INTRODUCTION

Robotics is a branch of engineering and science that includes electronics engineering, mechanical engineering and computer science and so on. This branch deals with the design, construction, use to control robots, sensory feedback and information processing. These are some technologies which will replace humans and human activities in coming years. These robots are designed to be used for any purpose but these are using in sensitive environments like bomb detection, deactivation of various bombs etc. Robots can take any form but many of them have given the human appearance. The robots which have taken the form of human appearance may likely to have the walk like humans, speech, cognition and most importantly all the things a human can do. Most of the robots of today are inspired by nature and are known as bio-inspired robots.

Robotics is that branch of engineering that deals with conception, design, operation, and manufacturing of robots. There was an author named Issac Asimov, he said that he was the first person to give robotics name in a short story composed in 1940's. In that story, Issac suggested three principles about how to guide these types of robotic machines. Later on, these three principles were given the name of Issac's

three laws of Robotics

Characteristics

There are some characteristics of robots given below:

Appearance: *Robots have a physical body. They are held by the structure of their body and are moved by their mechanical parts. Without appearance, robots will be just a software program.*

Brain: *Another name of brain in robots is On-board control unit. Using this robot receive information and sends commands as output. With this control unit robot knows what to do else it'll be just a remote-controlled machine.*

Sensors: *The use of these sensors in robots is to gather info from the outside world and send it to Brain. Basically, these sensors have circuits in them that produces the voltage in them.*

Actuators: *The robots move and the parts with the help of these robots move is called Actuators. Some examples of actuators are motors, pumps, and compressor etc. The brain tells these actuators when and how to respond or move.*

Program: *Robots only works or responds to the instructions which are provided to them in the form of a program. These programs only tell the brain when to perform which operation like when to move, produce sounds etc. These programs only tell the robot how to use sensors data to make decisions.*

Behaviour: *Robots behavior is decided by the program which has been built for it. Once the robot starts making the movement, one can easily tell which kind of*

program is being installed inside the robot.

Types of robots based on sensors

These are the some types of robots which is divided based on their sensors are given below:

***Articulated**: The feature of this robot is its rotary joints and range of these are from 2 to 10 or more joints. The arm is connected to the rotary joint and each joint is known as the axis which provides a range of movements.*

***Cartesian**: These are also known as gantry robots. These have three joints which use the Cartesian coordinate system i.e x, y, z. These robots are provided with attached wrists to provide rotatory motion*

***Cylindrical**: These types of robots have at least one rotatory joints and one prismatic joint which are used to connect the links. The use of rotatory joints is to rotate along the axis and prismatic joint used to provide linear motion.*

***Polar**: These are also known as spherical robots. The arm is connected to base with a twisting joint and have a combination of 2 rotatory joint and one linear joint.*

***Scara**: These robots are mainly used in assembly applications. Its arm is in cylindrical in design. It has two parallel joints which are used to provide compliance*

in one selected plane.

Delta: *The structure of these robots are like spider-shaped. They are built by joint parallelograms that are connected to the common base. The parallelogram moves in a dome-shaped work area. These are mainly used in food and electrical industries.*

Laws of Robotics

Laws of Robotics *are a set of laws, rules, or principles, which are intended as a fundamental framework to underpin the behavior of robots designed to have a degree of autonomy Robots of this degree of complexity do not yet exist, but they have been widely anticipated in science fiction, films and are a topic of active research and development in the fields of robotics and artificial intelligence.*

The best known set of laws are those written by Isaac Asimov in the 1940s, or based upon them, but other sets of laws have been proposed by researchers in the decades since then.

Isaac Asimov's "Three Laws of Robotics"

The best known set of laws are Isaac Asimov's "Three Laws of Robotics". These were introduced in his 1942 short story "Runaround", although they were foreshadowed in a few earlier stories. The Three Laws are:

1. *A robot may not injure a human being or, through inaction, allow a human being to come to harm.*
2. *A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.*
3. *A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.*[1]

Near the end of his book Foundation and Earth, a zeroth law was introduced, with the original three suitably rewritten as subordinate to it:

0. *A robot may not injure humanity, or, by inaction, allow humanity to come to harm.*

Adaptations and extensions exist based upon this framework. As of 2011 they remain a "fictional device"

EPSRC / AHRC principles of robotics

In 2011, the Engineering and Physical Sciences Research Council (EPSRC) and the Arts and Humanities Research Councle (AHRC) of Great Britain jointly published a set of five ethical "principles for designers, builders and users of robots" in the real world, along with seven "high-level messages" intended to be conveyed, based on a

September 2010 research workshop

1. *Robots should not be designed solely or primarily to kill or harm humans.*
2. *Humans, not robots, are responsible agents. Robots are tools designed to achieve human goals.*
3. *Robots should be designed in ways that assure their safety and security.*
4. *Robots are artifacts; they should not be designed to exploit vulnerable users by evoking an emotional response or dependency. It should always be possible to tell a robot from a human.*
5. *It should always be possible to find out who is legally responsible for a robot.*

Judicial development

Another comprehensive terminological codification for the legal assessment of the technological developments in the robotics industry has already begun mainly in Asian countries. This progress represents a contemporary reinterpretation of the law (and ethics) in the field of robotics, an interpretation that assumes a rethinking of traditional legal constellations. These include primarily legal liability issues in civil and criminal law.

Satya Nadella's laws

In June 2016, Satya Nadella, a CEO of Microsoft Corporation at the time, had an interview with the Slate magazine and roughly sketched five rules for artificial intelligences to be observed by their designers:

1. *"A.I. must be designed to assist humanity" meaning human autonomy needs to be respected.*
2. *"A.I. must be transparent" meaning that humans should know and be able to understand how they work.*
3. *"A.I. must maximize efficiencies without destroying the dignity of people".*
4. *"A.I. must be designed for intelligent privacy" meaning that it earns trust through guarding their information.*
5. *"A.I. must have algorithmic accountability so that humans can undo unintended harm".*
6. *"A.I. must guard against bias" so that they must not discriminate against people.*

Tilden's "Laws of Robotics"

Mark W. Tilden is a robotics physicist who was a pioneer in developing simple robotics His three guiding principles/rules for robots are:

1. *A robot must protect its existence at all costs.*
2. *A robot must obtain and maintain access to its own power source.*

3. *A robot must continually search for better power sources.*

What is notable in these three rules is that these are basically rules for "wild" life, so in essence what Tilden stated is that what he wanted was "proctoring a silicon species into sentience, but with full control over the specs. Not plant. Not animal. Something else."

What is Robotics

***Robotics** is an interdisciplinary branch of engineering and science that includes mechanical engineering, electronic engineering, information engineering, computer science, and others. Robotics deals with the design, construction, operation, and use of robots, as well as computer systems for their control, sensory feedback, and information processing.*

These technologies are used to develop machines that can substitute for humans and replicate human actions. Robots can be used in many situations and for lots of purposes, but today many are used in dangerous environments (including bomb detection and deactivation), manufacturing processes, or where humans cannot

survive (e.g. in space, under water, in high heat, and clean up and containment of hazardous materials and radiation). Robots can take on any form but some are made to resemble humans in appearance. This is said to help in the acceptance of a robot in certain replicative behaviors usually performed by people. Such robots attempt to replicate walking, lifting, speech, cognition, or any other human activity. Many of today's robots are inspired by nature, contributing to the field of bio-inspired robotics.

The concept of creating machines that can operate autonomously dates back to classical times, but research into the functionality and potential uses of robots did not grow substantially until the 20th century. Throughout history, it has been frequently assumed by various scholars, inventors, engineers, and technicians that robots will one day be able to mimic human behavior and manage tasks in a human-like fashion. Today, robotics is a rapidly growing field, as technological advances continue; researching, designing, and building new robots serve various practical purposes, whether domestically, commercially, or militarily. Many robots are built to do jobs that are hazardous to people, such as defusing bombs, finding survivors in unstable ruins, and exploring mines and shipwrecks. Robotics is also used in STEM (science, technology, engineering, and mathematics) as a teaching aid The advent of nanorobots, microscopic robots that can be injected into the human body, could revolutionize medicine and human health

History of Robotics

Origins of "robot" and"robotics"

The word "robot" conjures up a variety of images, from R2D2 and C3PO of Star Wars fame; to human-like machines that exist to serve their creators (perhaps in the form of the cooking and cleaning Rosie in the popular cartoon series the Jetsons); to the Rover Sojourner, which explored the Martian landscape as part of the Mars Pathfinder mission. Some people may alternatively perceive robots as dangerous technological ventures that will someday lead to the demise of the human race, either by outsmarting or outmuscling us and taking over the world, or by turning us into completely technology-dependent beings who passively sit by and program robots to do all of our work. In fact, the first use of the word "robot" occurred in a play about mechanical men that are built to work on factory assembly lines and that rebel

against their human masters. These machines in R.U.R. (Rossum's Universal Robots), written by Czech playwright Karl Capek in 1921, got their name from the Czech word for slave.

Early Conceptions of Robots

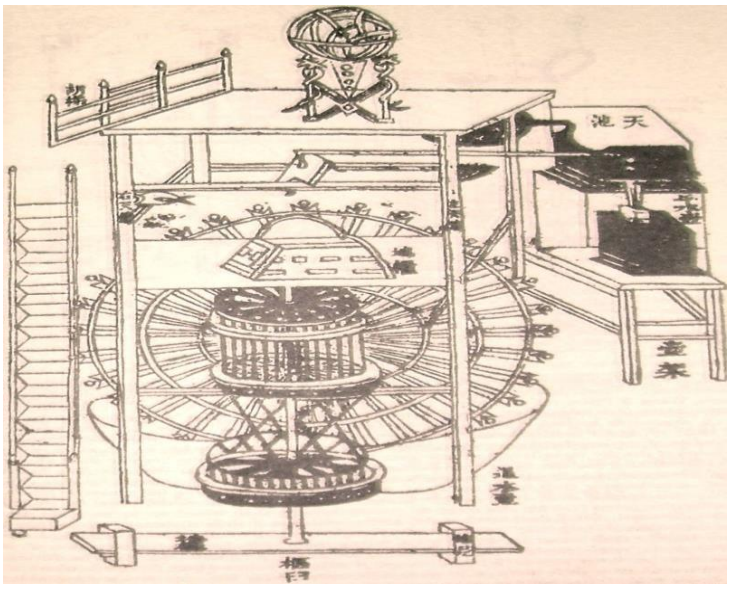
One of the first instances of a mechanical device built to regularly carry out a particular physical task occurred around 3000 B.C.: Egyptian water clocks used human figurines to strike the hour bells. In 400 B.C., Archytus of Taremtum, inventor of the pulley and the screw, also invented a wooden pigeon that could fly. Hydraulically-operated statues that could speak, gesture, and prophecy were commonly constructed in Hellenic Egypt during the second century B.C.

In the first century A.D., Petronius Arbiter made a doll that could move like a human being. Giovanni Torriani created a wooden robot that could fetch the Emperor's daily bread from the store in 1557. Robotic inventions reached a relative peak (before the 20th century) in the 1700s; countless ingenius, yet impractical, automata (i.e. robots) were created during this time period. The 19th century was also filled with new robotic creations, such as a talking doll by Edison and a steam-powered robot by Canadians. Although these inventions throughout history may have planted the first seeds of inspiration for the modern robot, the scientific progress made in the 20th century in the field of robotics surpass previous advancements a thousandfold

The first modern robots

The earliest robots as we know them were created in the early 1950s by George C. Devol, an inventor from Louisville, Kentucky. He invented and patented a reprogrammable manipulator called "Unimate," from "Universal Automation." For the next decade, he attempted to sell his product in the industry, but did not succeed. In the late 1960s, businessman/engineer Joseph Engleberger acquired Devol's robot patent and was able to modify it into an industrial robot and form a company called Unimation to produce and market the robots. For his efforts and successes, Engleberger is known in the industry as "the Father of Robotics."

Academia also made much progress in the creation new robots. In 1958 at the Stanford Research Institute, Charles Rosen led a research team in developing a robot called "Shakey." Shakey was far more advanced than the original Unimate, which was designed for specialized, industrial applications. Shakey could wheel around the room, observe the scene with his television "eyes," move across unfamiliar surroundings, and to a certain degree, respond to his environment.



Robotic technology in movies

1 . *The Terminator (1984)*

2. *Metropolis (1927)*

3. *WALL-E (2008).*

4. *Blade Runner (1982)*

5. *The Matrix (1999)*

6. *RoboCop (1987)*

7. *A.I. Artificial Intelligence (2001)*

8. *Westworld (1973)*

9. *The Stepford Wives (1975)*

10. *The Iron Giant (1999)*

11. *The Day the Earth Stood Still (1951)*

12. *Ghost in the Shell (1995)*

13 .*Big Hero 6 (2014)*

14 .*Transformers (2007)*

15. *Robots (2005)*

Types of robots

Aerospace

Disaster Response

Drones

Education

Entertainment

Exoskeletons

Humanoids

Industrial

Medical

Research

Self-Driving Cars

Tele presence

Underwater

Aerospace

It's a bird, it's a plane…yes, it is a plane, on which robots have spent countless hours working! Robots play an important role in aerospace applications, in both the

construction of aircraft engines as well as performing tasks such as drilling and painting airframes. Because of robots' reliability, capability, and precision, their popularity in the aerospace industry is growing And also these robots are used in special operations

Diseaster response

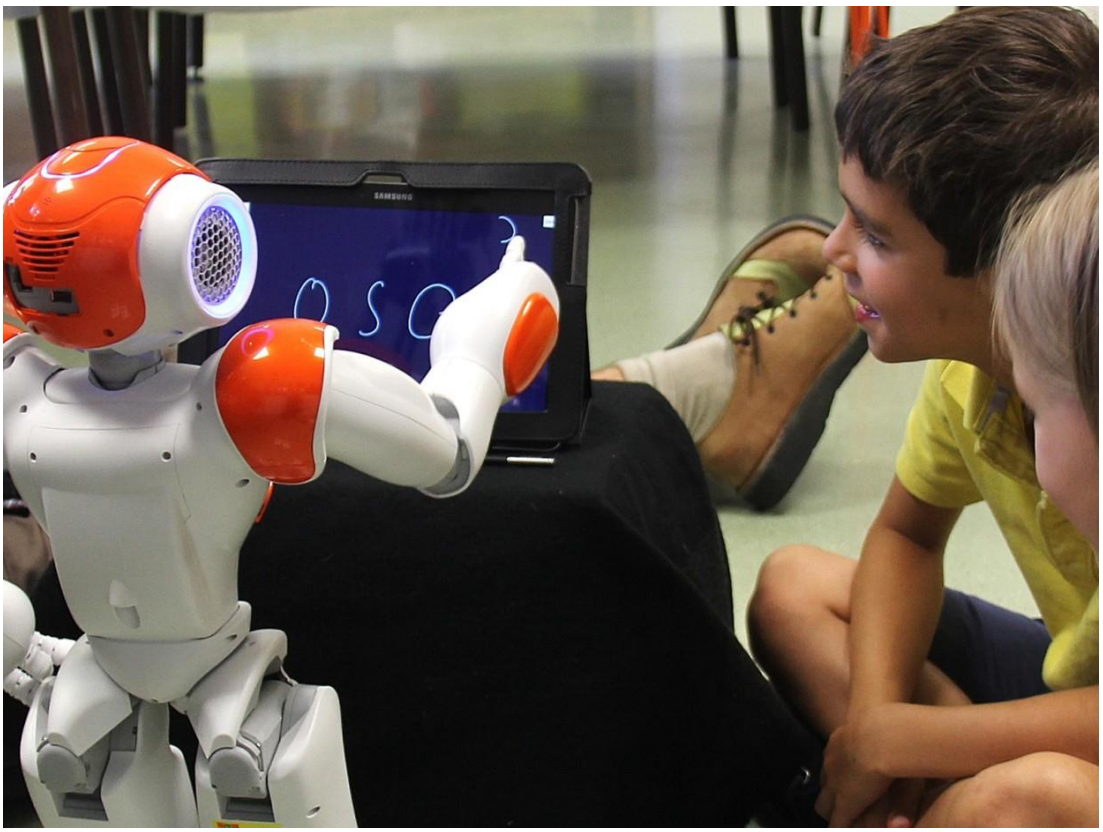
Researchers at IIT-Istituto Italiano di Tecnologia developed, assembled and tested a new disaster response robot called the Centauro, a Centaur-like robot consisting of a four-legged base and an anthropomorphic upper body. The robot is capable of robust locomotion, high strength manipulation and harsh interactions that may be necessary during the execution of disaster relief tasks. Centauro is 1.5 m tall, while its shoulder width is 65 cm and its weight is 93 Kg. It is made of aluminium, magnesium and titanium alloys, while cover parts are made from plastic using rapid prototyping fabrication. It is battery-powered and it can operate for 2.5 hours

Drones

A drone, in technological terms, is an unmanned aircraft. Drones are more formally known as unmanned aerial vehicles (UAVs) or unmanned aircraft systems (UASes). Essentially, a drone is a flying robot that can be remotely controlled or fly autonomously through software-controlled flight plans in their embedded systems, working in conjunction with onboard sensors and GPS

Education robots

***Educational robotics** teaches the design, analysis, application and operation of robots. Robots include articulated robots, mobile robots or autonomous vehicles. Educational robotics can be taught from elementary school to graduate programs. Robotics may also be used to motivate and facilitate the instruction other, often foundational, topics such as computer programming, artificial intelligence or engineering design.*



Entertainment robots

*An **entertainment robot** is, as the name indicates, a robot that is not made for utilitarian use, as in production or domestic services, but for the sole subjective pleasure of the human. It serves, usually the owner or his housemates, guests or*

clients. Robotics technologies are applied in many areas of culture and entertainment.

Expensive robotics are applied to the creation of narrative environments in commercial venues where servo motors, pneumatics and hydraulic actuators are used to create movement with often preprogrammed responsive behaviors such as in Disneyland's haunted house ride.

Entertainment robots can also be seen in the context of media arts where artist have been employing advanced technologies to create environments and artistic expression also utilizing the actuators and sensor to allow their robots to react and change in relation to viewers.

Exoskleton robots

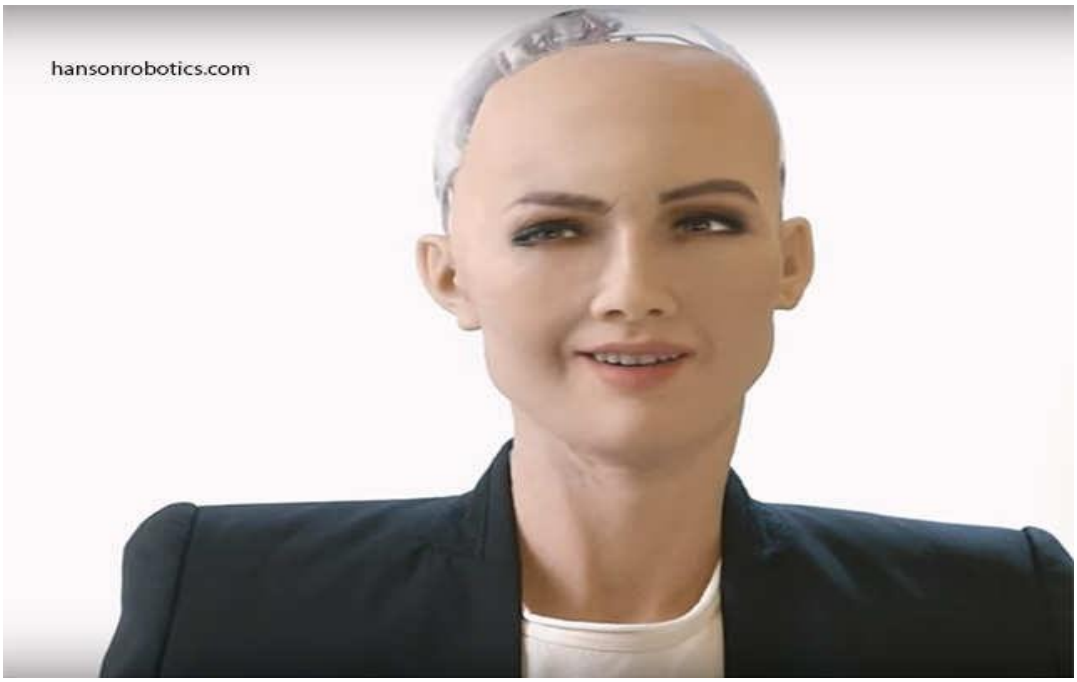
Robots are on the Verge of Exponential Market Growth

Exoskeleton robots are a unique form of professional service robots, deployed in a wide range of applications, intended to mimic, augment or enhance the body's own movements. These robots provide essential support for human motion, with potential uses ranging from consumer products to military deployment.

The market for exoskeleton robots is expected to explode in value in the next few years, reaching $2.8 Billion in value by 2023 and growing at an astounding 45.2% compound annual growth rate (CAGR)[1]. Advances in robotic technology and quickly rising demand in the healthcare sector are the main drivers of growth. Of all the different types of exoskeletons, powered exoskeleton robots have the highest growth potential, according to the International Federation of Robotics 2017 Service Robots World Report

Humaniod

*A **humanoid robot** is a robot with its body shape built to resemble the human body. The design may be for functional purposes, such as interacting with human tools and environments, for experimental purposes, such as the study of bipedal locomotion, or for other purposes. In general, humanoid robots have a torso, a head, two arms, and two legs, though some forms of humanoid robots may model only part of the body, for example, from the waist up. Some humanoid robots also have heads designed to replicate human facial features such as eyes and mouths. Androids are humanoid robots built to aesthetically resemble humans.*

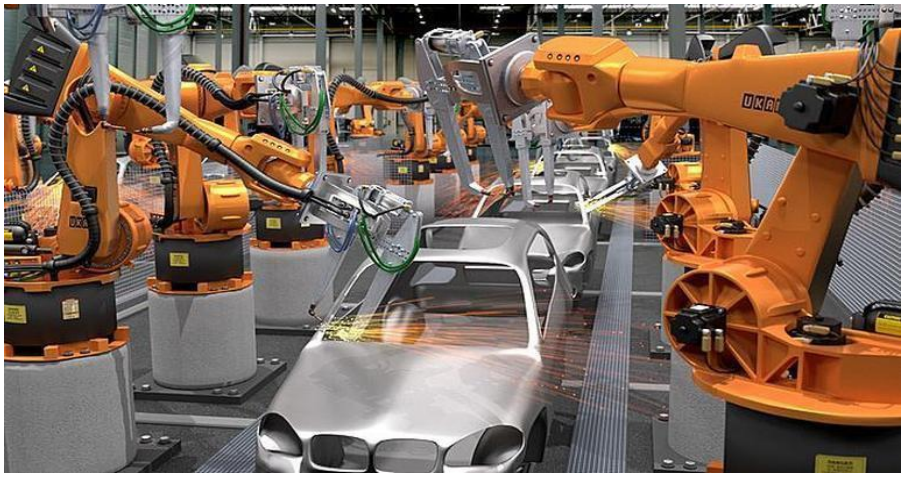


Industrial

*An **industrial robot** is a robot system used for manufacturing. Industrial robots are automated, programmable and capable of movement on three or more axis.*

Typical applications of robots include welding, painting, assembly, disassembly, pick and place for printed circuit boards, packaging and labeling, palletizing, product

inspection, and testing; all accomplished with high endurance, speed, and precision. They can assist in material handling.



Advantages

- ***Fast working.***
- ***Decreasing of human deaths.***
- ***Most powerful.***
- ***Easy to control.***
- ***Human friendly.***
- ***Most helpful.***

Dis advantages

- *Highly expensive.*
- *Chances to misbehave.*
- *Chances to revolute among humans.*
- *Limited capabilities.*
- *Reason for causing unemployment to humans.*