

**MEng Project Report**  
**Model Analysis of DTMB5415 and BURNSI Ship Model**

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# Contents

<b>1</b>	<b>Abstract</b>	<b>2</b>
<b>2</b>	<b>Introduction</b>	<b>2</b>
2.1	DTMB5415 . . . . .	2
2.2	BURNSI Ship Model . . . . .	2
<b>3</b>	<b>Methodology</b>	<b>2</b>
3.1	Mesh . . . . .	2
3.2	Wave Configuration . . . . .	5
<b>4</b>	<b>Result</b>	<b>5</b>
<b>5</b>	<b>Discussion</b>	<b>5</b>
<b>6</b>	<b>Conclusion</b>	<b>5</b>
<b>7</b>	<b>Reference</b>	<b>5</b>
<b>8</b>	<b>Appendix</b>	<b>5</b>
8.1	DTMB 5415 Specifications . . . . .	5

# **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**

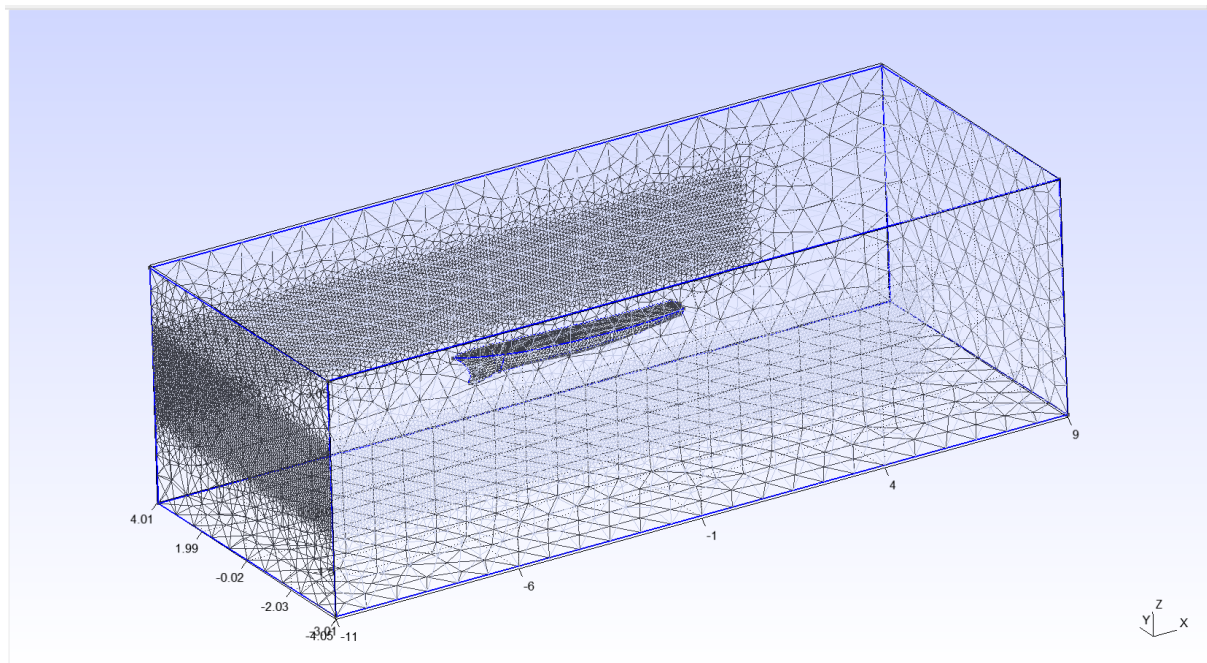


Figure 2: Mesh of the Domain

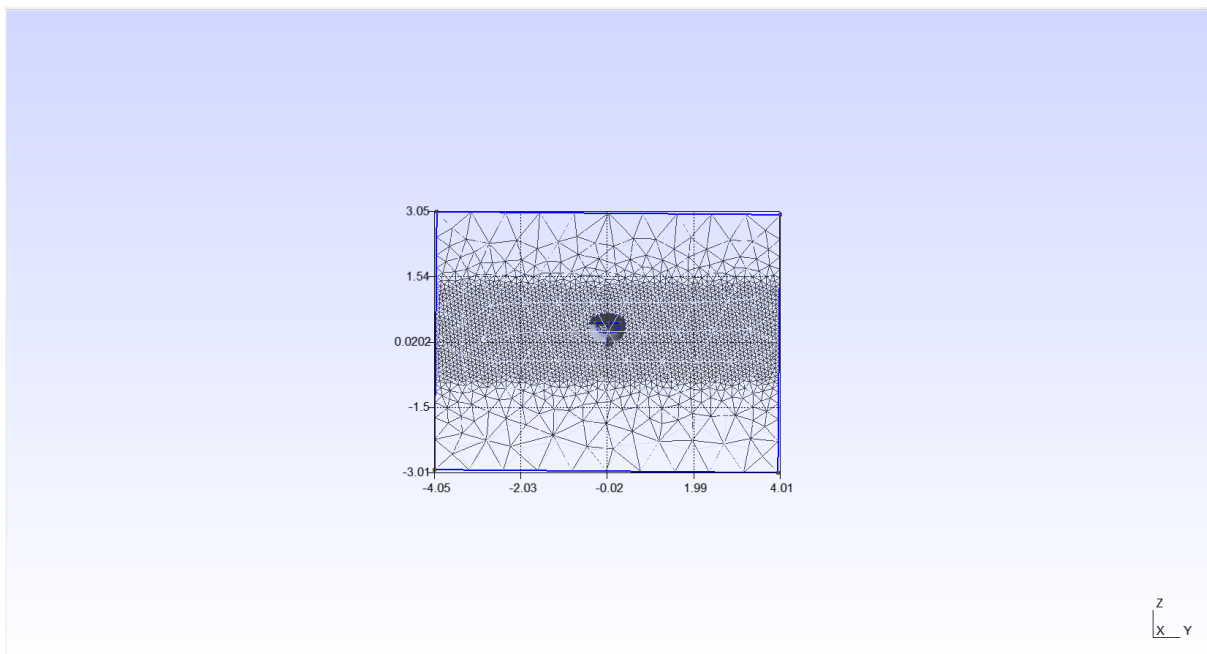


Figure 3: Front View of the Mesh

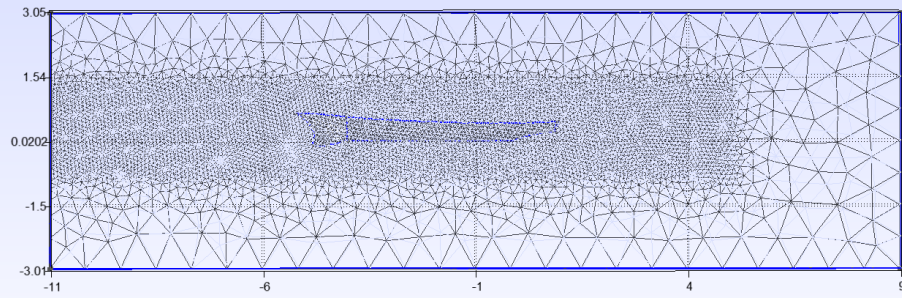


Figure 4: Side View of the Mesh

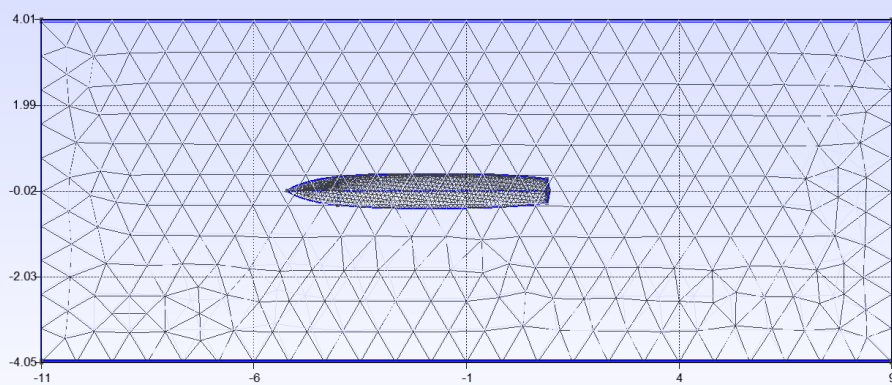


Figure 5: Top View of the Mesh

## 3.2 Wave Configuration

Table 1: Wave Conditions

Parameters	Value	Unit
$H_w$	0.32032	m
$k_w$	1.0845	m
$\lambda_w$	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

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

Table 2: Main particulars of the ship model