5.3 Need of Robot and its Application

Industrial Applications

Industrial robots are used to assemble the vehicle parts, as shown in the figure.As the assembly of the machine parts is a repetitive task to be performed, the robots are conveniently used instead of using mankind (which is more costly and less précised compared to robots.)

Auto Industry:

The auto industry is the largest users of robots, which automate the production of various components and then help, assemble them on the finished vehicle. Car production is the primary example of the employment of large and complex robots for producing products. Robots are used in that process for the painting, welding and assembly of the cars. Robots are good for such tasks because the tasks can be accurately defined and must be performed the same every time, with little need for feedback to control the exact process being performed.

Material Transfer , Machine Loading And Unloading

There are many robot applications in which the robot is required to move a work part or other material from one location to another. The most basic of these applications is where the robot picks the part up from one position and transfers it to another position. In other applications, the robot is used to load and/or unload a production machine of some type.

Material transfer applications are defined as operations in which the primary objective is to move a part from one location to another location. They are usually considered to be among the most straightforward of robot applications to implement. The applications usually require a relatively unsophisticated robot, and interlocking requirements with other equipments are typically uncomplicated. These are the pick ad place operations. The machine loading and unloading applications are material handling operations in which the robot is used to service a production machine by transferring parts to and/or from the machine.

Robots have been successfully applied to accomplish the loading and/or unloading function in the production operations

- Die casting
- Plastic molding
- Forging and related operations
- Machining operations
- Stamping press operations

The other industrial applications of robotics include processing operations such as spot welding, continuous arc welding; spray coating, also in assembly of machine parts and their inspection.

Robotic arm

The most developed robot in practical use today is the robotic arm and it is seen in applications throughout the world. We use robotic arms to carry out dangerous work such as when dealing with hazardous materials. We use robotic arms to carry out work in outer space where man cannot survive and we use robotic arms to do work in the medical field such as conducting experiments without exposing the research. Some of the most advanced robotic arms have such amenities as a rotating base, pivoting shoulder, pivoting elbow, rotating wrist and gripper fingers. All of these amenities allow the robotic arm to do work that closely resembles what a man can do only without the risk.

Medical Applications

Medical robotics is a growing field and regulatory approval has been granted for the use of robots in minimally invasive procedures. Robots are being used in performing highly delicate, accurate surgery, or to allow a surgeon who is located remotely from their patient to perform a procedure using a robot controlled remotely. More recently, robots can be used autonomously in surgery.

Future Applications

We can theorize a likely profile of the future robot based on the various research activities that are currently being performed. The features and capabilities of the future robot will include the following (it is unlikely that all future robots will possess all of the features listed).

•Intelligence: The future robot will be an intelligent robot, capable of making decisions about the task it performs based on high-level programming commands and feed back data from its environment.

•Sensor capabilities: the robot will have a wide array of sensor capabilities including vision, tactile sensing, and others. Progress is being made in the field of feedback and tactile sensors, which allow a robot to sense their actions and adjust their behavior accordingly. This is vital to enable robots to perform complex physical tasks that require some active control in response to the situation. Robotic manipulators can be very precise, but only when a task can be fully described.

•Tele presence: it will possess a tele presence capability, the ability to communicate information about its environment (which may be unsafe for humans) back to a remote" safe" location where humans will be able to make judgments and decisions about actions that should be taken by the robots.

•Mechanical design: the basic design of the robot manipulator will be mechanically more efficient, more reliable, and with improved power and actuation systems compared to present day robots. Some robots will have multiple arms with advanced control systems to coordinate the actions of the arms working together. The design of robot is also likely to be modularized, so that robots for different purposes can be constructed out of components that are fairly standard.

•Mobility and navigation: future robots will be mobile, able to move under their own power and navigation systems.

•Universal gripper: robot gripper design will be more sophisticated, and universal hands capable of multiple tasks will be available.

•Systems integration and networking: robots of the future will be "user friendly" and capable of being interfaced and networked with other systems in the factory to achieve a very high level of integration.

Industrial Applications

We will divide our presentation of future industrial applications into three areas:

- Manufacturing
- Hazardous and inaccessible environments,
- Service industries

Future Manufacturing Applications

The present biggest application areas for industrial robots are in the spot-welding and the materials handling and machine loading categories. The handling of materials and machine tending are expected to continue to represent important applications for robots, but the relative importance of spot welding is expected to decline significantly. The most significant growth in shares of manufacturing applications is expected to be in assembly and inspection and in arc welding.

Robotic welding is one of the most successful applications of industrial robotmanipulators. In fact, a huge number of products require welding operations in their assembly processes.Welding can in most cases impose extremely high temperatures concentrated in small zones. Physically, that makes the material experience extremely high and localized thermal expansion and contraction cycles, which introduce changes in the materials that may affect its mechanical behavior along with plastic deformation. Those changes must be well understood in order to minimize the effects.

The majority of industrial welding applications benefit from the introduction of robot manipulators, since most of the deficiencies attributed to the human factor is removed with advantages when robots are introduced. This should lead to cheaper products since productivity and quality can be increased, and production costs and manpower can be decreased.

Hazardous And Inaccessible Nonmanufacturing Environments

Manual operations in manufacturing that are characterized as unsafe, hazardous, uncomfortable, or unpleasant for the human workers who perform them have traditionally been ideal candidates for robot applications. Examples include die-casting, hot forging, spray-painting, and arc welding. Potential manufacturing robot applications that are in hazardous or inaccessible environments include the following:

· Construction trades

· Underground Coal mining: The sources of dangers in this field for humans include fires, explosions, poisonous gases, cave-ins, and underground floods.

· Hazardous utility company operations: The robots have a large scope of application in the nuclear wastage cleaning in nuclear plants, in the electrical wiring, which are dangerous and hazardous to humans.

· Military applications

· Fire fighting

· Undersea operations: The Ocean represents a rather hostile environment for human beings due principally to extreme pressures and currents. Even when the humans venture into the deep, they are limited in terms of mobility and the length of time they can remain underwater. It seems much safer and more comfortable to assign aquatic robots to perform whatever task must be done underwater.

· Robots in space: Space is another inhospitable environment for humans, in some respects the opposite of the ocean. Instead of extremely high pressures in deep waters, there is virtually no pressure in outer space. Therefore, this field is also of large importance as far as the robotics is concerned.

Service Industry And Other Applications:

In addition to manufacturing robot applications, robot applications that are considered hazardous, there are also opportunities for applying robots to the service industries. The possibilities cover a wide spectrum of jobs that are generally non-hazardous:

· Teaching robots

· Retail robots

· Fast-food restaurants

· Garbage collection in waste disposal operations

· Cargo handling and loading and distribution operations

· Security guards

· Medical care and hospital duties

· Agricultural robots

· House hold robots

Medical Applications

The medical applications of robotics include Nano robotics, swarm robotics, also surgeries and operations using the knowledge of robotics.

Nano robotics is the technology of creating machines or robots at or close to the scale of a nanometer (10-9 meters). Nanorobots (nanobots or nanoids) are typically devices ranging in size from 0.1-10 micrometers and constructed of nanoscale or molecular components. As no artificial non-biological nanorobots have so far been created, they remain a hypothetical concept at this time.

Swarm robotics is a new approach to the coordination of multirobot systems, which consist of large numbers of relatively simple physical robots. Potential application for swarm robotics includes tasks that demand for extreme miniaturization (Nano robotics, microbotics), on the one hand, as for instance distributed sensing tasks in micro machinery or the human body. On the other hand, swarm robotics is suited to tasks that demand for extremely cheap designs, for instance a mining task, or an agricultural foraging task. Artists are using swarm robotic techniques to realize new forms of interactive art installation.

Robots For Paralyzed Patients

One of the interesting and concerning future applications of robotics in medical field include service to paralyzed people who electric wheelchairs to move around. But now a robotic device can help paralyzed patients to walk on treadmills. After training, some of the patients, who rebuild confidence, have also regained muscle power and can, walk over short distances. The robot helps the paralyzed patients in their daily routine such as helping them to take bath, changing their clothes, and feeding them. A robot doesn't force food into their mouth but it takes the spoon to till the patient's mouth.