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Analysis And Synthesis of Dynamic Systems and Transient Processes in The Min Real Automatic Control Systems

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Annotation: In real automatic control systems (ACS), there may be cases when some of the parameters are not known exactly, or they change in during the operation of the system in advance known laws, and their meanings in principle cannot be measurable. If at the same time the ranges of possible values of constants are known parameters or limits of change of unstable parameters, then in such cases one speaks of a pair metric interval uncertainty. Systems having interval indefinite parameters are called interval systems. The following article is devoted to the analysis and synthesis of dynamic systems and transient processes in them in real automatic control systems.

Key words: analysis, synthesis, dynamic system, automatic control systems, servo system, output, stem, interval system.

Along with checking robust stability, answering the question: the interval system is stable stem or not, it is desirable for the designer also the robust quality of the interval system, corresponding to the location of its poles in not which is the given area of the complex plane.

In the literature, this problem is considered as analysis of robust relative stability. The concept of relative stability is associated with various options for the location of the roots interval characteristic polynomial with responsibly possible combinations of variable parameters within fixed intervals.

So far, researches in this area were conducted predominantly algebraically and frequency methods in two directions: formulating necessary and sufficient conditions and the conclusion of relatively non-conservative sufficient conditions for a relative robust sustainability.

The tool is important for the designer, allowing analysis and synthesis interval systems of automatic control. In each specific area, as a rule, there are specialized complexes of programs (CP), according to allowing conducting on personal computers research of real control systems and automatic devices using their models. Most common in infusion now received the Mat Lab package, which allows perform both numerical and analytical operations, and being an interactive system for engineering and scientific calculations? In the Mat package Lab, there are libraries of standard subprograms for analysis and synthesis of robust systems, based on various principles and criteria.

It should be noted that the built-in under programs don't use root methods though, it is the root approach in the study creation of interval systems has an essential new advantages. Therefore, it is of interest developed on the basis of root Godot theory KP graph for analysis and synthesis of interval system. This KP was named Root Analysis and Synthesis of Interval Systems (RASIS).

Analysis and Synthesis of Interval Systems (RASIS).There is an extremely wide variety of automatic systems that perform certain functions to control a wide variety of physical processes in all areas of technology.

In a servo system, the output quantity reproduces the change in the input quantity, and the automatic device responds to a mismatch between the output and input quantities. The tracking system has a feedback of the output with the input, which, in fact, serves to measure the result of the action of the system. At the system input, the input signal and the signal from the feedback sensor are subtracted. The magnitude of the mismatch affects the intermediate devices, and through it, the controlled object. The system works in such a way as to keep the mismatch to zero all the time.

The system includes nonlinearities, which is why, by the nature of internal dynamic processes; it is referred to as nonlinear systems. According to the course of processes in the system, it is referred to as

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continuous, since in each of the links a continuous change in the input value over time corresponds to a continuous change in the output value.

In order for the linearized system to meet the required quality indicators in a steady state and a transient process, it undergoes synthesis, namely, a regulator is included in it, which implements the selected control law. In the interests of simplicity of calculation, we reduce the problem to such a form as to maximize the use of methods for studying ordinary linear systems, since the theory and various applied methods for them are most fully developed.

Dynamic system analysis is the breaking down of a system into elements and establishing connections between them. There are three main types of relationships:

1) Serial connection (Fig. 1.1.), the input of the connection is the input of the first element, the output of the first element is the input of the second element, the output of the second element is the output of the connection;

Serial connection

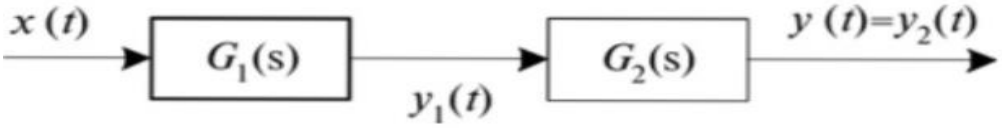

Figure. 1.2. Serial connection

2) parallel connection with the summing link (Fig. 3.9), the input of the connection is at the same time the input of each of the elements, the sum (difference) of the outputs of the elements is the output of the connection;

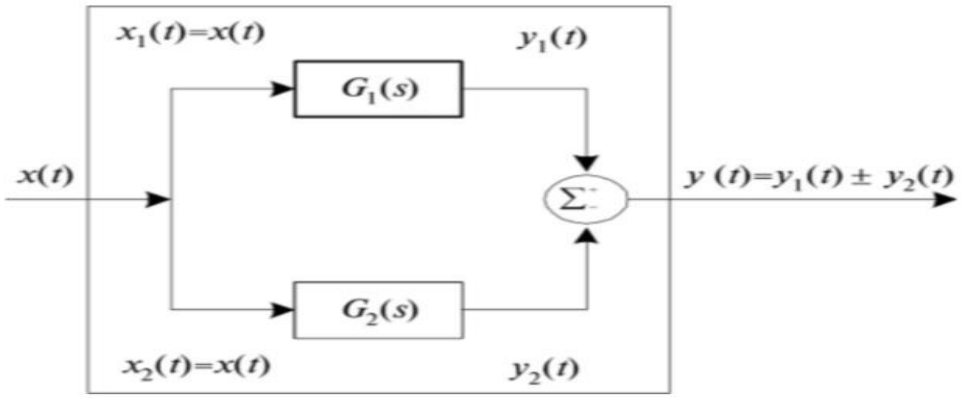

Figure. 1.3. Parallel connection

3) a closed loop with feedback (Figure 3.10), the loop contains controlled and control elements and a summing link, the input to the loop in the sum (difference) with the output of the control element enters the input of the controlled element, the output of the latter is the output of the connection.

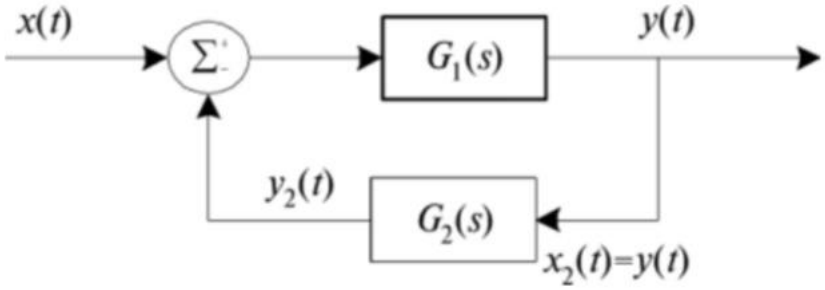

Figure. 1.4. Feedback loop

System synthesis consists in building (designing) a system with the required properties or possibly close to the required ones. For example, the most frequent and important requirement is the stability of the system. The first step in this direction: to determine the characteristics of the system according to the characteristics of its constituent elements. Knowing how to solve this first problem, it is possible to approach

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the solution of the main one: by changing the composition of the system, the relationship between the elements and the characteristics of the elements, one can choose from all possible options such a system whose characteristics are closest to the desired ones.

Since the main connections of elements in the system are sequential, parallel and with feedback, it is first of all necessary to be able to find the characteristics of these connections. But all the characteristics of elements and systems are determined by the transfer function, so the task is reduced to finding the transfer function of the connection by the transfer functions of its constituent links.

Transfer function of serial connection

The transfer function of series-connected elements is equal to the product of their transfer functions.

Example. Model of commissioning and development of production facilities. It was shown above that the process of mastering the introduced production capacities can be described in the form.

If we assume that the process of power input can also be described with the help of an inertial link, then the combined process of power input and development is thus similar to two series-connected inertial links with time constants where .

2 are the duration of the input and development of about two-thirds of the capacity.

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