

## Industrial Robot for Mankind

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### Abstract

Today Robots are there where job is critical dangers heavy complicated and repetitive say in every field of science & technology. There are various definitions of robot made by different scholars “ It is defined as mechanical or electrical or automatic device that performs functions almost similar to human intelligence”. According to the Robotic Institute of America “A robot is reprogrammable automatic device along with multifunctional manipulator used to move different kind of material, to different location by giving valid instruction to robot to do different tasks” According ISO “A reprogrammable, multipurpose automatic manipulator that programmed to works in multi dimension.” Generally any robot are made by Actuator, Sensors, Manipulators; Power Unit, Control Unit and Software which all work together. Ninety percentages of modern manufacturing industries use robots. The areas are welding, material, transports, assembly, spray painting and so on. Robots are having generally four characteristics such as sensing and perception , ability to carry out different task, reprogrammable, interact with human, Isaac Asimov also called “Father of Robotics” gives four laws/rules according to them. Robot does not injure human when they are under rules. Robot obeys the order given to it. By human robot protect its own existence as long as protection cannot conflict other rules

There are three types of robots

- 1) Industrial Robot: These play important role in Manufacturing and Processing Industry, Computer Industry
- 2) Research robot: These are used in research and development activities
- 3) Educational Robots: These provide Education, Training, and Entertainment to kids and students

In this scientific study we try to understand how Robot can change our life. How they help us. How they make our life more comfortable. In developing country today they are out of reach to the common people due to the cost and awareness about science and technology. In developed country Robots are more popular .We make Honda Asimo, Sofia, Path finder, Curiosity Rover over on mars used in space technology, Chandrayan and so on. Boston becomes capital for robotics. Robots are used by china to give service to corona COVID-19 infected patient as it is very risky job aim is to keep other people protected from infection. Days are no long when robots are used to make robots of its own kind I think defiantly good days for robotics that are coming soon.

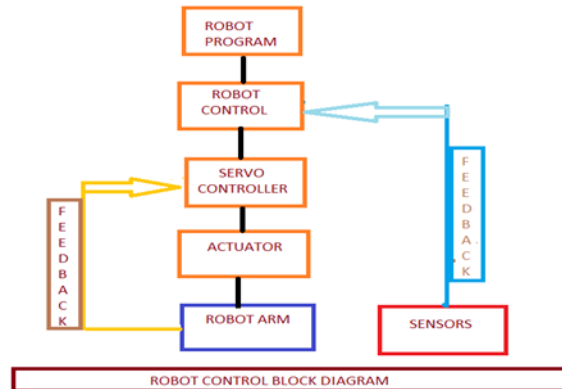
### General Terms

**Keywords:** Sensors, Manipulator, Actuators, DOF etc.

### INTRODUCTION

We know that today maximum research is carried out in Artificial Intelligence and Robotics. The importance of robotics is increased day by day. Robotics and Automation is possible due to artificial intelligence that stands both branches or say both branches stand each other. The human operation to control the machinery is

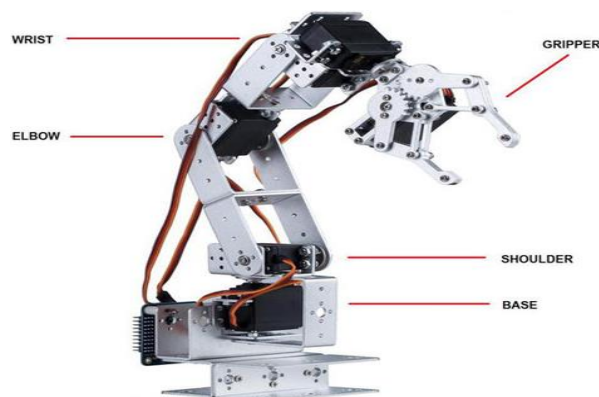
replaced by control system in automation. In automation any process can be automated by using devices like varies types of sensors actuators and other related required equipment. In past few years there is global competition in all manufacturing company. In order to face global competition and for high production they start industrial automation and using Robotic Technology.



They start using computer technology in production planning and control. These attempts defiantly increases productivity We have so many expectations in robotics and defiantly having a bright future

- 1) Robots are portable with minimum installation, calibration, programming efforts
- 2) Robot may interact human safely
- 3) Robots capable for heavy load applications
- 4) Robots may take decision logically
- 5) Robots may available at low cost
- 6) Robots become user friendly with education
- 7) Robot must support three dimensional vision system
- 8) Robot may work in any kind of environment.
- 9) Robot may adopt variability in component geometry
- 10) Robot technology reaches to middle class.

**METHODS:** The industrial robot is characterized by their arm which has main role. Robot has to move or work in 3-dimensional space as per the instruction given to it. This is called as Workspace. (Maximum Envelops). Reachable workspace means robot can reach for at least one orientation while joint Degree of Freedom are allowed to take all their admissible values also referred as(Restricted Envelop) Secondary workspace is the set of all positions of the workspace which can be reached with some specified orientations also called (Operating Envelop) There are three main component of robot.



- 1) **Manipulator:** It is important unit of robot that works on orders assigned by control unit. Manipulator receives control signal send by control unit Manipulator is with two important components Arm and Wrist with necessary tools at its end.
- 2) **Control unit:** It will control all activities of robot. It sends necessary control signals to activate various parts of manipulator. It also provides an interface to various components that determine external environment in which robot work.
- 3) **Power unit:** It supplies energy so that robot can perform no of required activity. Electrical energy is utilized supplemented by hydraulic or pneumatic category.

**Sensors:** A sensor is a device that measures some attribute of the world. Being one of the three primitives of robotics (besides planning and control), sensing plays an important role in robotic paradigms Sensors can be classified according to the physical process with which they work or according to the type of measurement information that they give as output. In this case, the second approach is important.

**Actuators:** Actuators are the motors responsible for motion in the robot. Actuators perform like muscles and joints but having different structures. They can be electric, pneumatic, hydraulic, piezoelectric or ultrasonic. Hydraulic and electric actuators have a very rigid behavior and can only be made to act in a compliant manner through the use of relatively complex feedback control strategies. While electric coreless motor actuators are better suited for high speed and low load applications, hydraulic ones operate well at low speed and high load applications. Piezoelectric actuators generate a small movement with a high force capability when voltage is applied. They can be used for ultra-precise positioning and for generating and handling high forces or pressures in static or dynamic situations. Ultrasonic actuators are designed to produce movements in a micrometer order at ultrasonic frequencies (over 20 KHz). They are useful for controlling vibration, positioning applications and quick switching. Pneumatic actuators operate on the basis of gas compressibility. As they are inflated, they expand along the axis, and as they deflate, they contract. If one end is fixed, the other will move in a linear trajectory. These actuators are intended for low speed and low/medium load applications. Between pneumatic actuators there are cylinders, bellows, pneumatic engines, pneumatic stepper motors and pneumatic artificial muscles. It is interested to know robots application for mankind

**Spot welding:** It is mainly in automotive sector to weld the panel and body frames. The spot welding gun is heavy and large in size welding gun can be easily oriented in different orientation robot can be programmed in such a way that it will perform different pattern during different welding cycles at different speeds. It is used to join thin metal together

**ARC Welding:** It is tedious, hazardous job for human workers. Therefore it is carried out by robotic technology It is used in following industries

- 1) Fabrication Industries
- 2) Ship Building Industries
- 3) Aerospace Industries
- 4) Construction Industries

**MIG Welding:** It is Gas Metal Arc Welding

- 1) High deposit rates and weld without stop
- 2) Best quality and no operator required
- 3) Less scrap and High Productivity

Gas Tungsten Arc Welding: It is commonly used high quality welding process It uses tungsten electrode and inert gas

- 1) Welding is spatter free
- 2) High Productivity & Less Scrap
- 3) High Quality and Low Distortion

Robot Laser welding: It consists of servo controlled robot multi axis six degree of freedom robotic arm. The laser cutting head is mounted to the face plate of the robotic arm

- 1) Increases Flexibility
- 2) Repeatability & High Quality
- 3) High return on investment
- 4) Decreases in application cost

Resistance Welding: It is applied for variety of joining metals it is economical one

- 1) Increase in profit
- 2) Good quality & Reduction in cost
- 3) More flexibility & Return on investment
- 4) High Repeatability.

Robot Electron Beam Welding: It consists electron beam is generated in the vacuum It is easy for robots to work in low Vacuum environment.

- 1) Robotic EBW gives narrow weld zone.
- 2) The distortion level is low
- 3) Low contamination vacuum
- 4) High Safety Workers

Robotic Plasma Cutting: This technique is used to cut nonferrous materials which are less than 20 mm thickness. It gives high quality cuts also increase speed of cutting.

Pick and Place Operations: It is most popular application. It is repetitive task Robots are successfully being installed to do tedious repetitive tasks with high speed and accuracy.

- 1) High Speed & Accuracy
- 2) More Production & More Flexibility.
- 3) More Saving and Reliability
- 4) High Return on Investment.

Robot Part Transfer: Robots do part transfer operation faster, efficient and with less cost. They work with more accuracy in all three shifts.

- 1) Less cost more productivity
- 2) Less errors as less human interface
- 3) 24 hour Working also reduces cycle time
- 4) High return on investment

Robotic Order Picking: The robotic system can be programmed to do a variety of multiple tasks according to requirement

- 1) High Quality and Productivity
- 2) Programming Flexibility
- 3) Less operation time & Less money
- 4) No tiredness.

Robotic Grinding: We know that manual grinding is very tough, dirty, and noisy. Hazardous metal dust is very harmful. Robotic operations are very quick and efficient gives healthy environment for workers.

Robotic Drilling: It is very powerful over manual drilling with greater accuracy, speed, increase in productivity high returns on investment. It is time saving.

Robotic De Burring: Robots are used for material removal process such as burrs, sharp edges, fins of metal parts

- 1) High Production
- 2) Increase in working speed
- 3) More Saving
- 4) High return on investment

Robotic Assembly:

In order to carry out assembly with greater accuracy and speed difficulties lies in

- 1) Orientation
- 2) Alignment
- 3) Joining Operations
- 4) Complexity of the assembly process

It is possible to make assembly process automatic with the help of robots. Note that all assembly products cannot be automated

We need

- Faster and low cost robots
- Versatile Inexpensive Grippers
- Improved Assembly Efficiency
- Low Cost Feeders

The design of assembly robotic systems depends upon the design of the product.

- The individual parts are designed in such a way that easy for feeding and orienting for automated assembly.
- The components for the assembled product should be designed for ease of assembly
- The designed parts must be simplified
- The suitable gripper should be designed for ease of assembly

Assembly Robot can work 24 hour

Advantages are:-

- 1) High productivity due to continuous work.
- 2) High quality due to better performance.
- 3) More saving due to less operational time.

Robotic Inspection : Robots play very important role in inspection and testing Robots are along with sophisticated testing equipment for automated inspection these are along with sensors and probes for inspection.

The robotic vision system capture 2-D scene and analyses it by

- 1) Frame Grabbing
- 2) Edge Detection
- 3) Detecting the selected area of image

Future Industrial applications:

- checking container labels
- Inspection Parts
- Robot as Fire Fighter
- Hazardous Sealing Packaging, Gasketing operations
- Nuclear Reactor Operations.
- Warehousing
- Polishing and Surface Preparations

Bonding and sealing Robots: They work with high consistency and repeatability and gives relief to workers who work in hazardous working area of bonding and sealing

Robot bonds and sealed following product in the production manufacturing lines

- Batteries , Fuel Cells,
- Sensors,
- Semiconductor Packages
- Disk Drives
- LCD Screens
- Electrical Connectors
- Electrical Switches
- Composite Structures
- Transducers
- Fluidic Filters
- Waterproof Electronics
- Transmission Housings
- Mobile Phones
- Air Filters

Robotic Spray painting: It is very hazardous, noisy, and even difficult to breath in painting area. This job is carried out with robot. A robot is with spray gun that is attached with robot wrist. Spray painting is applied for painting of automobile bodies' engines, other parts of automobile industry.

The advantages are

- Hazardous free environment for worker
- Consistency in Spray Painting
- High quality less wastage of paint.
- Increased Productivity & Uniform Painting

Manufacturing: In manufacturing unit of company robots are used for

- Metal cutting
- Fetting
- De Flashing
- Milling
- Polishing

Food Industries: In food consumer goods industry

- Processing of food items
- Assembly
- Filling of food items
- Packaging of consumer goods

Nano Manufacturing: Nano technology is going to increase rapidly Nano Material; Nano Design, Nano Assembling is at the globe. Highly sophisticated sensors designed & robots are used to assemble Nano parts

**CONCLUSION:** Robotics and automation are important to accept as it helps workers to get free from hazardous environment. It also helps to get some relief as well as to maintain proper health of workers. The real fact is that robotics and automation is possible with large scale industries only. The small scale industries are not going to accept this technology as not get maximum returns on investment they made. In future when cost on robotics become less then we hope lots more

**RESULT:** Robots play very important role in Industrial Automation, Research ,Manufacturing units, Heavy, Critical, Complicated, Risky and Dirty Jobs, In addition to this Space Programs, Medical Science, Robotic Surgery and so on .Mean while we have to understand that robots replaces man power & make them jobless. JCB Machine is also one kind of robot that works equal to near about 50 workers and thereby replace their jobs. Science and technology is for progress and comfort but if it takes jobs of people. Seriously we have to think about Semiautomatic Machines instead of Automatic Machines to assure no of jobs. I think for every hand there should be a job. It is necessary to learn new things and skills these types of updates surly keep the jobs of worker and get adjusted with new technology like robotics and Automation and off course computerization. It is demand of time to get adjust ourselves with new technology.

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