# A MOTION CONTROL SYSTEM AND CONTROLLERS FOR A MARINE VESSEL

## ABSTRACT

A high-level motion controller (200) provides a lower-level thrust allocation (TA) (202) with generalized forces demanded on the ship (10) for the current instant of time as well as a prediction of future generalized forces $\{\hat{\boldsymbol{\tau}}_{\boldsymbol{D}}\}_{t=0}^{T}$ demanded over a predicted future time, and optionally one or more other reference predictions, such as a time-varying velocity and position of the ship $\{\hat{\boldsymbol{\eta}}_{\boldsymbol{D}}, \hat{\boldsymbol{v}}_{\boldsymbol{D}}\}_{t=0}^{T}$. When predictions of the future desired forces and torque are made available to the lower-level thrust allocation, the lower-level thrust allocation will be aware of what is needed in the future and use the predictions to make efficient changes towards the desired future references, when it generates control signals (**u**) to thrusters available in the thruster system (100) to distribute the desired generalized forces into individual forces of the individual thrusters.

(Figure 2A)