

---

# Explanation of the robot system

## 1.Overview:

Robotic arm is the most widely used automatic mechanical device in the field of machinery. It can be found in industrial manufacturing, medical treatment, entertainment services, military, semiconductor manufacturing, and space exploration. Although their forms are different, they all have a common feature, that is, they can accept instructions and accurately locate to a certain point in the three-dimensional (or two-dimensional) space for work.

The robot arm can imitate certain actions of a human arm, and realizes grasping, assembling, carrying and other actions according to a fixed program. It is the earliest industrial machine to replace humans to realize the mechanization and automation of production, and it can replace humans to complete dangerous operations. Therefore, the robot arm is widely used in the assembly, transportation, disassembly, detection of flammable and explosive items, as well as the use in highly dangerous environments such as fire fighting and anti-terrorism.

## 2.The composition of a robot arm

The robot arm is mainly composed of an actuator, a driving mechanism and a control system. In order to capture objects at any position and orientation in space, 6 degrees of freedom are required; degrees of freedom are key parameters for the design of a robotic arm. The more degrees of freedom a robot arm has, the more flexible it will be, the more versatile it is, and the more complex its structure will be. Generally dedicated robots have 2 to 3 degrees of freedom.

## 3.Execution structure

The mechanical arm's actuator is divided into hand, arm, and trunk.

### 3.1 Hand

The hand is mounted on the front of the arm. The inner hole of the arm is equipped with a transmission shaft, which can transmit the motion to the wrist and fingers.

The hand structure of the robotic arm mimics human fingers and is divided into three types: jointless, fixed joint and free joint. The number of fingers can be divided into two fingers, three fingers, four fingers, etc., of which the two fingers are most used. According to the shape, size, weight, material and operation requirements of the object to be grasped, the hand of the robot arm has various structural forms, such as clamping type, holding type and adsorption type.

---

## **3.2 Arm**

The function of the arm is to guide the fingers to accurately grasp the workpiece and transport it to the desired position. In order for the robot to work correctly, the three degrees of freedom of the arm must be accurately positioned.

## **3.3 Torso**

The torso is the support for the power source and various actuators.

# **4. Drive structure**

There are four main driving mechanisms used by the robotic arm: hydraulic drive, pneumatic drive, electrical drive and mechanical drive. Among them, hydraulic drive and pneumatic drive are most used.

## **4.1 Hydraulic drive**

Hydraulic driven mechanical arm usually consists of hydraulic motor (various oil cylinders, oil motors), servo valve, oil pump, fuel tank, etc. to form the drive system. Generally, it has a large snatch capacity (up to several hundred kilograms or more), which is characterized by compact structure, smooth movement, impact resistance, vibration resistance, and good explosion resistance, but hydraulic components require high manufacturing accuracy and sealing performance. Otherwise, oil leakage will pollute the environment.

## **4.2 Pneumatically driven**

The drive system is usually composed of air cylinder, air valve, air tank and air compressor. It is characterized by convenient air source, fast action, simple structure, low cost and convenient maintenance. However, speed control is difficult, and the air pressure cannot be too high, so the snatch capacity is low.

## **4.3 Electric drive**

Electric drive is the most commonly used drive method for robots. Its characteristics are convenient power supply, fast response, large driving force, convenient signal detection, transmission and processing, and it can adopt a variety of flexible control schemes. Generally, stepper motors and DC servo motors are the motors mainly used for electric drive. Due to the high speed of the motor, a reduction mechanism (such as harmonic drive, RV cycloid pin gear drive, gear drive, screw drive, and multi-rod mechanism, etc.) is usually required. Some robotic arms have begun to drive directly with high-torque, low-speed motors without a deceleration mechanism, which can simplify the mechanism and improve the control accuracy.

## **4.4 Mechanical drive**

Mechanical drive is only used for fixed action. In this method, a cam link mechanism is generally used to achieve a predetermined action. It is characterized by reliable movement, high working speed and low cost, but it is not easy to adjust.

---

## 5.Control System

The control system completes specific actions by controlling each motor of the robot arm, and at the same time receives information from the sensors to form a stable closed-loop control. The core of the control system is usually composed of single-chip microcomputers or micro-control chips such as dsp.

The elements controlled by the robot arm include work sequence, arrival position, action time, movement speed, acceleration and deceleration, etc. The control of the robot arm is divided into point control and continuous trajectory control.

According to the action requirements, a program is first prepared and saved on the control board, and then the robot is controlled to work according to the program.

## 6. LK Cokoino Robotic arm system:

The above-mentioned are all relatively demanding robotic arms, which have high accuracy, large size, heavy weight, and expensive price, which are very complicated and unnecessary for our beginners and makers. Now let's introduce the LK cokoino robot arm. This is an affordable, interesting robot arm that anyone can make. The control system, control method, power supply, power conversion, and actuator of the robotic arm will be expressed in the form of pictures below.

