RESEARCH ON NEW OBSTACLE AVOIDANCE ALGORITHMS FOR SHIPS

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INTRODUCTION
The contribution will report the progress of a research project for Young Academic Staff in FY2018. The project is dedicated to the development of a path planning module, constituting a part of an intelligent control system for ships - a Guidance, Navigation and Control system (GNC) [1], shown in Fig.1. The GNC system is composed of three main subsystems: the Guidance System, responsible for path planning, the Control System, responsible for motion control and the Navigation System, responsible for measurement of motion parameters (ship’s positions and velocities). The basic component of the path planning module (the Guidance System) is called the Trajectory Generator (TG). An advanced optimization algorithm, constituting the core of the TG, calculates a safe, optimal path for a ship.

The aim of the research is the development of new, original, effective algorithms for the determination of a safe, optimal path for a ship in a collision situation at sea. The algorithms will be tested by carrying out simulation and experimental studies.

SIMULATION STUDIES
One of the developed approaches uses a heuristic optimization method – the ant algorithm. The description of the developed method and the results were published in [2]. The second algorithm uses a deterministic optimization method, based upon an original approach of selecting the solution, which fulfils the restrictions, from the base of previously segregated trajectories [3]. The simulation studies will be carried out with the use of the MATLAB environment. Exemplary results for an encounter situation with eight target ships are presented in Fig.2.

Figure 1. Guidance, Navigation and Control system.
EXPERIMENTAL STUDIES

The developed ship's path planning algorithms, will be tested with the use of a systems composed of a group of mobile platforms and an Indoor Positioning System for localization of the moving objects. The results of experimental studies for situation with one dynamic obstacle in the environment are shown in Fig. 3.

RESULTS

The problem solving capability of the developed solution will be proven by its implementation in the GNC system and performed tests on board the research and training ship *Horyzont II* under operating conditions. The main goal of the presented research is the development of new path planning solutions for ships, which will contribute to achieve safer shipping and progress in autonomous navigation.

REFERENCES

