

Renovating Robots

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Abstract – Robots have become a subject of great interest now a-days. In this day and age, robots work alongside humans in hotels and factories, while driverless cars are being test driven on the roads. Robots have long captured the human imagination. But despite many advances, robots have yet to reach the potential so often envisioned in science fiction. Today's engineers and computer scientists are still pursuing one missing ingredient: high intelligence. The goal of this article is to introduce the reader to the rich and vibrant field of robotics, in hopes of laying out an agenda for future research on robots. The primary purpose of this article is to provide a comprehensive description about the past, present-day and futuristic robotics.

Index Terms – Autonomous, Emotional intelligence, Hijacking robots, IFR, Intelligence quotient, Sensorimotor, Vacuuming floors, Humanoid Robots, Cloud Robotics.

1. INTRODUCTION

1.1. Definition

A robot by definition is "an automatic device that performs functions normally ascribed to humans or a machine in the form of a human."

A robot can be defined as a programmable, self-controlled device consisting of electronic, electrical, or mechanical units. More generally, it is a machine that functions in place of a living agent.

Robots are especially desirable for certain work functions because, unlike humans, they never get tired; they can endure physical conditions that are uncomfortable or even dangerous; they can operate in airless conditions; they do not get bored by repetition; and they cannot be distracted from the task at hand.

In the 1940s, the word robot caught the world's attention when Isaac Asimov coined the Three Laws of Robotics:

Law 1- A robot may not injure a human being, or through inaction allow a human being to come to harm.

Law 2- A robot must obey orders given to it by human beings, except where such orders conflict with the first law.

Law 3- A robot must protect its own existence, as long as such protection does not conflict the first or second law Asimov's three laws of robotics were designed to guide robots in their interaction with humans and provide a safe way for future robotic development, one that cannot threaten human

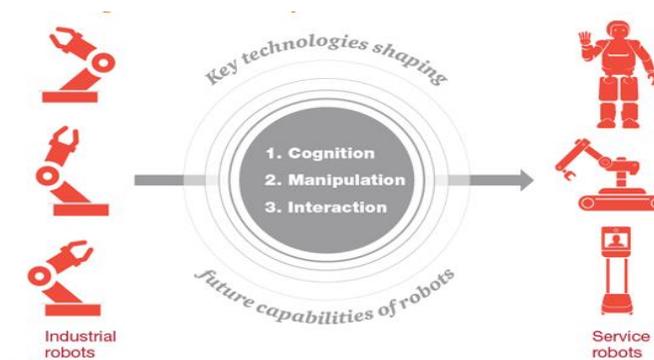
existence. Yet in his own short stories Asimov's robots always happen to fall into all kinds of trouble while following the laws in reality.

1.2. Ambit

In basic robotics we design machines to do the specified tasks and in the advanced version of it robots are designed to be adaptive, that is, respond according to the changing environment and even autonomous, that is, capable to make decisions on their own

1.3. Robots and Beyond: Exploring Artificial Intelligence

Artificial intelligence (AI) is the science of making smart machines, and it has come a long way since the term was coined in the 1950s. It deals with helping machines find solutions to complex problems in a more human like fashion. This generally involves borrowing characteristics from human intelligence, and applying them as algorithms in a computer friendly way.



AI is generally associated with *Computer Science*, but it has many important links with other fields such as *Math*, *Psychology*, *Cognition*, *Biology* and *Philosophy*, among much others. Our ability to combine knowledge from all these fields will ultimately benefit our progress in the quest of creating an intelligent artificial being.

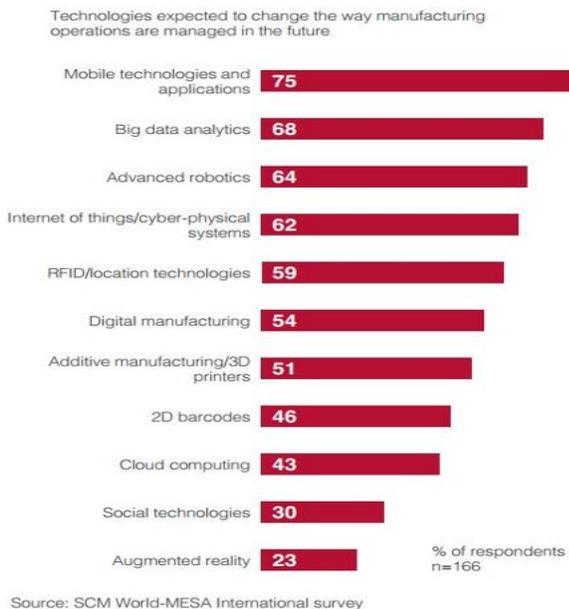
- Math – solving problems, logic.
- Psychology – the study of mental processes and behavior.

- Cognition – processing information, applying knowledge.
- Biology – the study of living organisms and how the work.
- Philosophy – wisdom and understanding.

2. INTUITION INTO THE FUTURISTIC ROBOT

The Future of Robots Doesn't Look Like What You Think It Looks Like. Robots have become a normal part of the human experience— from vacuuming floors and assisting the elderly to entertaining at concerts and diffusing bombs on the battlefield. We have seen robots transition from incredibly expensive machines with limited functionality to today's modern industrial robots that can do amazing things while offering a quick return on investment.

Not only have these robots started working their way into every aspect of our daily routines, they have also reduced injuries in the workplace, increased the competitiveness of companies in a fierce global market, elevated the quality of affordable products, increased profits for countless businesses, and created a universe of high paying and rewarding jobs.



With more than 8.6 million robots in existence, and the field of robotics recently being pegged as the “fastest growing industry in the world”, we find ourselves increasingly wondering what this robot-overrun future will look like

The future will likely be a bit more harmonious, with humans and robots coexisting in the workplace, and in our everyday lives. Automation will drive social and economic growth, with humans and our machine counterparts working side by side to

achieve business goals. Forrester says there are many positive changes we can expect over the next few decades, including:

- **Self-driving cars** — Large cities that already heavily regulate traffic (like London and Rome) will ban all human-driven vehicles from their downtown areas by 2025.
- **More focus on security and risk expertise** — As company systems become more complex and automated, the risk of stolen customer data increases. There will also be the new risk of hackers hijacking robots in warehouses or retail stores. Controlling these security threats will be a high priority and will require skilled professionals.
- **Robot management will be a new job skill** — We have probably heard of IQ (intelligence quotient) and EQ (emotional intelligence), but the new acronym will be RQ (robotic intelligence quotient). Companies will look to hire professionals with experience in human-machine interactions.
- **Blue-collar workers will have job titles like Robot Maintenance Technician** — For jobs threatened by automation, job retraining programs will be available and will focus on professions supporting the new economy, like robot maintenance. For white-collar workers, programming skills will allow them to participate in extended software ecosystems for robots.
- **Manufacturing will require less low-skilled human labor** — Highly automated manufacturing can be done closer to customers and with low transportation costs. Because of this, countries like India and China will have to evolve from their current growth strategies of providing low service and labor costs to countries like the U.S.
- **The gig economy will create higher taxes and less focus on employee benefits** — As [the gig economy](#) expands, public policy will have to catch up. Due to the atomization of work, governments will have to step in to provide gig workers with access to things like health care, as they will have just-in-time jobs with no benefits.
- **Robots will be your friend.** In the future, robots will become friends and caretakers to humans. Powerful voice-controlled agents — like Cortana and Google Now — meant to assist us with our daily lives, will become integrated into robots.
- **There will be cultural backlash, but it won't hold automation back** — With every economic revolution there has been backlash, but it has never stopped industry from advancing. For businesses, communication will be key to keeping the peace. Change will be easier for people to accept if they feel new jobs are being created and value is being added for customers.

3. EMPOWERING ROBOTS

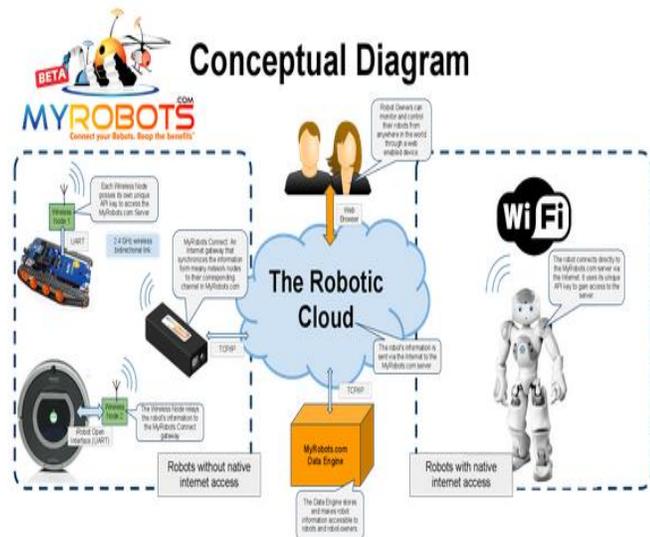
3.1. Brains of Future Robots - Cloud Robotics

Cloud computing is one of the tech buzzword of the decade, and can be considered another IT revolution since the time the Internet was discovered. The reliable and fast connections have also changed the way people connect and communicate.



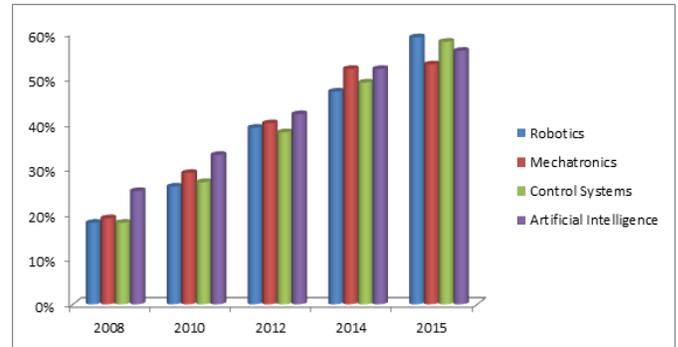
The rise of the cloud robotics also known as brain robots may have yet another major influence on how people live their lives. The partnership of brain robots and cloud computing may be seen in many different ways. It could be another way to make life easier or it could also be a threat because people may lose their jobs for a brain robot.

Cloud robotics, which involves the integration of cloud computing technology in robots, has been gaining prominence globally.



End users have begun to recognize the benefits of this novel concept, which uses the Internet to augment a robot's capabilities, mainly by off-loading computation and providing

services on demand. With this concept set to make future robots more productive and efficient, the diverse requirements of end users will be met with no compromise made to the quality of services.



New analysis from Frost & Sullivan, Innovations in Cloud Robotics finds that cloud robotics will lead to the development of smart robots that have higher computing efficiency and consume less power. These attributes will drive down the cost of manufacturing as there is less hardware and also result in lower emissions.

Innovations in cloud robotics have gained significant momentum, with initiatives by large companies such as Google and IBM and the engagement of research institutes in several active projects around the world. The need to develop robots that rank high on performance and accessibility has been the key focus in research activities.

“As cloud robotics moves beyond its nascent stage, numerous applications of these technologies will come to the fore,”

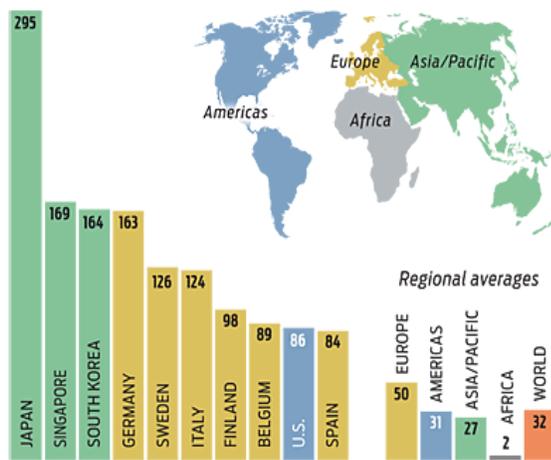
“For the moment, healthcare, transportation, consumer robotics and manufacturing are areas that can benefit from the use of shared resources and the elimination of the need to manage or update robotics software.”

Considering the prevalence of cloud computing technology and smart phones/tablets, the consumer robotics market will witness strong growth. In fact, cloud robotics will be a catalyst for the emergence of a mainstream consumer robot marketplace.

The major challenge for market participants, however, is the high dependence of cloud robotics on active Internet connectivity for processing any function. In areas of limited or no connectivity, robots powered by the cloud are unable to function effectively and respond promptly in critical situations.

The convergence of cloud robotics with big data, context-aware computing and high-speed ubiquitous wireless networks, along with the use of advanced wireless sensors, could solve connectivity issues that slow response times.

TOP 10 COUNTRIES BY ROBOT DENSITY
 (Industrial robots per 10 000 manufacturing workers)



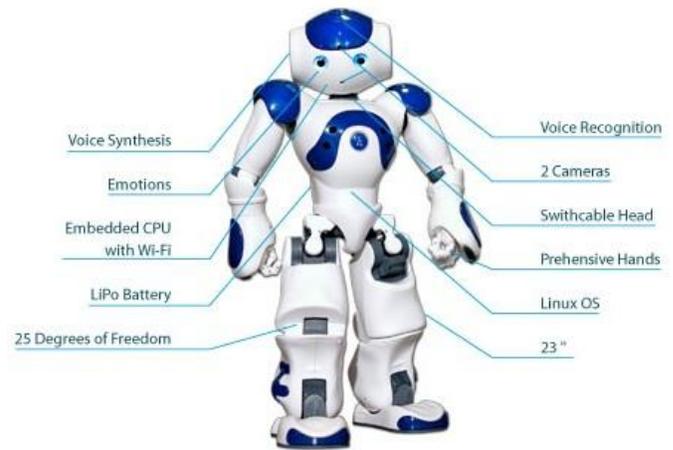
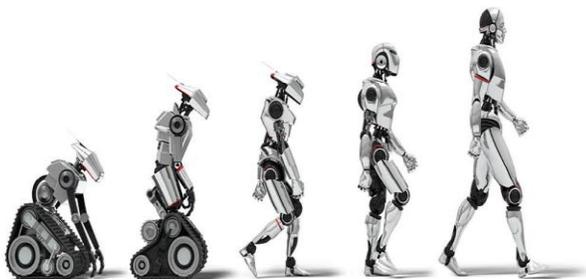
4. FROM VISION TO ACTIONS

4.1. Smart Community: Humanoid Robots

A humanoid robot is a robot with its overall appearance based on that of the human body.

Humanoid robotics is an emerging and challenging research field, which has received significant attention during the past years and will continue to play a central role in robotics research and in many applications of the 21st century. Regardless of the application area, one of the common problems tackled in humanoid robotics is the understanding of human-like information processing and the underlying mechanisms of the human brain in dealing with the real world.

Ambitious goals have been set for future humanoid robotics. They are expected to serve as companions and assistants for humans in daily life and as ultimate helpers in man-made and natural disasters. In 2050, a team of humanoid robots soccer players shall win against the winner of most recent World Cup. DARPA announced recently the next Grand Challenge in robotics: building robots which do things like humans in a world made for humans.



Considerable progress has been made in humanoid research resulting in a number of humanoid robots able to move and perform well-designed tasks. Over the past decade in humanoid research, an encouraging spectrum of science and technology has emerged that leads to the development of highly advanced humanoid mechatronic systems endowed with rich and complex sensorimotor capabilities. Of major importance for advances of the field is without doubt the availability of reproducible humanoid robots systems, which have been used in the last years as common hardware and software platforms to support humanoids research. Many technical innovations and remarkable results by universities, research institutions and companies are visible.

5. THE FUTURE IS NOW

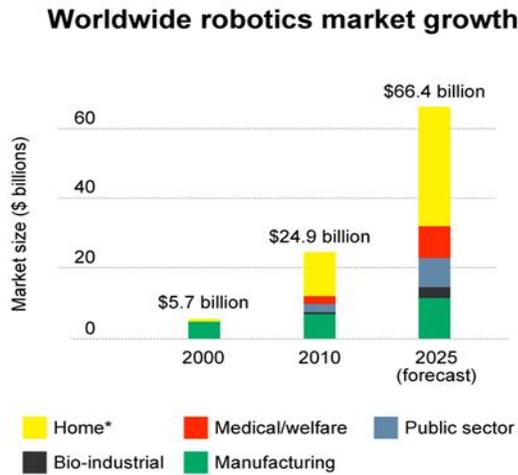
5.1. Business Opportunities

Robotics opens up a plethora of opportunities for both entrepreneurs and students. The industries across a range of sectors such as automotive, atomic energy, defense, space, metals, textiles and manufacturing use Robotic technologies very extensively.



They are also being used in operation theatres and rehabilitation centre to augment the quality of life. Developed countries like Japan and America have been using robots to

clean rooms, entertain etc. It is an ever growing field and many avenues have opened up in recent past.

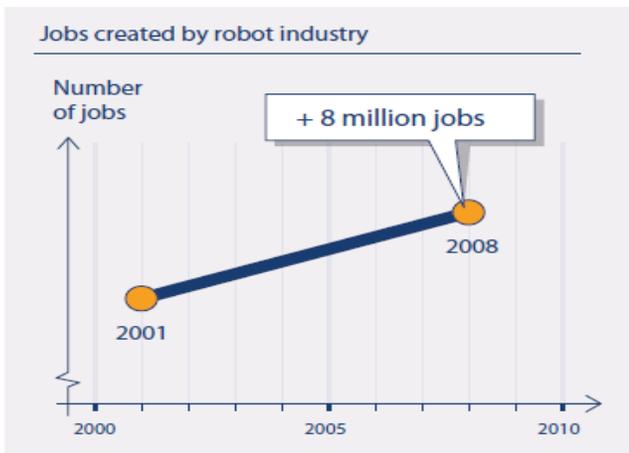


6. ISSUES AND CHALLENGES

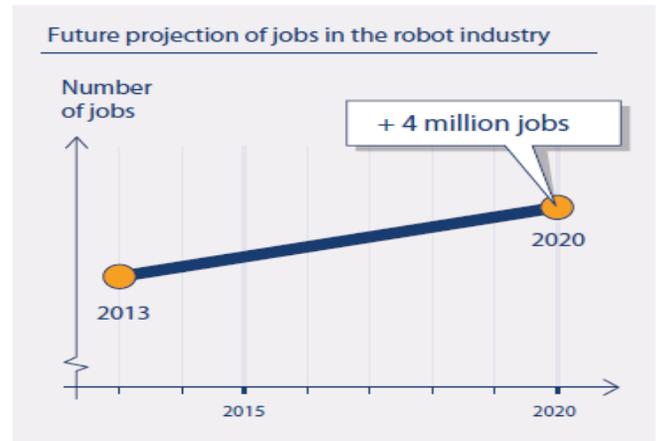
6.1. Employment

Many detractors have sounded the alarm, warning of a job-stealing robotic world of the future. Nevertheless, real-life experiences showing us otherwise. According to a recent International Federation of Robotics (IFR) report, in countries that have adopted the largest share of robots, unemployment has actually declined over time—meaning there is a positive relationship between robot adoption and job creation.

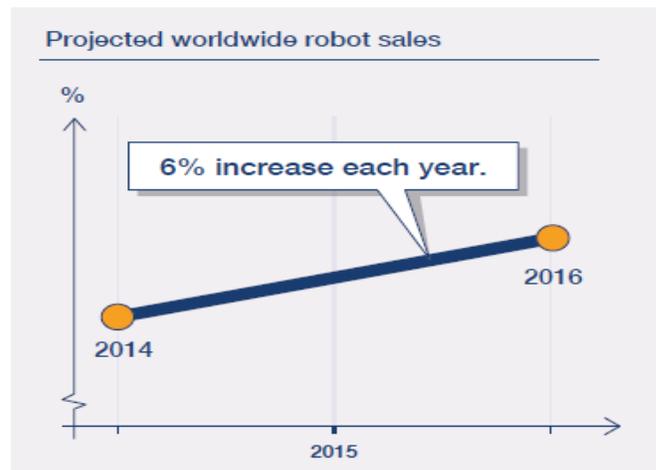
The IFR report notes that between 2000 and 2008 the robotics industry created 8–10 million new jobs, either directly or indirectly.



That's more than 1 million jobs globally per year. Although the economic recovery has stalled job growth on all fronts, the report predicts that another 4 million jobs will be created in this 'robot ecosystem' between now and 2020.



Along with these benefits, however, come some economic challenges. As the IFR study notes, many new jobs are created by robots; however, these jobs require skill sets that are sometimes hard to find among the existing population. For instance, the managers of the future will have to be well-versed in robot operations, service and logistics, as well as be able to train new operators. And for those individuals just joining the workforce, systems and institutions need to be in place to ensure they get the right counseling when thinking of how to enter the job market.



6.2. Technical challenges

As robots find their way into an increasing number of distinct applications, they will inevitably find themselves working alongside humans. This will be especially pronounced during the transitional phase in which robots are still incapable of perfectly reproducing human dexterity, but have enough dexterity and ability to work with delicate objects

The industry, working in conjunction with lawmakers and regulators around the planet, will need to agree on ways to mitigate the inherent risks of human interaction with robots by

developing new global standards governing this interaction as well as innovating new solutions to meet these standards.

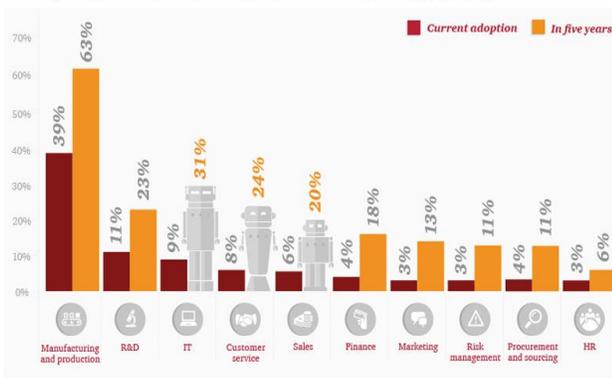
Ease of deployment and programming is also a large technical challenge that the industry is grappling with. As an increasing number of companies find that robots are within their affordability range, it is clear that one of the final barriers to adoption is the perceived complexity of programming and designing robotic systems.

6.3. A bright future

Certainly these challenges are not small matters, but they are opportunities not crises. In fact, the robotics industry and governments around the world have already begun addressing them in substantial ways.

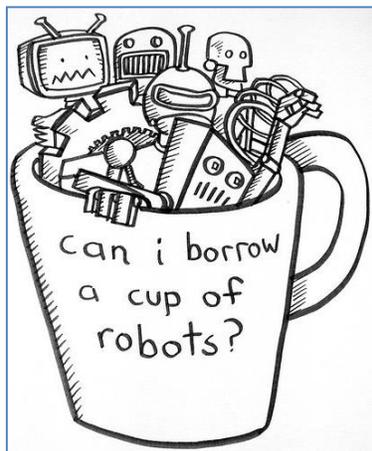
The IFR predicts that between 2014 and 2016, worldwide robot sales will increase by about 6 percent on average per year, reaching an annual supply of industrial robots of more than 190,000 units. Instead of reviling robots as job stealers, we need to recognize that they are the future and create policies that encourage safe and economically.

Role of robotics in IT, customer service and sales to grow significantly



7. CONCLUSION

Given that Robotics is fast entering into the industrial space in India, it is but natural that a lot of employment and entrepreneurship opportunities are opening up for people who wish to enter this growing and exciting field. From what the many entrepreneurs had to say, there is no denying the fact that there are many challenges that need to be overcome before the countries are seen as a go-to destination for Robotics. One of the



biggest challenges that they face today is the procurement of the hardware and other electronic components that are required to build a robot. However, this can be seen as a golden opportunity for budding entrepreneurs to set up businesses that can supply components and hardware to the existing and upcoming companies involved in Robotics. Finally, as the technology improves, there will be new ways to use robots which will bring new hopes and new potentials. The future of Robotics seems certainly bright and promising!

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