HYDRODYNAMIC MODELING AND CONTROL FOR A REMOTELY OPERATED VEHICLE

By

Nabil Mamdouh Mohamed Mahmoud Khalifa

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of

MASTER OF SCIENCE
in
Aerospace Engineering

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Under the Supervision of

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Title of Thesis:

Hydrodynamic Modeling and Control for a Remotely Operated Vehicle

Key Words:

ROV; Maneuvering theory; Virtual Planar Motion Mechanism; Hydrodynamic coefficients; System dynamics assessment

Summary:

A remotely operated vehicle was designed and tested to assess the hydrodynamic coefficients calculation techniques. Drag terms were found using steady Computational Fluid Dynamics simulations. Added mass terms were found through unsteady CFD simulations for Planar Motion Mechanism test. System dynamics from experimentation and nonlinear simulator using coefficients was compared to judge them. Results showed that added mass terms were correctly estimated while rotational drag terms were erroneous and linear ones were acceptable.

Dedication

This Thesis is dedicated to:

My Mother
This unique, strong and irreplaceable woman, who stood by my side through the highs and lows & taught me the true meaning of never giving up..

My Late Father
Who has always been in my thoughts & prayers, and i was doing this for more than most..

My Family
Whose support has been a true blessing and their understanding made the sour times much more bearable..

And Lastly my Future Family This is for you, may this be a source of pride and joy one day.

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