

Abstract

In the automatic control system, the output of the controlled object is a physical quantity that needs to be strictly controlled. A control device is the sum of all the mechanisms that exert control over the controlled object. Different principles and methods can be used to control the controlled object, but the most basic is based on open loop control and closed loop control of automatic control technology.

We must pay attention to the advantages and disadvantages of open loop and closed loop control systems and carry out targeted scientific research.

Key words: open-loop control ; closed loop control; actual use

1. Definition of open-loop control system

The controlled quantity of the open loop control system does not have any influence on the control of the system, and the signal is transmitted one-way from the input quantity to the controlled quantity. As shown in the figure below.

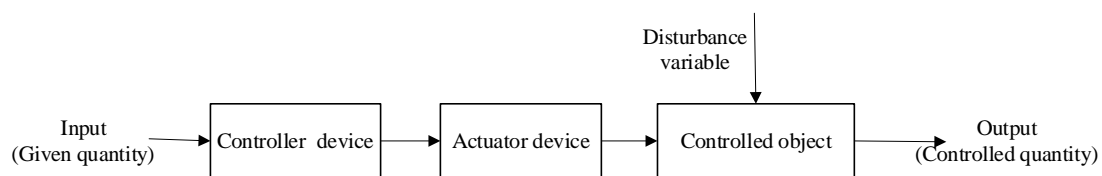


Figure 1: Schematic frame of an open-loop control system

The advantages of this control are simple structure and high economy. The disadvantage is that the error caused by interference can not be eliminated. When the controlled object or control device is interfered, or the characteristic parameters change in the work, it will directly affect the controlled quantity and cannot be automatically compensated, so the control precision of the system is difficult to guarantee.

2. Definition of closed loop control system;

The controlled quantity of the closed-loop control system is fed back to the input control system, and the output signal of the system returns to the input end of the system along the feedback channel, forming a closed channel .As shown in the figure below.

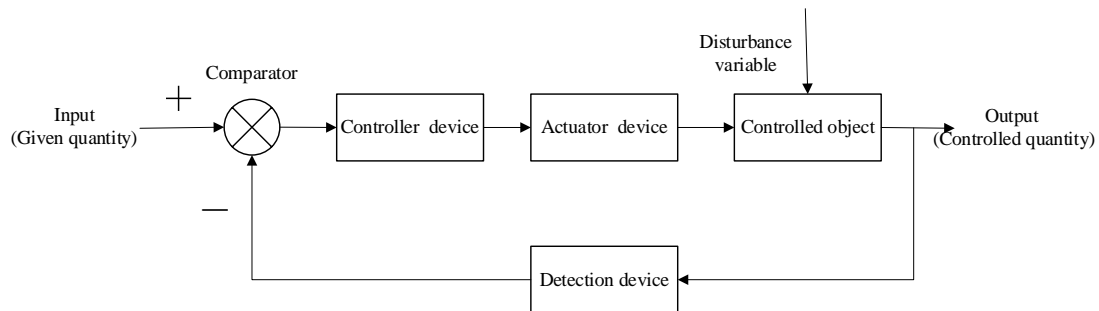


Figure 2: Schematic frame of a closed-loop control system

Compared with open-loop control system, closed-loop control has a series of advantages. The closed-loop control system is controlled according to the deviation according to the negative feedback principle, that is, by comparing the deviation between the system output and the expected output, and eliminating the deviation to obtain the expected system performance. So whether it is the change caused by interference or the change of structural parameters, the deviation can be used to correct the deviation, so that the system to achieve a higher control precision.

The disadvantage is that the structure of the closed-loop system is complex and difficult to construct, and the improper gain selection will cause the instability and abnormal operation of the system. In addition, there is often a contradiction between the accuracy of the control system and the stability of the system.

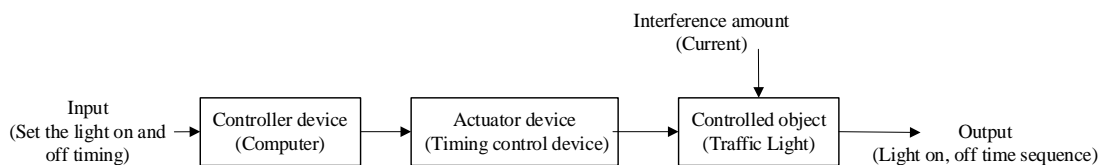
3. The choice of actual use

In the actual project, it should be decided according to the project requirements and specific circumstances. If the change law of the input quantity is foreseen in advance, and there is no change of external and internal parameters, it is better to use open loop control. If the external interference of the system cannot be predicted and the internal parameters of the system often change, closed-loop control is more appropriate to ensure the control accuracy. If the performance of the system is relatively high, in order to solve the contradiction between the precision and stability of closed-loop control, the composite control system combining open-loop control and closed-loop control can be adopted.

4. Typical circuit block diagram

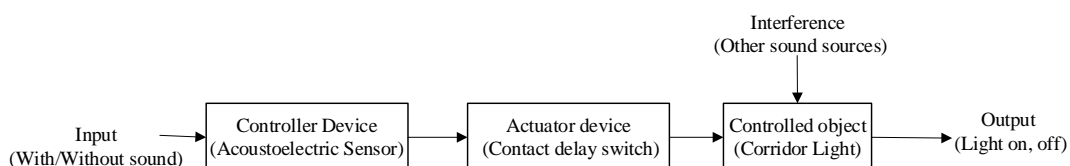
4.1 Open loop control system

① The traffic light timing control system of the intersection



In advance in the computer programmed traffic lights on and off time sequence, through the timing control device output control signal, so that the traffic lights in accordance with the lights on and off time sequence.

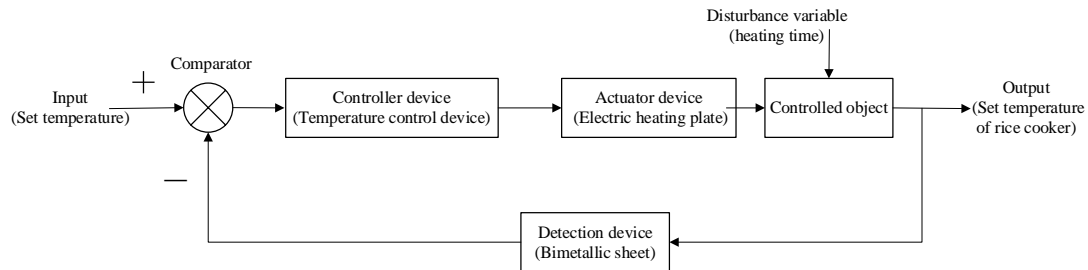
② corridor light sound control device system



When there is acoustic signal in the control range of the acoustic lamp, the acoustic sensor will output a control signal, so that the corridor light is lit for a period of time, and then automatically extinguished.

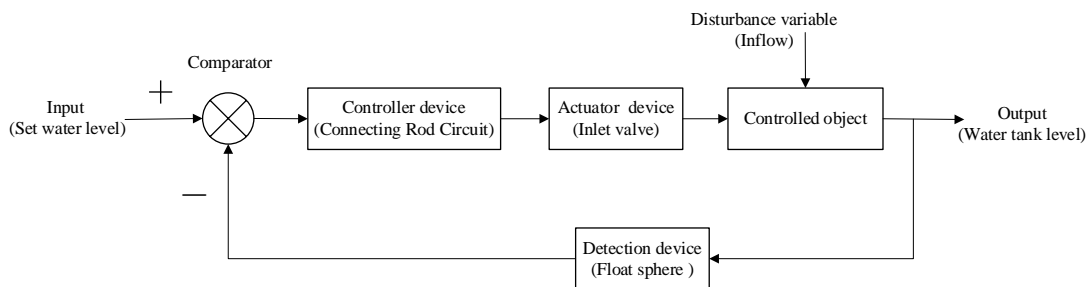
4.2 Closed-loop control system

① Thermal insulation control system of household electric rice cooker



When the actual temperature is higher than the set temperature, the thermal expansion rate of the two pieces of the bimetallic sheet is different, so that the bimetallic sheet bends upward, thus cutting off the power supply of the electric heating plate. When the actual temperature is lower than the set temperature, the bimetallic sheet gradually cools and recovers, so as to connect the power supply of the electric heating plate for heating. This is repeated to achieve insulation effect.

② the automatic control system of the flush toilet



When the actual water level is low, the float in the lower position through the connecting rod circuit to open the inlet valve, the subsequent actual water level will rise. When the actual water level rises to a certain height, the floating ball is at a higher position, and the inlet valve is closed through the connecting rod circuit, and then the position of the water tank is kept at a certain height.