Enablers affecting the Robots used in Engineering Applications: A Review
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Abstract—An industrial robot is a general-purpose, programmable machine. It possesses some anthropomorphic characteristics, i.e. human-like characteristics that resemble the human physical structure. There are lots of enablers which could affect the implementation and working of robot in industry. The purpose of this research is to find out different types of enablers that help robots in the industrial robotic application.

Key words: enablers, robots, applications, joint

I. INTRODUCTION

An industrial robot is a general-purpose, programmable machine. It possesses some anthropomorphic characteristics, i.e. human-like characteristics that resemble the human physical structure. The robots also respond to sensory signals in a manner that is similar to humans. Anthropomorphic characteristics such as mechanical arms are used for various industry tasks. Sensory perceptive devices such as sensors allow the robots to communicate and interact with other machines and to take simple decisions. The general commercial and technological advantages of robots are listed below:

- Robots are good substitutes to the human beings in hazardous or uncomfortable work environments.
- A robot performs its work cycle with a consistency and repeatability which is difficult for human beings to attain over a long period of continuous working.
- Robots can be reprogrammed. When the production run of the current task is completed, a robot can be reprogrammed and equipped with the necessary tooling to perform an altogether different task.
- Robots can be connected to the computer systems and other robotics systems. Nowadays robots can be controlled with wire-less control technologies. This has enhanced the productivity and efficiency of automation industry.[2]
- This study deals with almost all the important enablers that help in robotic application in industries like flexibility, Robot speed, accuracy, repeatability.

II. ENABLERS OF ROBOTIC INDUSTRY

A. Flexibility

The main advantage of robots is their flexibility, which allows their implementation for manufacturing a variety of products in small and medium batch sizes. Flexibility is essential in modern manufacturing to respond to short product life cycles, varying demand, small production lots, and model changes. We can extend the range and complexity of the tasks by robots as our work specification. In the industrial environment the working range for any specified work can be easily increased by of working

B. Sensors

There are varieties of ways to classify sensors depending on what they measure, and how they measure it. Proprioceptive sensors are used to measure the internal state of a robot, which might include position of different degree of freedom, temperature, voltage on key components, motor current, force applied to an effecter, and so forth. Exteroceptive sensors, on the other hand, generate information about the external environment in terms of distance to an object, interaction forces, tissue density and so forth. [8]

C. Actuators

Actuators supply the motive power for robots. The three commonly used actuators are hydraulic, pneumatic, and electromagnetic. The most common type of actuators in robots today are electromagnetic actuators.[8]

D. End effectors

One of the most important areas in the design of robot systems is the design of end effectors. Most of the problems that occur in production are caused by badly designed tooling and not by faults in the robots. There are many different types of gripper available along with the vast number of specialist tools for nut running, arc welding, paint spraying etc. These grippers are not used solely with robots however. They can be used for fixturing components anywhere in an automated or semi-automated line.[2]

E. Joint configurations

Joints for most robots allow either rotary or linear movement, termed revolute and prismatic joints. Other joints that are available are the ball-in-socket, or spherical joint, and the hook- type universal joint. Integration of the mechanical structure of the robot with its joint mechanism, which includes the actuator and joint motion sensor, is a source of structural flexibility.

F. Degree of freedom

Six degree of freedom are the minimum required to place the end-effector or tool of a robotic manipulator at any arbitrary location within its accessible workspace. Most simple or pre-planned tasks can be performed with fewer than six DOFs. This is because they can be carefully set up to eliminate certain axis motions, or because the tool or task does not require full specification of location. Some applications require the use of manipulators with more than six DOFs, in particular when mobility or obstacle avoidance is necessary.[1]

G. Robot speed

Maximum joint velocity is not an independent value. For longer motions it is often limited by servomotor bus voltage or maximum allowable motor speed. Typical peak end-effector speeds can range up to 20 m/s for large robots.
H. Accuracy
This specification covers the ability of a robot to position its end effector at a pre-programmed location in space. Robot accuracy is important in the performance of non-repetitive types of tasks programmed from a database, or for taught tasks that have been remapped or offset owing to measured changes in the installation. Thus manipulator accuracy becomes a matter of matching the robot solution in use by precisely measuring and calibrating link lengths, joint angles, and mounting positions.[8]

I. Repeatability
The specification represents the ability of the manipulator to return repeatedly to the same location. Depending on the method of teaching or programming the manipulator, most manufacturers intend this figure to indicate the radius of a sphere enclosing the set of locations to which the arm returns when sent from the same origin by the same program with the same load and setup conditions. Typical repeatability specifications range from 1-2 mm for large spot-welding robots to 0.005 mm (5µm) for precise micro positioning manipulators.[7]

J. PC controller
PC-controller has a large number of port to which we can add hardware system to control robots. Basically the pc Terminal software is required to send receive commands to control the robot. PC-controllers have the benefits of abundance of memory, program space and processing power. Additionally they provide best debug I/O.

K. Working at hazardous environment
Among the many justifications for using robotics, the most important is to shield people from working in dangerous environments and from handling hazardous materials. From dealing with chemicals that are explosive to handling radioactive substances, robots are routinely used to perform tasks that would kill or maim people. Robots are ideal for use in hazardous environments by removing people from direct exposure to unfriendly conditions such as materials that are radioactive or highly explosive.[4]

L. Greater capability (strength of Robots)
Robots are amazing at their work; they function like no human with only electricity and software. They have much more capability than humans.[7]

III. CONCLUSIONS
The robot plays a very important role in the industry. Now a days the various activities and operations are performed by the robots in the industries. The various enablers are discussed in the research paper by the literature review that affects the working of the robots.

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