

USE OF INFORMATION MODELING SYSTEMS FOR THE CREATION AND TESTING SHIP'S CONTROL SYSTEMS

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Introduction. Modern ships are increasingly equipped with computer software systems (digital control systems). The use of digital control systems increases their reliability, accuracy and flexibility as well as gives them new opportunities like use of complex mathematical device. In addition, automatic systems are much cheaper than traditional ones with the crew. Taken into consideration this, a number of European companies and research organizations in the next two decades are planning to automate the seagoing vessels completely [1; 4; 5].

The use of a complex mathematical apparatus in the control systems algorithms requires their preliminary testing to ensure the correct functioning of the system. Previously, working out of control systems was carried out mainly in aviation and space industries. With the advent of new technologies, in particular, simulators, appeared the possibility of using these systems not only for the direct purpose – the development of skills in steering mobile objects, but also for the development of highly intelligent control systems by such objects.

Relevance of research. The use of simulator equipment in a closed scheme with imitation control system equipment (system blocks, data exchange programs, software modules of the control system) is a very relevant area, which allows getting a platform for researching development of highly intelligent traffic control systems. It is very relevant taking into account modern global trends about full automation the processes of vessel management in the next 10-20 years.

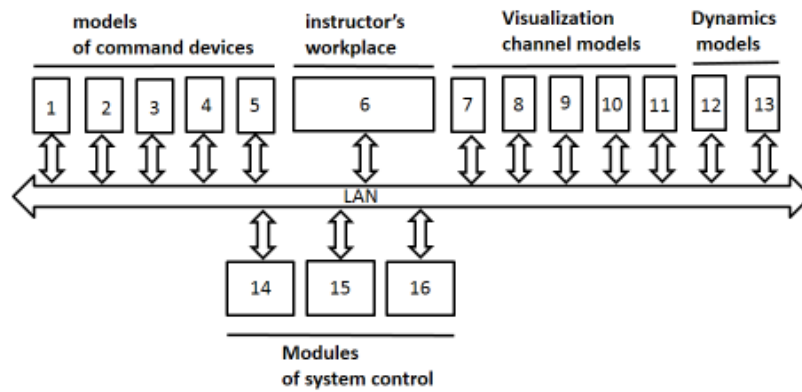
Problem statement. The structural scheme of the simulation modeling stand is shown in picture 1.

The exchange of data between the simulator equipment and the imitation equipment of the control system and the primary assessment of information is organized in the developed data exchange program. The data exchange program is located in one of the blocks of simulation control system, provides data exchange on the local network using the COM port emulator and NMEA protocol [2].

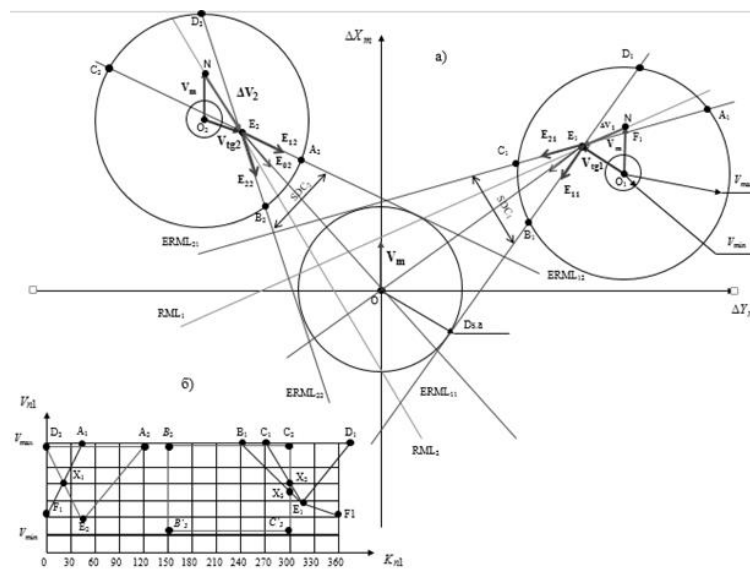
For the practice of the modeling stand was created mathematical, algorithmic software for module of the «automatically passing with dangerous targets» in accordance with the received patent №129699 to the useful model «Method of passing with dangerous targets» [3].

The method involves the numerical construction in onboard calculator with a period ΔT information processing, areas of admissible steering in case of passing with all targets, including maneuvering targets, further choice from the built area with parameters of passing with dangerous targets. Area of admissible steering - it is a zone where any spot (V_{n1} , K_{n1}) is permissible for passing with all targets simultaneously. An area is found by combining the areas of admissible steering for each target separately

$$\Omega = \Omega_1 \cap \Omega_2 \cap \dots \cap \Omega_{N_{tg}}$$



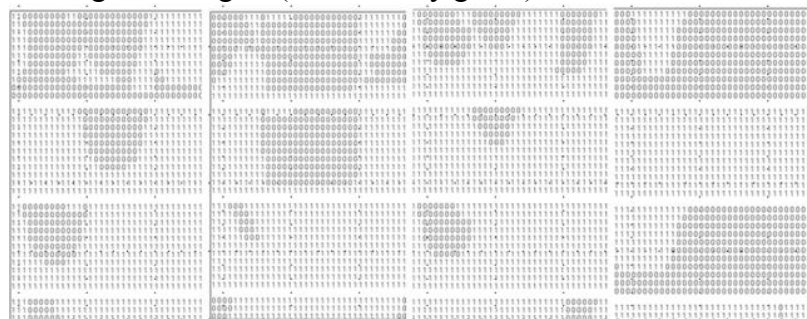
Picture 1 – Structural scheme of the simulation modeling stand



Picture 2 – Method of passing with dangerous targets

For checking working conditions of modeling stand were created tasks (selected area of sailing, our personal ship – container vessel, created five dangerous targets, for all of targets were added speed and different courses, which making them dangerous to our container vessel. Also were added weather conditions).

Picture 3 shows the areas of admissible steering built in the on-board controller with automatic passing with dangerous targets (indicated by green).



Picture 3 – Areas of admissible steering

As can be seen from the above pictures, the shape and size of the allowed areas are constantly changing. This happens due to a change in the mutual position of the vessel and the targets, also due to maneuvering of targets.

Conclusion. The results of the research showed that the created simulation stand can be used as a platform for creating and testing high-intelligence ship control system.

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