MEng Project Report

Model Analysis of DTMB5415 and BURNSI Ship Model

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July 22, 2024

Contents

1 Abstract

2 Introduction

This project investigated into the global response of BURNSi ship model under the influence of surface waves.

2.1 DTMB5415

The ship model used for the first part of this project is DTMB5415, which was conceived as a preliminary design for a Navy surface combatant around 1980. The hull geometry of Model 5415 includes both a sonar dome and a transom stern. Propulsion is provided through twin open-water propellers driven by shafts supported by struts.

It is important to note that no full-scale ship exists for this model. The hull geometry and relevant loading conditions and speeds are detailed in the Appendix section.

Figure 1: Side of DTMB5415

2.2 BURNSI Ship Model

3 Methodology

The main workflow of this project is first reproduce the result from section 9.2 of the Vaibhav's Ph.D thesis[1]. Then replace the DTMB5415 ship model with the BURNSi ship model to conduct a model analysis of that ship. The main target is the heave motion of the BURNSi ship model under the same inlet wave conditions as in the section 9.2 of[1].

3.1 Mesh

Note that for better view, only 2D mesh is presented below. A 3D view is provided in the Appendix section.

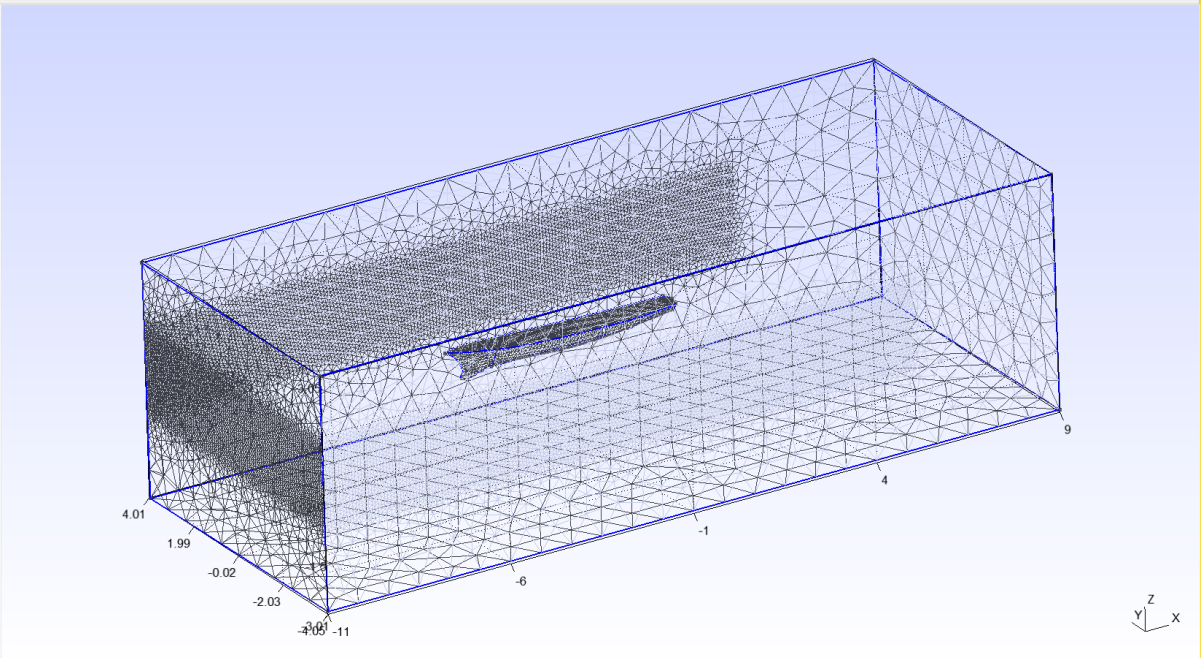

Figure 2: Mesh of the Domain

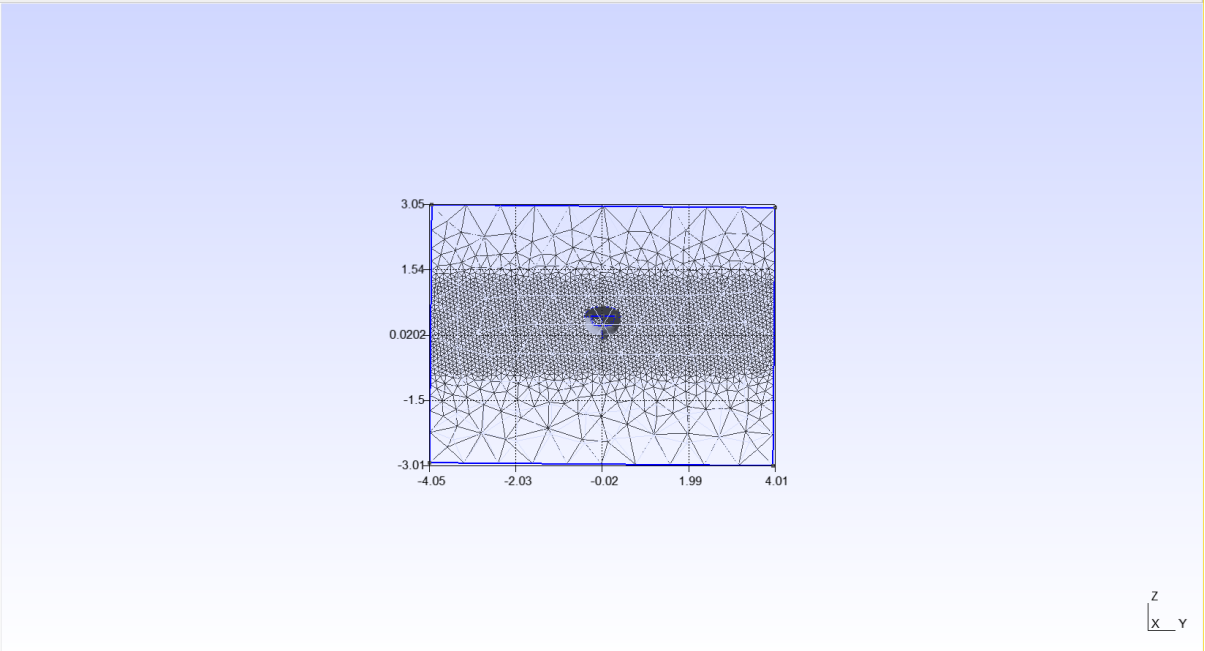

Figure 3: Front View of the Mesh

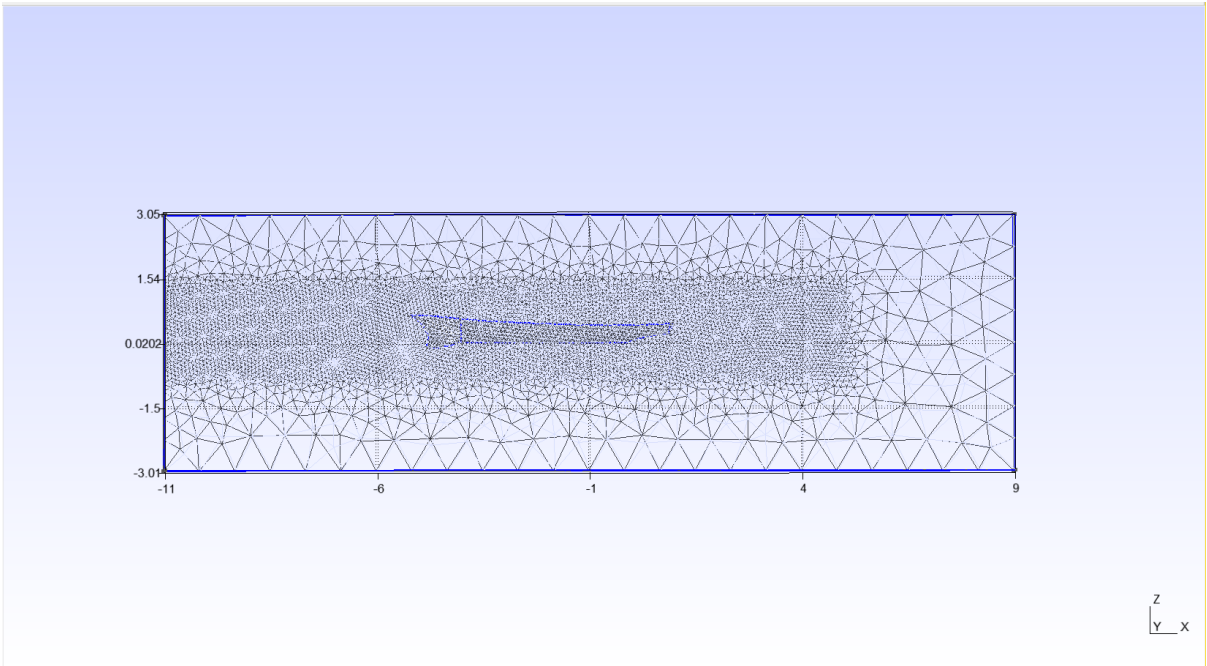

Figure 4: Side View of the Mesh

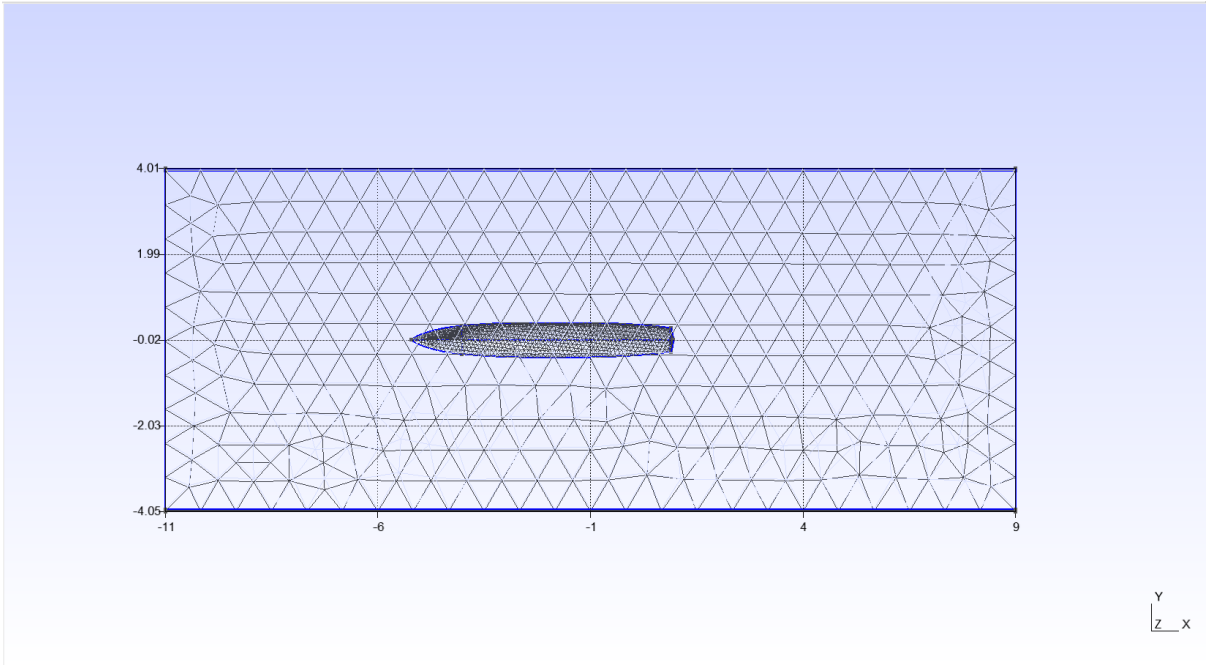

Figure 5: Top View of the Mesh

3.2 Mesh Statistics

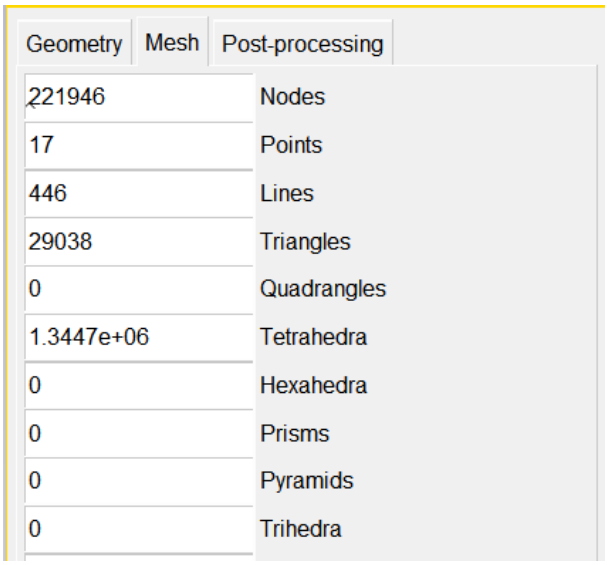

Figure 6: Mesh Statistics

3.3 Wave Configuration

Table 1: Wave Conditions

Parameters	Value	Unit
H_w	0.32032	m
k_w	1.0845	m
λ_w	0.91	m
T_w	1.929	m

4 Result

5 Discussion

6 Conclusion

7 Reference

References

[1] Vaibhav Joshi, *Variational Methods and Applications for Turbulent Single and Two-Phase Fluid-Structure Interaction*, ScholarBank@NUS Repository, 2018.

8 Appendix

8.1 DTMB 5415 Specifications

	Full-Scale	MARIN	INSEAN	IIHR	
Lpp (m)	142.00	4.002	4.002	5.719	3.048
Lwl (m)	142.18	4.007	4.008	5.726	3.052
Bwl (m)	19.06	0.537	0.538	0.768	0.409
T (m)	6.15	0.173	0.172	0.248	0.132
Displacement (m^3)	8424.4	0.189	0.188	0.554	0.0826
S w/o rudder (m^2)	2972.6	2.361	2.424	TBD	TBD
CB	0.507	0.507	0.507	0.506	TBD
CM	0.821	0.821	0.821	0.821	0.821
LCB (%Lpp), fwd+	-0.683	-0.683	-0.652	-0.652	TBD

Table 2: Main particulars of the ship model

8.2 3D Mesh

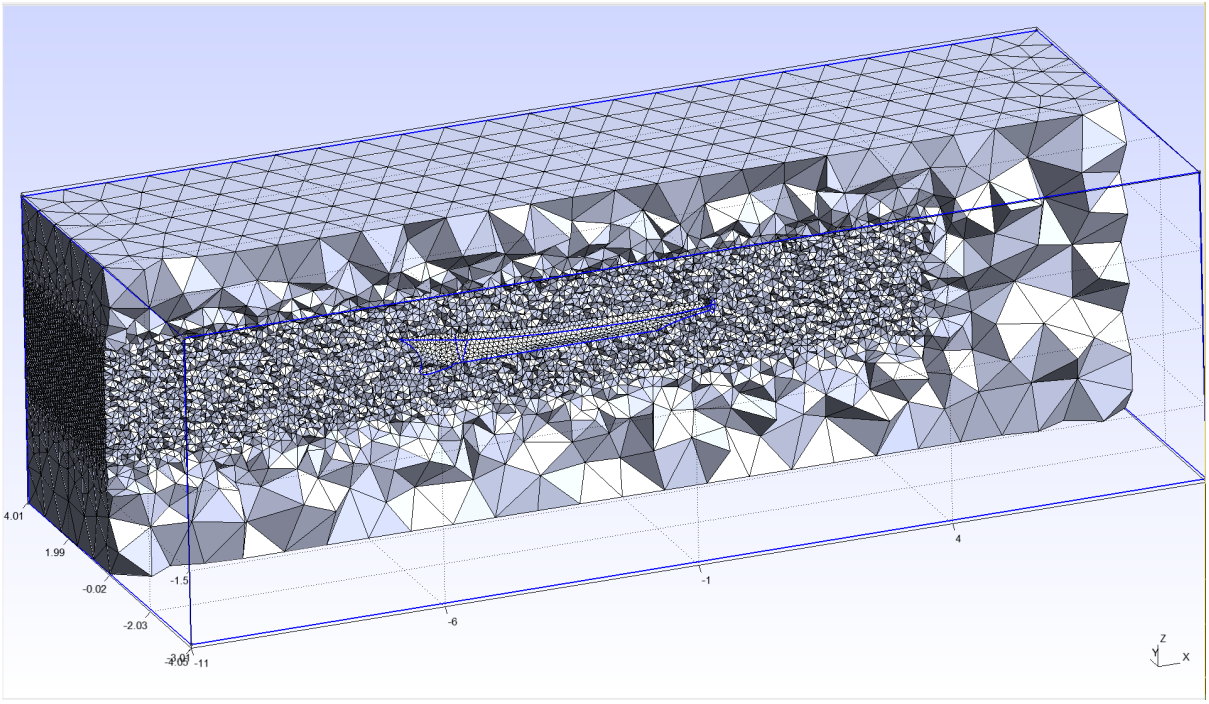

Figure 7: 3D Mesh