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HUMANOID ROBOTS IN FUTURE HEALTH SECTOR

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Abstract

Robots are nowadays common in every sector. From December 31st 2019 onwards an unknown virus was detected in Wuhan city, China that has been spread over the world and took lakhs of lives. As it is still prevailing as a contagious disease and is affecting all sectors especially medical field. During this situation the use of Robotics has been increased. As the threat of being affected by coronavirus; doctors, nurses and other health care workers started using robots to interact in real time with patients. Even though robots are efficient in many ways, they cannot mimic empathy which includes a core of compassion, listening to those in need, expressing genuine concern etc. But these robots can also be the sole companions of healthcare workers in future. So, we are discussing about the necessity of humanoid robots in the medical field.

Keywords: Robots,Health sector,
Pandemic situation,Covid-19,AI,Future.

I. INTRODUCTION

The first Robot "Unimate" was invented by George.C.Devol & Louisville,Kentucky in 1950.The word 'Robot' originated through the play i.e,Czech playright Karel Capek .

It developed from the word 'Robota' which means 'forced labour'. The very first non-laparoscopic robot was the Puma 560, that performed neurosurgical biopsies with high accuracy in 1985.Nowadays the usage of robots are essential in the medical sector.There are simple as well as highly complex robots,i.e. used for surgery.Robots have an extremely important role in assisting healthcare workers during pandemic**[1]**. A study which was conducted in the Science Robotics says "Robots have the capability to be used for disinfecting, transferring medicines and food, count important signs. As the epidemics shoot up, the roles of robotics are becoming more clearer". A vast

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digit of hospitals are currently using robots to sustain healthcare workers & patients **[9]**.

IIApplying **R**obotics in **P**andemic(Covid19)

There are various types of robots which operate in hospitals, for the patients it is like talking to a doctor face to face.In India this pandemic has been the turning point for the services of the robot industry.We turned to robots on a scale never seen before to help with the global war against the coronavirus in a crisis where people themselves are hazardous,Robots become more useful and valuable today than ever before.

Robots often get a bad rap in public consciousness with movies like Terminator,in the opinion of respected figures ,*Elon Musk* and the late *Stephen Hawking* who have warned against the dangers of AI. There's also the more immediate threat of AI and robots replacing jobs in the coming decades.Time and time again society has turned to robots and unmanned vehicles to perform functions that have become dangerous for humans to perform controlled robots.

TABLE I
[8]ROBOTS USED IN MEDICAL FIELD DURING PANDEMIC

SL.N0	NAME	FUNCTION
1	UVD Robots	Keeping services disinfected,and is directed to clean rooms by hospital staff/mobile App
2	Cylindrical Robots	Rolls into treatment room to allow health care workers to remotely take temperature & measure blood pressure & oxygen saturation from patients hooked up to a ventilator.
3	Xenex X5 Lightstrike	It is a disinfecting robot.
4	Starship delivery Robot	It is a self-driving robot which safely transports needed items such as food & medicine without human interaction.
5	Moxie	It's a hospital robot assistant designed to aid nurses by performing supporting task such as gathering medical supplies & delivering them to patient's rooms,collecting fresh linens & removing old ones & transporting patient lab samples.
6	Ninja	Designed for recovering stroke patients but have been repurposed to measure patient's fever & allows doctors & nurses to communicate with patients via video chat.
7	Tommy	Helping by being placed in patient's room to monitor health conditions & relay patient's messages to nurses via touchscreen.

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III.Requisite For Robots

Expenditure

As robots are required on a large scale in the health sector they need to be cost efficient for extensive availability and usage. Adaptability of these system may not be practicable in most parts of the world.Surgical robots are very expensive, as they are providing cutting edge technologies with unified high definition video systems for tool guidance and direction for the surgeon**[4].**

Over the last 10-15 years we have seen the arrival of an increasing role of technology in all aspects of medicine and surgery .One of the exciting new modalities that came along is that of robotic-assisted Laparoscopic surgery.So there is keyhole surgery employing a robotic slave to improve both vision and dexterity of the surgeon.The robot that has dominated the field is the Da Vinci Robot made by intuitive medical .
It's now available in numerous hospitals across the UK and is employed across a breadth of specialities,particularly in urology.Operations where this device is used include radical prostatectomy for prostate cancer,radical cystectomy for bladder cancer and in robotic-assisted partial nephrectomy for renal cancers.

Power requirements

To set off medical robots AC or DC power have to be required without interruption,so these reproving systems can perform tasks frequently.As medical facilities differ from wide ranging city hospitals to small hospitals,various sustainable energy sources are also employed for well grounded power solutions[**2**].

Semiconductors specialises in energy efficient innovations and solutions.This is highly relevant in the area of power management in industrial robotics where on semiconductor advancements are enabling more efficient machine.On semiconductor solutions are helping the next generation of robots manage power as they become more robust .Advancement in voltage regulators are enabling to operate more efficiently and generate less heat.All power management requires mosfets and superjunction mosfets are ideal for high voltage industrial power application.This technology is tailored to minimize conduction loss provides superior switching performance dvdt rate and higher avalanche energy. Point of load power supply places the individual power supply regulators close to their point of use.This solves key design issues such as emi radiation and conduction losses for high performance industrial robotics with high peak current demands and low noise margins.

Today's robots process more high resolution images to identify ,classify,manipulate & avoid objects.Idos are key components to provide a clean voltage input which results in higher image quality from cmos image sensors. This allows both collaborative & autonomous robots to navigate their environment more accurately synchronous switching regulators are an ideal solution for battery powered robots, extending battery life with increased efficiency. Linear regulators block the noise from switching dc dc power supplies ,like point of load regulators .The compact is more simplistic design of ldos fits easily into design with limited space yet still offers high performance capabilities whether you need to switch electronic signals ,amplify signals or convert power in your robotic design on semiconductor products are highly efficient solutions that fit in compact circuit designs .Then robots can move and see more accurately .They help protect the people they assist and they accelerate production workflows.

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IV.AI & Humanoid Robots Improving Health Sector

Face Mask Detector Robot:A new robot called 'whiz' which can detect humans without a mask.A face mask detection app has been installed in this robot which is working with an artificial intelligence algorithm to detect if you were wearing a mask or not.It will generate a voice reminding people to wear a mask or to wash their hands often.

Robots enhancing accuracy in the surgical field: Many robots has been used in top hospitals all around the world.As they don't have feelings ,never get tired and also doesn't loss concentration,hence they are considered as perfect surgeons.They are called waldo surgeons,these surgeons aqueduct gap between humans & machines and perform task with great accuracy.As long as the software is set to function correctly, the human surgeons have only supervising role by controlling it.[**11**]

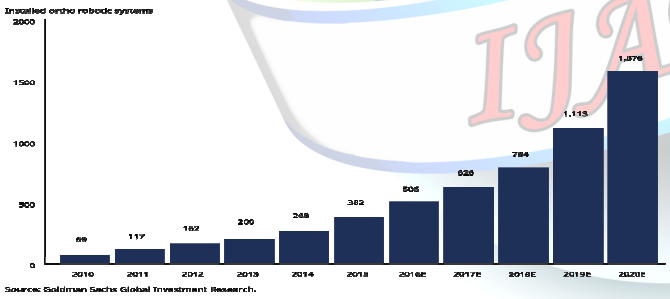

Figure 1-**Growth of surgical robots**

Precision in Diagnosing: Computer algorithms are performing incredible task with high accuracy at massive scale using human like intelligence that is often referred as Artificial intelligence.AI is poised to make an incredible impact on human lives in future.Even now we still face massive challenges in diagnosing several-life threatening illnesses such as infectious diseases and cancer.Thousands of people lose their lives due to liver and oral cancer.The best way to help these patients is to perform early detection and diagnosis of diseases.**[10]**

Instead of using 10,000 very expensive medical images,we can now train the AI algorithms in an unorthodox way, using only 50 of these high-resolution, but standard photographs, acquired from DSLR cameras and mobile phones & provide diagnosis.

Remote Robot Interventions: It is mainly used for emergent medical events, such as heart attack and stroke.This advancement has the potential to help millions of stroke patients around the world who lack access to the medical care they need.In stroke ,they say time is brain for every hour and a half delay in care a patient losses one year of disability free life.Even transport hospital can result in losing upto 2 years of independent life.As a result two-third of the patients may not survive or will have permanent disabilities from their stroke event.

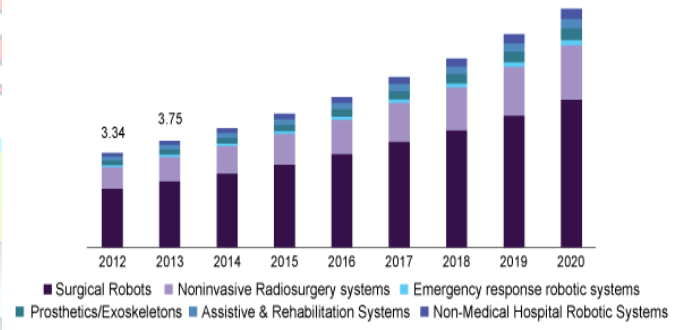

Figure 2-**Graph of robotics growth in whole world**

The Goal is to disrupt the status quo by bringing the physicians to the patients with remote robotics.That will enable them to reach patients ,treat them faster and that will bring great outcomes in future. There is a robotic assisted remote PCI interventions on patients who are more than 30kilometers away from a physician.Its proven that it is applicable to

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perform first in human projects of remote robotics[**3**].

Micro Robots : It is a tiny robot i.e, used inside the body.Used for carrying cancer killing drugs to treat difficult-to-reach tumors which are deep inside the body.The approach of drug delivery would minimize the exposure of normal ,healthy cells to toxic chemotherapy drugs , thus avoiding the side effects**[7]**.The team developed call these bots 'microrollers' because they navigate blood vessels by rolling along their walls.By sticking to the walls where blood flow is slower with the help of a magnetic field, the microrollers can roll against the bloodstream which has been a challenge for bots of this size.It has two faces , each with a specific job, one side is needed for navigation & it's made of magnetic gold & nickel layers, which allows the researchers to control the microbot's movement by flipping on a weak external magnetic field.

V.Grace : The Robot Nurse

Grace is a humanoid robot developed by the Hong Kong team which launched the celebrity humanoid robot Sophia.Grace uses artificial intelligence for diagnosing patients. She is targeted to assist in the health sector and designed to interact with the elderly and those isolated by the covid-19 pandemic.She is dressed in blue & has asian features with collar length brown hair and a thermal camera in her chest to take your temperature and measure responsiveness of patients.She can speak english mandarine and cantonese.She can do all things for elderly people,can visit people and brighten their day with social stimulation,entertain and help guide exercise and also can do talk therapy,take bio readings and help health care providers assess their health and deliver treatment.

Grace's resemblance to a health care professional and capacity for social interaction is aimed at relieving the burden of front line hospital staff overwhelmed during the pandemic.For simulating 48 major muscles on the face Grace has 36 motors in the face they are reversible which means that each motor can simulate two muscles because human muscles require two for the actions.As the covid has accelerated ,the deployment of humanoid robots in different settings will have a positive effect in the health sector. For socially isolated individuals during covid with a lot of negative thoughts, if they can get help through deployment of these social robots in their intimate settings, certainly it will have a positive impact in the society.

VI.Will AI & Robotics Replace Doctors ?

People have different opinions when comes to this topic.Its true that AI has already been a part of our lives, we may not have realized it.If you have a modern generation smartphone which already got neural chips inside it, the apps we use every day like twitter, facebook etc .They all are optimized through AI to give a personalized feed.

All sectors are investing heavily in the AI space And so as you can imagine that healthcare is the next big place for AI.There is so much money invested in this, that the dialogue has gone from *'let's build tools to help doctors to AI might replace doctors*'.It says there exist major problems with having human medical providers for example, human error.Now matter how accurate humans are, it is a part of being humans to make mistakes which creates ambiguity when you consider how powerful the human brain actually is, In 2016 study from Johns Hopkins University found that medical error can be the third leading cause of death.It's estimated that quarter million patients are dying annually from medical error.In medical AI big changes are occuring every every week.We now know that deep learning or machine learning algorithms really are changing the way we interpret images whether it's

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MRIs, CTs ,X-rays, Ultrasounds which is equal to or above radiology performance.It can diagnose skin cancer just as accurately as a panel of dermatologist and another machine learning algorithm can predict who's at risk for heart disease much better than doctors can. Using machine doctors is also much cheaper with the upcoming doctor shortage and a collapsing healthcare financial system .Training a doctor takes thousands of dollars and years of work.Whereas as the robots can learn diagnose much faster.And can calculate all the drug interactions and possible treatments much faster than a mere human doctor can.With medical knowledge doubling every three years , it may be hard for humans to keep up also they don't get tired after looking thousands of X-rays & doesn't need sleep at night.If take an area like breast cancer diagnosis even amongst highly trained pathologist agreement on some forms of breast cancer can be as low as 48% that's because each pathologist is reviewing the equivalent of thousand 10 megapixels images for every case.This is a large data problem but one in which machine learning is uniquely equipped.

From a survey conducted says that AI is better at picking objects than humans.In speech recognition AI is almost equal to humans but only for single speakers i.e once you put two speakers in a room, AI gets confused.It also says that they are *brilliant idiots* for example as we said that AI is fantastic at detecting objects , so they can tell what is what.But can't tell why they are arranged .

Today's AI is fantastic at solving single simple tasks,imagine if it's a radiology AI might be brilliant at detecting TB in lung, it's not a radiologist, It does that one job very well.There are still challenges in this health care sector that AI can't deal with & it also says that ,they can't take over doctors job.For example robots can't **mimic emotion & empathy[6]**.Let's consider an example scenario; A lady actually flown across the country driven 50 km from the airport through the pouring rain and finally made it to the hospital where her mother has been admitted with serious health issues.She saw her mother through hospital room window & all she wanted to tell her mother how sorry she was for not being there for the past few years & wanted to tell her that she is there now and everything is going to be okay.But in this particular hospital there was a robot who took care of the facilities & it's set to lock the door at 9.00 p.m .When the lady arrived the hospital it was almost 9.01 p.m .And the robot said 'no visitors are allowed'.She pleased the robot to let her see her mother just once.But for robots rules are rules , here robots are build on binary logic.They unfailingly do what they were programmed to do , what they believe is right without any exceptions.It's actually a cruel combination ie, brilliance, calculating logic & lack of compassion which is one of those reasons that make sure AI won't replace doctors.

Trust can also be a reason , we know that robotics in healthcare has increased from year to year. Back then mostly used were surgical robots and were only available in multispeciality hospitals.Different robots assisting healthcare workers has been rapidly increased only during covid19 pandemic.In a research also, found out that it's difficult for patients to believe robots. Because they think that programmed robots can't meet their needs in hospitals.The medical support provided by robots are kind of insufficient. Their way of assisting is more systematic which creates trust issues in the patient's mind. And the comforting words of a machine made of algorithms can't actually make us feel secure.The warmth & the concern from health workers which comfort & heal patients are lacking in many ways.[**5**]

Robots are not **flexible** like doctors i.e,there will be situations where immediate changes are required for

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different cases, a pre-programmed robot definitely can't deal with this situation alone ,they need guidance from doctors to perform the corresponding task.We know that patients need physical as well as mental support in health care. For example in gynaecology, some patients are mentally and emotionally weak & they need counseling before operation.But for robots they can't understand the gestures and pain of humans which is deep inside ,because it's a human thing. And they cannot perform counseling sessions with the programmed messages.We know for different people problems are also different ,So the advice and help they provide should vary from patient to patient.It will be difficult for robots to give professional advices like doctors.

Even though robots doesn't get tired and neither required sleep like doctors and can work for whole day, there should be adequate **power** needed for them to perform tasks and if some power failure problem occur during surgery or disfunction occur, it will cause the life of patients.Robots can't handle situations like this, all by themselves.So these are some important reasons that is going to keep doctors in future health sector without any threat of being replaced.

VII.Conclusion

The covid 19 pandemic had made us use more robots in different countries.As it was contagious , doctors had no option but to treat patients while keeping a safer distance from them. During this time robots were used as a medium by the health care workers to interact with isolated patients.To be honest we don't know what the future holds for us.What if something like this happens again?So we have to be prepared.Using robots in health care was one of the best choice. It will be way more efficient if we use **Humanoid Robots** instead of other robots ,as it is convenient for patients to interact with.

We can say that when compared to other robots humanoid robots don't have much difference.But when it comes to the health sector, humanoid robots have a plus point.Their human like appearance, actions , gestures and the way of mimicking human emotions will be more appealing for patients.It will become a little bit easier for patients to trust them because of their human like behaviour & facial expression.

We have AI which is pretty good at lots of things & we have humans who are good at different things, each having weaknesses and strengths that complement each other. If we summarize it ,AI really is tremendously important in partnership with humans, i.e, it's going to make a big difference and we are going to be better at diagnosis and treatment. Also we are going to have a smarter, more agile and safer healthcare system.It will be absolutely possible only if doctors are going to keep their hands on the wheel of future healthcare along with robots.This idea of losing medical job isn't real in the future , in fact it will be the cooperation of both Robots & Healthcare workers.

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