

ABSTRACT

ROSARIO, Rafael V. C. *Variable structure control of a boat pushing an underactuated floating load*. 2017. 175 f. Thesis (Master Degree in Electronic Engineering) - Faculdade de Engenharia, Universidade do Estado do Rio de Janeiro (UERJ), Rio de Janeiro.

This thesis formulates and solves the problem of control of a boat pushing an underactuated floating load. The dynamic model of this system and its properties are described to allow the design of the control system. This problem is challenging due to the unstable dynamics and the absence of actuators on the load. Partial feedback linearization was chosen to linearize and simplify both the nonlinear dynamics and controller design. Variable structure control (VSC) was chosen in view of its robustness to parametric uncertainties and disturbances. The strategies developed were tested by simulation and experiments with a small boat in a tank. In this experiments, the position and orientation of the ship are measured by an accurate image capture system Vicon MX. As preliminary steps, trajectory tracking of ships and the control of pushing mobile robots were studied.

Keywords: Variable structure control; Marine systems; Feedback linearization; Manipulation tasks; Uncertain systems; Underactuated systems.