital and healthcare facilities specially concerned with the COVID-19 outbreak. The motivation behind this examination is to investigate key medical services digitization advancement through mechanical technology usage regarding worldwide COVID-19 administration viewpoints. This examination will furnish decision-makers and strategy creators with key experiences in improving the medical services quality in local and global disasters together with pandemic settings and other comparative circumstances.

2. INCREASING DEMAND OF MEDICAL ROBOTS

The worldwide clinical robots market is becoming fundamentally because of expanding interest for insignificantly obtrusive medical procedures with the assistance of robots in the business. Also, rising requirement for errorless medical procedures are relied upon to help the development of the clinical robots market. Monstrous unexplored market in clinical robots industry of creating economies are making sufficient open doors for the clinical robots market to develop at a significant rate in the coming years.The serious innovative work offices and new item improvements by the organizations are supporting to address the interest for practical medical services in the clinical robots industry. Careful robots diminish the pre and post-employable expense and length of remain in medical clinic. In addition, the innovation of nanorobots is also expected to support the growth of the market for clinical robots in the coming years. The market can be organized as non-invasive radiosurgery robots, surgical robots, rehabilitation robots, hospital and pharmacy robots and others, based on the form of clinical robots[4]. By type, surgical robots lead the market for clinical robots, as surgical robots reboot. Orthopedic surgical robots, robotic laparoscopy systems, robotic steering systems, robotic neurosurgical systems, etc[5].The laparoscopic automated frameworks lead the market for surgical robots; while the portion of neurosurgical mechanical frameworks relies on the rapid development of the neurosurgical mechanical frameworks, among all the surgical robots class, in the coming very long time due to the increasing interest in negligibly obtrusive medical procedures.Rehabilitation robots include assistive robots, prosthetics, exoskeleton radiosurgery robots, orthotics and therapeutic robots [6]. In addition, the medical clinic and drug store robots incorporate telemedicine robots, I.V. robots, drug store robots and others.

To shield them from risky tasks, robots have long served humans. At a General Motors manufacturing plant in New Jersey, the Unimate, the first industrially effective robot, started working, performing automated tasks hazardous to humans. Other examples include mobile robots that support firefighters in settings with minimal visibility, robots that replicate the motions of hands and weapons carried out by humans at a safe distance to minimize health hazards for vulnerable workers, such as in nuclear settings, and robotic assistance in mountain rescue operations. The new pandemic of COVID-19 introduces to our society many risks and restrictions. The current COVID-19 pandemic brings along several threats and restrictions to our society. In order to face these obstacles, a number of possible implementations have been suggested to use robotics in healthcare and beyond. Healthcare staff are at the frontline of the fight during pandemics and are a highly vulnerable skilled community. In Canada, 51 percent of the 438 cases occurred during the 2003 epidemic of extreme acute respiratory syndrome (SARS), including three fatal cases. Among the first 138 patients, one of the earliest studies from the epicentre in Wuhan (China) found 40 healthcare employees, with infection rates up to 20 percent. As of July 2020, more than 1,800 healthcare staff reported from 64 countries had died of COVID-19, 20 being the youngest and 99 the oldest. In a revised list at the end of August 2020, 1,079 fatal cases of health workers in United States. A lack of personal protective equipment (PPE) is a key problem even among the best equipped centers and most advanced nations, which can trigger fierce competition between governments and prioritize medical personnel over others in some countries. Labour is another limiting factor.Although devices in healthcare systems could theoretically run for longer periods beyond full capacity and ventilators or wards

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can be urgently produced, healthcare staff cannot follow this speed, creating a limiting factor during high-demand periods in patient management and treatment. In both of these cases, the use of robotics will help (1) minimize interaction between the patient and the healthcare provider and hence the need for PPE and (2) operate at full capacity during exceptional times.

A portion of the components driving the development of clinical robots market are ascend in geriatric populace, expanding pervasiveness of neurological and muscular conditions, rising interest for telemedicine, mechanical progression in robotization of medical services industry, and expanded interest and use of robot helped techniques. The clinical robots market can be ordered based on application as nervous system science, specialized curriculum, laparoscopy, muscular health and others. Furthermore, decrease in prescription blunders utilizing clinical robots, increment in medical care spending and ascend in government subsidizing and gives are likewise filling the development of the worldwide clinical robots market. Rehabilitation robots include assistive robots, prosthetics, exoskeleton radiosurgery robots, orthotics and therapeutic robots. Geologically, North America will be driving the worldwide medical robots market in the upcoming years, because of rise in aging population, developing unmistakable quality of recovery robots, and positive repayment strategies. Besides, Asia-Pacific is the quickest developing locale in the worldwide clinical robots market. The significant reasons including to the quickest development in the locale are expanding medical services consumption, huge pool of patients, ascend in government backing and financing, expanding clinical the travel industry, and improving medical care framework in the area. In addition, the medical robotic market is likewise becoming because of expanding consciousness of patients in the developing nations, for example, China and India, of Asia-Pacific locale. The clinical robots market is extended to arrive at USD 16.74 billion by 2023 from an expected USD 6.46 billion out of 2018. The key variables driving the development of the market are mechanical progressions in medical robots, preferences offered by robot-helped preparing in restoration treatment, an expansion in financing for medical robot research, and the issuance of IPOs by medical robot organizations. Quick development in the geriatric populace and rising patient inclination for negligibly intrusive medical procedures is probably going to offer development openings during the estimate time frame. Graphical structure of Robotics development in medical applications is shown in figure.3.

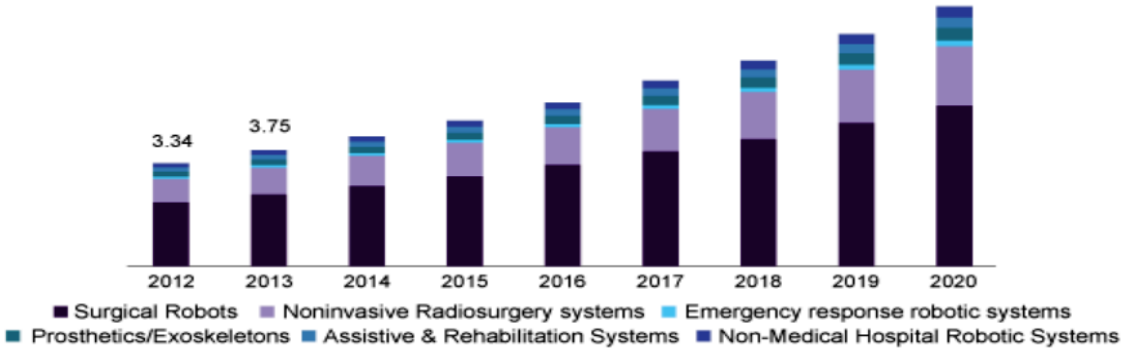

Figure 3: Robotics development in medical application

3. ADOPTION OF ROBOTS IN INDIAN HOSPITALS TO RAISE DURING AND POST COVID.

In India, due to a shortage of personal protective equipment, the appropriation of robots to treat patients with Coronavirus is contingent on filling in. Specialists research how cobots can be used to remotely test infection patients to forestall medical staff. To diminish consistent presentation between Coronavirus patients and guardians, and strengthen screening, emergency clinics in India are going to robots, everything being equal. In Coronavirus wards, Delhi-based AIIMS emergency clinic has transmitted a story disinfectant and a humanoid robot. At its passageway, Fortis Hospital, Bengaluru also sent an intuitive robot to screen all, including clinical workers, entering the premises. Universal Robots also noted interest in cobots or shared robots to assemble great face veils in sequential government-run construction systems. Specialists are studying how cobots can be used to remotely test patients for infection to minimize risks for staff in medical services.[7]. AIIMS needed

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anintelligent robot system that can support medical services labourers from going inside the Coronavirus ward too often, as each time an individual goes in and emerges from the ward, they should change the PPE. This April, the intelligent humanoid robot deployed at AIIMS is standing 92cm-tall robots in Covid wards, and progressively through various private multi-claim to fame emergency clinics, these robots will go at a pace of 2.9 kmph and record all exercises using their in-fabricated three-dimensional (3D) data and top quality (HD) camera, and also associate patients with their loved ones by averageof its 10-inch screen[8].LIDAR (light detection and range) and SLAM (simultaneous localization and mapping) technologies are used by these humanoid robots to identify objects in their way of preventing any crashes and have more than 60 sensors.They are also used to make additional customizations possible, when necessary, through open API (application program interface). Produced by Milagrow Robotics, their battery limit is 12 hours on a solitary charge and takes four hours to energize. While they were used previously for cleaning air pipes and pools and yard cutting, Milagrow, organizer and CEO Rajeev Karwal, told Indianexpress.com that it was a natural extension during the pandemic to be used in medical clinics. It took a little variety to get them fit for telemedicine, far from therapy, meetings and appreciation for humanoids who were mostly going into cordiality.We did it for AIIMS at the main doorway, he says. An ordinary robot costs between Rs 80.000 and 12 lakh, while Rs 6.5 lakh requires the humanoid elf. The intelligent humanoid nursing robot for covid care shown in Figure 4 is used by AIIMS, India.

Figure 4: Intelligent Nursing humanoid robot at AIIMS, India

Today, as proposed by ICMR, robots help clean floors and sterilization areas with the help of sodium hydrochloride. Invento Robotics used ultraviolet (UV-C) light for cleaning at Apollo Hospital in Bangalore as a further step in this direction. C-Astra is a medical, office, and retail cleaning unit. The six sources on the robot make the UVC light on the premises revolutionary. Balaji Viswanathan, CEO, Invento Robotics, says the robot's ability to travel when illuminating would ensure that all alcoves and corners are protected.Robots were previously used in India by hospitals. For example, a two-year-old child built without a food pipe was used in the accuracy medical procedure carried out by PGIMER Chandigarh specialists. In any case, the use was limited to a few clinics and activities. The continuous emergency brought the importance of a large number of the growing technologies, e.g. 3D printing, automatons and robots, to the world.

4.WHEELED MOBILE ROBOT MANIPULATOR PERFORMANCE IN COVID-19

Mobile robot manipulator play out the computerized manual tasks they are work concentrated, tedious and dreary so as to diminish the weight on bleeding edge medical care workers. Since robots can give exceptionally exact, reproducible, quick and controlled moves, they can encourage an a lot higher all through in lab testing and test examination, medical clinic hardware and climate cleansing/disinfection, and drug store administration. While task-specific programming of robots is testing and requires broad PC programming expertise [9], where any medical services labourer can illustrate an offered assignment to the robot by truly managing it through the ideal movements and the robot learns the capacity to repeat the undertaking all alone. This is exceptionally favourable during the COVID-19 pandemic when mechanical frameworks should be profoundly excitable and reproposable to best meet the exceptionally unique everyday difficulties of the medical care framework.Wheeled mobile robot manipulator (WMM) permitting cutting edge medical services labourers to

assess and emergency patients before they enter the clinic. Wheeled mobile robot manipulator supporting live sound video association with hospitalized patients with the capacity to distantly control a camera or measure quiet vitals, particularly for the ones that are being disengaged and supporting the checking of countless patients in non-clinic crisis wellbeing conditions, for example, recreation centres, tents, swab tests, directing drugs from a protected separation, and so forth

5.ROBOTS IN FUTURE PANDEMICS

As the world keeps on halting the Covid-19 flare-up, it has become evident that robots and computerization advancements will be required as people and robots cooperate. Ideally, COVID-19 will quicken the selection of existing robots and their variation to new specialties; however it may likewise prompt new robots. Research facility and gracefully chain robotization is rising as a disregarded chance. Robotizing the moderate COVID-19 test handling that depends on a little arrangement of labs and extraordinarily prepared labourers would dispense with a portion of the postponements presently being knowledgeable about numerous pieces of the U.S.Automation isnot especially energizing, however like the unglamorous sterilizing robots being used now, it is an important application. In the event that the administration and industry have at last taken in the exercises from past debacles, more unremarkable robots will be prepared to work next to each other with the medical care labourers on the bleeding edges when the following pandemic shows up.

6. CONCLUSION

Medical field staffs are fending off the infection at the forefronts in medical clinics and care homes and patients amass, it gets hard for staff to protect up and remain. In addition, administrators end up in a troubling situation, as senior residents in care homes are among the most defenseless against infection. Humanoids robots have a wide number of arrangements that can ease and minimize outstanding pressure and concern for workers, as well as provide more ways for everyone to be cautious in weak situations, with arrangements such as cover testing, watching, and telepresence. The human dash of guardians and clinical staff will never be supplanted by robots, but they can help reduce the remaining burden and make their work simpler and more productive. They can come as huge guide like the emergency that we are presently living incoming to their salvage somewhat, humanoid robots that are helping them in inspecting patients and different systems, consequently diminishing their introduction to the infection and preparing for the utilization of machine in the Covid-19 battle.

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