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AUTO ASSIST PHYSIO ARM TO ARM CONTROLLER USING ANDROID OF THINGS

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ABSTRACT: Pneumatic robots are essential for material handling in chemical industries where electric or hydraulic robots are unsuitable due to fire hazard. A 3 axes (3 Degrees of Freedom) articulated pneumatic robotic arm was designed and assembled in this project along with its control system. Pneumatic rod less linear actuators were used as the main drive system for the robotic arm and were controlled by pneumatic 5/3-way proportional directional control valve. The design of the arm for this project implements crank mechanism to convert linear actuation displacement to angular displacement about the joint

INTRODUCTION

Nowadays, robots are increasingly being integrated into working tasks to replace humans especially to perform the repetitive task. In general, robotics can be divided into two areas, industrial and service robotics. International Federation of Robotics (IFR) defines a service robot as a robot which operates semi- or fully autonomously to perform services useful to the well- being of humans and equipment, excluding manufacturing operations. These robots are currently used in many fields of applications including office, military tasks, hospital operations, dangerous environment and agriculture. Besides, it might be difficult or dangerous for humans to do some specific tasks like picking up explosive chemicals, defusing bombs or in worst case scenario to pick and place the bomb somewhere for containment and for repeated pick and place action in industries. Therefore a robot can be replaced human to do work. 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 effectors and it is analogous to the human hand. The end effectors can be designed to perform any desired task such as welding, gripping, spinning etc., depending on the application. The robot arms can be autonomous or controlled manually and can be used to perform a variety of tasks with great accuracy. The robotic arm can be fixed or mobile (i.e. wheeled) and can be designed for industrial or home applications. This report deals with a robotic arm whose objective is to imitate the movements of a human arm using accelerometers as sensors for the data acquisition of the natural arm movements. This method of control allows greater flexibility in controlling the robotic arm rather than using a controller.

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COMPONENTS USED PNEUMATIC CYLINDERS:

Pneumatic equipment can be split up into two basic categories of cylinders and valves. Cylinders are the 'muscles' of pneumatic systems as they are used to move, hold and lift objects. They can even be used to operate other pneumatic components. Cylinders are operated by compressed air and they covert the stored energy in the compressed air into linear motion. Linear motion is motion in a straight line: an apple falling from a tree or a sliding door closing is an example of linear motion. We can represent linear motion by arrows like the ones below.

Fig.1.1

There are two types of cylinder that we will be using:

- Single-Acting Cylinders
- Double-Acting Cylinders

COMPRESSOR

Compression ratio is expressed by the discharge pressure measured in the generally accepted unit of bars. Compressors should be installed in a separate room. Special care is required to ensure that the compressors will be able to take in air that is preferably cool but above all dry and substantially dust-free. At locations where clean suction air is not available, the installation of a separate intake filter can answer this requirement. Piping leading from the filter to the compressor intake should be amply dimensioned. In this way it is also possible for clean suction air to be supplied to a multiple number of compressors via a common intake duct.

OPERATION

There are many valve design variations. Ordinary valves can have many ports and fluid paths. A 2-way valve, for example, has 2 ports; if the valve is open, then the two ports are connected and fluid may flow between the ports; if the valve is closed, then ports are isolated. If the valve is open when the solenoid is not energized, then the valve is termed normally open (N.O.). Similarly, if the valve is closed when the solenoid is not energized, then the valve is termed normally closed. There are also 3-way and more complicated designs. A 3-way valve has 3 ports; it connects one port to either of the two other ports (typically a supply port and an exhaust port). Solenoid valves are also characterized by how they operate. A small solenoid can generate a limited force. If that force is sufficient to open and close the valve, then a direct acting solenoid valve is possible. An approximate relationship between the required solenoid force *Fs*, the fluid pressure *P*, and the orifice area *A*

WORKING PROCESS

The working process of the robotic arm is very simple. All kinematic motion are control by pneumatic cylinder with the help of the compressor in effective manner.

It was particularly design for hospital patent. So that each parts or components are made up of light weight material so that patent can able to use in friendly manner. It was similar to the real hand principal so that it will perfectly suitable for the every person. Whole system completely work depend upon the pneumatic cylinder, performance of these robotic is completely depends upon the compressed air supply to into the pneumatic cylinder. Skeleton of the robotic arm an able to perform all kind of operations similar to the real hand. It was completely control by the pneumatic cylinder. With the help of the air pressure which supply form the compressor. It was perfectly design for the patent comfortless. So that it was very user friendly to the patent. The model image of the project was given in above block diagram. Inlet and outlet of the pneumatic cylinder was control by the solenoid valve in effective manner with the support of the electric power supply.

CONCLUSION

An articulated robot arm was developed using pneumatic linear actusators to carry out material handling tasks for industries where the usage of electric components can be hazardous. The design of the arm employed crank mechanism in which linear displacement from actuation was converted to angular displacement of the joint effectively. A 5/3-way proportional control valve proved to be very effective in controlling the highly nonlinear arm compared to normal 5/3- way directional control valve. It was also found that the force changes with the position of the articulated arm dynamically.

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