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Concept for Automated Sorting Robotic Arm

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Abstract

Repetitive tasks and high accuracy have become the two contradictory needs of any industrial process. By introducing autonomous robotic applications, simple repetitive tasks can be accomplished keeping the demands of the accuracy and speed in mind. Nowadays in this fast growing industrial age every company needs speed in manufacturing to cope up with the customer's requirements. The basic objective of our project is to develop a versatile and low cost robotic arm which can be utilized in any industry to eliminate this problem.

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1. Introduction

A robotic arm is a robot manipulator, usually programmable, with similar functions to a human arm. The links of such a manipulator are connected by joints allowing either rotational motion (such as in an articulated robot) or translational (linear) displacement. The links of the manipulator can be considered to form a kinematic chain. The business end of the kinematic chain of the manipulator is called the end effector and it is analogous to the human hand. The end effector can be designed to perform any desired task such as welding, gripping, spinning etc.,

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depending on the application. Our robotic manipulator can be used in a number of applications by changing the program of controller. Moreover, by selecting appropriate capacity of motors, the arm will be capable to lift light loads (e.g. household applications), as well as heavy loads (e.g. industrial applications).

2. Design of Robotic Arm

On the basis of degree of freedom of the arm and the type of joints used, a robotic arm can have any of the following designs:

- Cartesian robot
- Cylindrical robot
- Spherical robot
- Articulated robot
- SCARA (Selective Compliance Assembly Robotic Arm) [1]

2.1. Cartesian Robot

In this the kinematic structure of a robot arm is made of three mutually perpendicular prismatic joints. The wrist center position of of a Cartesian robot can be conveniently described by three Cartesian co-ordinates associated with the three prismatic joints. The regional work-space of a Cartesian robot is a rectangular box.

2.2. Cylindrical Robot

A robot arm is called cylindrical robot if either the first or second joint of a Cartesian robot is replaced by a revolute join. The wrist center position of a cylindrical robot can be described by a set of cylindrical coordinate system associated with the three joint variables. The workspace of a cylindrical robot is confined by two concentric cylinders of finite length.

2.3. Spherical Robot

A robot arm is called a spherical robot if either the first or second joint of a Cartesian robot is replaced by a revolute joint. The wrist center position of a spherical robot can be described by a set of spherical coordinate system associated with the three joint variables. The workspace of cylindrical robot is confined by two concentric spheres.

2.4. Articulated Robot

A robot arm is said to be an articulated robot if all three joints are revolute. The workspace of an articulated robot is very complex, typically a crescent shaped cross.

2.5. SCARA

It is a special type of robot consisting of two revolute joints followed by a prismatic joint. All three joint axes are parallel to each other and usually point along the direction of gravity. The wrist has one degree of freedom and hence the entire robot has 4 degrees of freedom. This type of robot is useful for assembling parts on a plane.