# A Review on Robotics Technology

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**Technology advancements is widening up by the advent of new inventions. Robot is one such invention to overcome ever-present challenges of high cost of labour .It is interdisciplinary field that ranges in scope from the design of mechanical, electrical, electronic as well as computer science. At this time robots help in many fields for human being to make the life reliable as well to deliver fast than a human being.This paper introduces the introduction about robotics technology and science and system. We introduce the history of robotics technology, science and system also we are introduce the structure of the robot, and the components used in manufacturing the robots as well as advantages disadvantages and applications of robotics technology. We included in this paper the uses of robotics technology as ,in the current scenario, the Robot vision system is basically used for inspection purposes in industries such as gauging, verification of presence of components , detection of flaws etc .In this paper we are giving brief explanation about the robotics future uses in daily life,i.e for domestic purpose, as well as commercially uses."The main aim of our paper is to aware the people about advancement in technology in robotics which help the people which would be a Businessman as well as common people or Scientist and would be Doctors & Engineers also.**

## I. INTRODUCTION ABOUT ROBOTICS

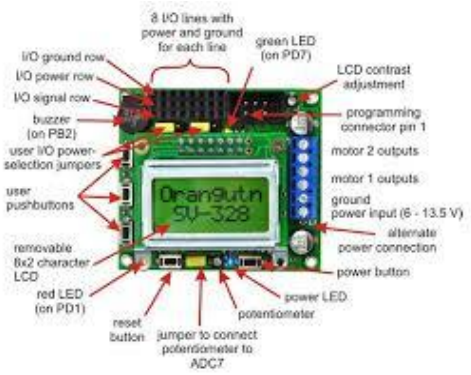
The word robotics derived from the word robot which was introduced to the publically Czech writer karel Capek in his play. Robotics is the combination of many branches of engineering i.e. it's a composition of Electrical engineering, mechanical engineering, computer engineering as well as Electronics engineering. There are many parts which assembled to make a complete robot. These parts of a robot including a sensor which relates to electronics stream, a bunch of wires for the power supply in each components which is a part of electrical stream and parts of electrical are motor i.e. stepper motor. A chip which programmed by the computer engineer as a brain of artificial system. The promise of robotics is easy to describe but hard for the mind to grasp. Robots hold the promise of moving and transforming materials with the same elan and ease as a computer program transforms data. Today, robots mine minerals, assemble semi-processed materials into automobile components, and assemble those components into automobiles. On the immediate horizon are self-driving cars, robotics to handle household chores, and assemble specialized machines on demand. It is not unreasonable to imagine robots that are given some task, such as reclaim desert into photovoltaic cells and arable land, and left to make their own way. Then the promise of robotics exceeds the minds grasp.In summary, robotics is the field related to science and technology primarily related to robotics. It stands tall by standing the accomplishments of many other fields of study.


We can also say the robot an" Artificial Intelligence"

## II. FUNDAMENTALS OF ROBOTICS

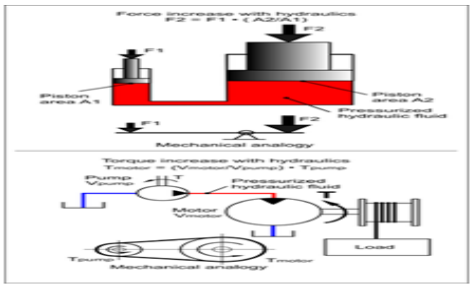
Parts of Robot system with brief description are as follows :-

1. Controller: - The controller is the part of a robot that coordinates all the movements of the mechanical system. As shown in fig given below. It also receives the inputs from the immediate environments through various sensors. The heart of robot's controller is generally microprocessor linked to input/output and monitoring devices. The commands issued by the controller activate the motion control mechanism, consisting of various controllers, amplifiers and actuators. An actuator is a motor or valve that converts power into robot movements.



2. Power Supply :- The power supply provides the energy to drive the controllers and actuator. It may convert ac voltage to the dc voltage e required by the robot's internal circuits, or it may be a pump or compressor providing hydraulic or pneumatic power. The three basic types of power supplies are electrical, hydraulic, and pneumatic. The most common energy source available, where industrial robots are used, is electricity. The second most common is compressed air, and the least common is hydraulic power. These primary sources of energy must be converted into the form and amount required by the type of robot being used. The electronic part of the control unit, and any electric drive actuator, requires electrical power. A robot containing hydraulic actuators requires the conversion of electrical power into hydraulic energy through the use of an electric, motor-driven, hydraulic pump. A robot with pneumatic actuators requires compressed air, which is usually supplied by a compressor driven by an electric motor.

1. Hydraulic Drive: A hydraulic drive system is a drive or transmission system that uses pressurized hydraulic fluid to power hydraulic machinery. The term hydrostatic refers to the transfer of energy from flow and pressure, not from the kinetic energy of the flow. A hydraulic drive system consists of three parts: The generator (e.g. a hydraulic pump), driven by an electric motor, a combustion engine or a windmill; valves, filters, piping etc. (to guide and control the system); and the actuator (e.g. a hydraulic motor or hydraulic cylinder) to drive the machinery.



principle of hydraulic drive system

2. Electric Motors:- The vast majority of robots use electric motors, often brushed and brushless DC motors in portable robots or AC motors in industrial robots and CNC machines. These motors are often preferred in systems with lighter loads, and where the predominant form of motion is rotational.

3. Linear Actuator:-Various types of linear actuators move in and out instead of by spinning, and often have quicker direction changes, particularly when very large forces are needed such as with industrial robotics. They are typically powered by compressed air (Pneumatic actuator) or oil (hydraulic actuator).

4.Series Elastic Actuators :- A spring can be designed as part of the motor actuator, to allow improved force control. It has been used in various robots, particularly walking humanoid robots.

5.Muscle wire :- Muscle wire, also known as shape memory alloy, Nitinol or Flexinol wire, is a material which contracts (under 5%) when electricity is applied. They have been used for some small robot applications.

6. Piezo Motors:-Recent alternatives to DC motors are piezo motors or ultrasonic motors. These work on a fundamentally different principle, whereby tiny piezo ceramic elements, vibrating many thousands of times per second, cause linear or rotary motion. There are different mechanisms of operation; one type uses the vibration of the piezo elements to step the motor in a circle or a straight line. Another type uses the piezo elements to cause a nut to vibrate or to drive a screw. The advantages of these motors are nanometre resolution, speed, and available force for their size. These motors are already available commercially, and being used on some robots.

7. Sensing: -Sensors allow robots to receive information about a certain measurement of the environment, or internal components. This is essential for robots to perform their tasks, and act upon any changes in the environment to calculate the appropriate response. They are used for various forms of measurements, to give the robots warnings about safety or malfunctions, and to provide real time information of the task it is performing.

8. Vision: -Computer vision is the science and technology of machines that see. As a scientific discipline, computer vision is concerned with the theory behind artificial systems that extract information from images. The image data can take many forms, such as video sequences and views from cameras. In most practical computer vision applications, the computers are pre-programmed to solve a particular task, but methods based on learning are now becoming increasingly common. Computer vision systems rely on image sensors which detect electromagnetic radiation which is typically in the form of either visible light or infrared light. The sensors are designed using solid state physics. The process by which light propagates and reflects off surfaces is explained using optics. Sophisticated image sensors even require quantum mechanics to provide a complete understanding of the image formation process. Robots can also be equipped with multiple vision sensors to be better able to compute the sense of depth in the environment. Like human eyes, robots' "eyes" must also be able to focus on a particular area of interest, and also adjust to variations in light intensities. There is a subfield within computer vision where artificial systems are designed to mimic the processing and behaviour of biological system, at different levels of complexity. Also, some of the learning-based methods developed within computer vision have their background in biology.

9. Mechanical Gripper :- One of the most common effectors is the gripper. In its simplest manifestation it consists of just two fingers which can open and close to pick up and let go of a range of small objects. Fingers can for example be made of a chain with a metal wire run through it. Hands that resemble and work more like a human hand include the shadow hand and the robonaut

hand. Hands that are of a mid-level complexity include the delft hand. Mechanical grippers can come in various types, including friction and encompassing jaws. Friction jaws use all the force of the gripper to hold the object in place using friction. Encompassing jaws cradle the object in place, using less friction. Mechanical grippers can come in various types, including friction and encompassing jaws. Friction jaws use all the force of the gripper to hold the object in place using friction. Encompassing jaws cradle the object in place, using less friction.

## III. FIELDS OF APPLICATION

Space Robotics: - The research area Space Robotics deals with the development of intelligent robots for extraterrestrial exploration focusing on:

- Development of robot systems for unstructured, uneven terrain based on biologically inspired innovative locomotion concepts.
- Development of multi-functional robot teams usable for different tasks ranging from in-situ examinations to the organisation and maintenance of infrastructure.
- Reconfigurable systems for planetary exploration.
- AI-based methods for autonomous navigation and mission planning in unknown terrain.

Space Robotics

- Image evaluation, object recognition and terrain modelling.
- AI-based support systems for scientific experiments.

2. Underwater Robotics :-This area deals with the development and realization of Artificial Intelligence methods in underwater systems. Main points of research are:

Water Robotics

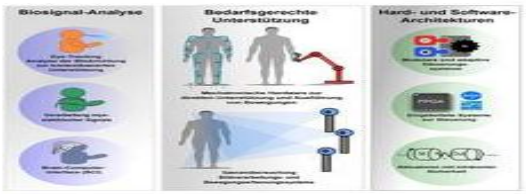
- Development of systems for user support in remote-controlled underwater vehicles employing virtual immersion methods.
- Design of methods for autonomous manipulation and mission planning of robot arms in underwater applications, particularly with state-of-the-art sensor technology, such as "Visual Servoing".
- Image evaluation and object recognition with modular and intelligent underwater cameras.
- Design of control methods for next-generation autonomous underwater vehicles.
- Development of biologically inspired and energy-efficient methods of transport for underwater vehicles, such as oscillating systems.

3. Electric Mobility :-In the field of electric mobility we are testing concepts for electric vehicles, battery charge technologies, and the collection of vehicle data. We are creating models for intelligent, environmentally sound, and integrated urban mobility. Our research focuses around:

Robotic Car

- Development and demonstration of innovative vehicle concepts.
- Design of new approaches to mobility and traffic control, application support, technology integration.
- Data collection by fleet tests with technologically different electric vehicles (see E- Mobility Fleet in Research Facilities ).
- Coordination of the regional project office of the model region Electric Mobility Bremen/Oldenburg.
- Virtualization of the model region, simulation of future, larger vehicle fleets, and predictions of the effects on the model region in terms of traffic volume, infrastructure needs, environmental pollution, and economic efficiency.
- Creating a foundation for new business models and traffic concepts on the basis of the data previously collected.

4. Assistance and Rehabilitation Systems :-This field deals with robotic systems that can support humans in complex, exhausting or often repeated tasks. Application areas are both help during activites of everyday life (at home or work) and medical rehabilitation. Support can either take place using systems the human is wearing like exoskeletons or orthoses, or by service robots performing the respective task.




Representation of various components with in the scope of Assistance-and Rehabilitation Systems.

5. Agricultural Robotics: -We develop robots for agricultural applications and transfer methods and algorithms from robotics to conventional agricultural machines. Our objective is to increase the performance of machines and processes and to reduce resource consumption at the same time. Our research is focused on technology applications used in the cultivation of land.


For Agricultrual Use

- Methods for autonomous planning and navigation of outdoor machinery.
- Methods for environmental recognition in agricultural machinery control.
- Methods of infield logistics to optimize cooperation and resource consumption between multiple agricultural machines.
- Interoperability at the level of communication, processes and knowledge processing.

## IV. ADVANTAGES & DISADVANTAGES OF ROBOTICS SYSTEM

1.You can send them to very dangerous places.

2. You can make them do your job for you.

3. They are more accurate than humans Eg no shaking when in a very important surgery, puts every screw in fabricating a car etc.

4. Can do jobs 24/7.

5. Can guard without being tired just keep doing the same thing 24/7?

6. No need of nutrients.

7. You can programme them to make them do exactly what you want them to do.

8. Theycan not harm you unless they are programmed to.

9. Can work without doubts E.g. when you think "what do i do now"?

10. They can lift very heavy things.

Disadvantages: - 1.You need to get people trained to fix them if anything wrong happens.

2. Need a very intelligent crew.

3. They can ruin people's lives Eg Take their job away from them.

4. They are very expensive to make.

5. You need the right materials to make them that could be very rare.

6.If you make a very amazing robot with amazing quality and it brakes, it might be very hard to fix

7.They can be very hard to programme.

8.They can reproduce but it could cost money for the materials.

9.You need highly trained people to make them.

10.They cannot recharge themselves.

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