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DESIGN OF A COMPUTER VISION ALGORITHM FOR A SURFACE VESSEL POSITION DETECTING IN A LABORATORY POOL

Ramos A. (ITMO University, Saint-Peterburg)
Scientific supervisor - Ph.D., Shavetov S. V.
(ITMO University, Saint-Peterburg)

The implementation of surface vessels as autonomous mechanisms includes the development of a control algorithm, including the tracking approach for positioning the surface in real-time. To solve this problem, digital process imagery methods can be considered according to the principal aims required. Therefore, this paper develops a practical and theoretical implementation of a computer vision algorithm for a surface vessel positioning implemented in a test rig based on a laboratory pool.

Introduction. Autonomous mechanism approaches have been implemented in Unmanned Aerial Vehicles (UAV). However, there is not a wide benchmark regarding control and tracking implementation for Surface Vessels, including experimental setups. Object detection allows tracking objects in an imaginary. In positioning and control tasks, tracking the desired spot is mandatory to guarantee the correct functionality of the autonomous mechanism. Therefore, to reach a good-enough performance in control tasks is necessary to design and implement a computer vision algorithm capable of satisfying all requirements required by the control implemented, in this case for Surface Vessels, as well all parameters and set up for experimentation.

Problem Statement. This work aims to design and implement a Computer Vision algorithm including the test rig setup for the laboratory pool, camera parameters taking into account lens, focal length, lighting, and structural-functional schemes. Therefore, all input parameters had been considered for a swimming pool with long 4,37 m and wide 2,04 m. A scaled surface vessel equipped with DC motors and a controller has been equipped inside the surface mechanism. However, to satisfy all requirements required by the control implemented is necessary to obtain the position and direction parameters of the boat. Therefore, the test rig includes a camera (Logitech Brio) considering a ceiling of 3.55 m, guarantying a good-enough focal length. Afterward, the camera setup obtains the imagery and processes it through a Computer Vision algorithm to obtain the linear position of the surface vessel as well the direction. These parameters are sent to the controller of the surface vessel in an open loop to maneuver the boat. However, there are many different algorithms for estimating coordinates, such as infrared, ultrasound, radio-frequency, and GPS. However, image segmentation is one of the easier approaches to obtain the principal segments of the surface vessel and assign local and global coordinated axes to obtain the required parameters aforementioned.

Conclusion. In this work, a design approach has been implemented for the positioning and tracking control of a surface vessel in a laboratory pool. This approach is figured out by a computer vision algorithm, which satisfies all requirements of the test rig. Furthermore, this method has been defined by one of the simpler approaches to obtain the principal coordinates of the boat. As well, the optimization, verification, and prospectus analysis of using in the future were taken into account.

Ramos A. Signature

Shavetov S. V. (scientific supervisor) Signature