University of South-Eastern Norway

Faculty of Technology, Natural Sciences and Maritime Sciences, Campus Porsgrunn

FMH606 Master's Thesis

Title: System identification and dynamic positioning (DP) of ships

USN supervisor: David Di Ruscio

External partner: None

Task background:
Dynamic models of ships are usually constructed from first principles theory and the primarily equation for building such models is the Newton 2nd law and the forces acting on the ship. The resulting mathematical model has some major advantages, e.g. they are robust against measurements failure. There are basically 6 states in a ship model. Two of these states, the position in the x direction (surge) and y direction (sway) is of central importance in a DP control system. An illustration is as illustrated in Figure 2. This often results in non-linear models.

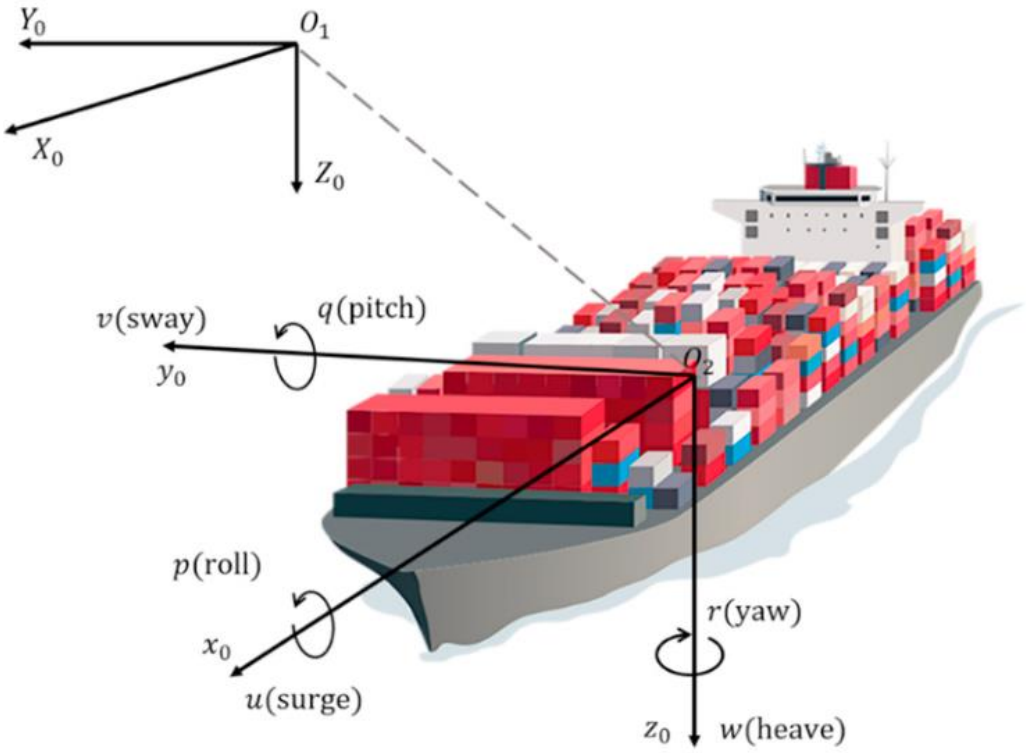

Fig. 2. Coordinate frames for ships.

System identification builds linearized dynamic models based on known input and output data. Such known input and output data are usually obtained from input experiments on the real process/ship or on a non-linear simulator equivalent.

Task description:

1. Perform a literature research on DP systems for marine vessels.
2. Implement a dynamic model (possible to use available software) of a marine vessel which may be adequate for the description of the motion of the ship.
3. Perform an input experiment design on the inputs, thrusters etc, in order to obtain input and output data matrices U and Y, respectively.
4. Investigate if the above input and output data may be used to identify dynamic models, and a DP system for the ship.

Student category: IIA

Is the task suitable for online students (not present at the campus)? Yes

Practical arrangements:
Online status meeting.

Supervision:
As a general rule, the student is entitled to 15-20 hours of supervision. This includes necessary time for the supervisor to prepare for supervision meetings (reading material to be discussed, etc).

Signatures:

Supervisor (date and signature): 25.01.2022 David Di Ruscio

Student (write clearly in all capitalized letters): LIPING WANG

Student (date and signature): Liping Wang
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