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# STUDY OF AUTOMATIC CONTROL SYSTEMS

Yuldashova Hilola Bakhtiyor qizi
Nukus Branch of Navoi State Mining Institute,
2nd year Student of the Faculty of General Engineering 5311000
Technological Processes and Production Automation and Control (by Industry)

## ANNOTATION

This article covers the main part of the theory of large-scale automatic equipment, their development trends and prospects.It also examines a number of studies of these systems, with the construction principles of automatic control and adjustment systems.

**Keywords:** Theory of automtic control, mathematical models, robustness of system, criteria plays, digital model, technical cybernetic, ABT, analog, quality assessment.

## INTRODUCTION

The theory of automatic control is a branch of technical cybernetics that conducts research on the development of automated control systems (ABT) for processes of varying complexity and nature. The theory of automatic control uses similar (adequate) mathematical models of real objects instead of real ones. It mainly focuses on two issues: research on the analysis and synthesis of ABT. The two types of control systems, open and closed control systems, differ in the way they manage processes. In the first, the control effects are derived from the process-slowing effects and are aimed at reducing the difference in their wear. The main disadvantage of such a control system is that it cannot withstand unmeasurable external drag effects. In addition, these control systems cannot control unstable objects for long periods of time. At the heart of closed control systems is the idea of feedback. This idea is known as the parameter deviation control principle (or feedback control).

Here, execution signals are generated that return aathe control parameters to the required state due to deviations from the required level. The universality of this method is reflected in the control of unstable objects. The central problem in the theory of automatic control, in particular, in the theory of closed systems, is the robustness of the system. The 1950s and 1960s were a period of rapid development of synthesis methods for such systems. The choice of quality criteria plays a key role in solving the problem of synthesis. Among the methods of synthesis of ABT, invariant and autonomous methods of synthesis of such systems have a special place. In this theory, the ABT synthesis method, based on the use of integrated criteria for quality assessment, is preferred. Encouraged the emergence of modified methods. The synthesis methods of optimal systems are generalized and the theory of automatic control. In some control objects, the a priori (initial) of a fixed mathematical model is inadequate for the actual state of the object when operating or designing the ABT. Often due to the extreme complexity of the process, it is practically impossible to create a mathematical model of the control object based on certain physical or chemical laws.

This is, of course, the result of external and internal friction parameters that cannot be measured when using ABT, which change their performance. Therefore, a scientific field called methods of identification of control objects has emerged. The advent of adaptive management

systems has made it possible to fill a priori information gap and increase system efficiency. A simple closed-loop extreme adjustment system belonging to the class of adaptive control systems can be divided into a separate class, and such a control problem is considered a probability problem. To solve it, statistical solutions and controlled random process theory methods are used. Continuous (analog) and continuous (digital) modeling methods are of great importance in the stage of scientific and applied research on the creation of ABT.

From time immemorial, man has wanted to use the forces of nature and objects for his own purposes, that is, to control them. You can control inanimate objects (for example, throwing stones elsewhere), animals (hand training), people (boss - subordinate). In the modern world, many management functions are related to technical systems - cars, ships, planes, cars. For example, to maintain the course of a specified vessel, the height of the aircraft, the speed of rotation of the engine, the temperature in the refrigerator or heating furnaces. If these tasks are solved without human intervention, they are called automatic control."How to manage?" management theory tries to answer the question. Until the 19th century, automatic control systems already existed, but there was no science of control. For example (to rotate against the wind).

The development of management theory coincided with the Industrial Revolution. First of all, this direction was developed by mechanics to solve the problems of adjustment in science, ie (for example, in steam engines). required to adjust the rotational speed, temperature, pressure values in the given technical devices. From this we can see the origin of the name automatic adjustment system. It turned out that the principles of management could be applied not only in the field of technology, but also in biology, economics and social sciences. Cybernetics is the study of the processes of control and information processing in any system of nature. One of its main sections, which is mainly related to systems, is the automatic control theory. In addition to the classical adjustment tasks, it studies the issues of optimiza tion and flexibility of control laws. The terms automatic control theoryand automatic adjustment theoryare sometimes used interchangeably.

For example, in modern foreign literature you can find only one - the theory of control.1.2. Control systems1.2.1. What does the control system consist of? In management matters, there are always two - controllable and controllable objects. Usually a controlled object is called a control object or simply an object, and a controlled object is a controller. For example, in the control of the frequency of rotation, the object of control is the engine (electric motor, turbine), the ship is in the water to stabilize the speed of the ship, and the speakers are used to maintain the volume. Regulators can be based on different principles. The most famous of the first mechanical adjusters was the James Watt Steam Machine, an automatic adjuster that could adjust the speed of rotation of the shaft. (pictured right) As the number of revolutions of the shaft changes, the loads change their position under the influence of centrifugal forces, and the transmission of steam changes due to the displacement of the adjusting body.In many modern systems, controllers are microprocessor-based devices and computers that can successfully control aircraft and spacecraft without human intervention.Typically, regulators do not directly affect the object to be controlled, but act to control and amplify the signal exchange through actuators (drives), for example, the conversion of an electrical signal into valve movement, fuel i is to adjust the flow or turn the steering wheel a few angles.The controller needs sensors to

monitor the process with the object. The properties of the objects to be controlled are studied with the help of sensors.

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