

**UNIVERSITI TEKNOLOGI MARA**

**TECHNICAL REPORT**

**EULER LAGRANGE EQUATION  
FOR THE UNMANNED HOVERCRAFT**

**NOR SYAHIRAH BINTI MAZELI  
2014824926 D1CS2496A  
NURFARAHIN BINTI SUZAIRY  
2014602198 D1CS2496A  
AMIRA AWATIF BINTI ISMAIL  
2014698064 D1CS2496A**

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Faculty of Computer and Mathematical Sciences**

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## ABSTRACT

There are many electrical and mechanical systems that are used in agriculture operations, oil rigs and border patrol in order to increase the quality of human life. Hovercraft is a vehicle that can help to overcome the worst condition such as floods, earthquakes, nuclear reactors and others which is normally faced by human nowadays. This vehicle can move on land and water surfaces and it also consist of air cushion which has air compressed inside. This research paper focuses on hovercraft model that based on Euler Lagrange Equation. We used Maple software to solve the model of the hovercraft. Then, we used MATLAB/Simulink environment to test the stability of the model with open loop and closed loop simulations. Lastly, we show our results using graphs.

## 1 INTRODUCTION

A hovercraft also known as an air cushion vehicle is able to travel on the land, mud and other surfaces. There are two types of hovercraft which are manned and an unmanned hovercraft. The unmanned hovercraft can perform in all types of climate such as in Arctic, in the Tropics, and Asian climates. There is air cushion in the vehicle to help it float and move easily in any surface because there is air pressure inside the cushion. Most of the time the pressure inside the cushion needs to be maintained. Due to the air pressure inside the hovercraft's cushion, the unmanned hovercraft has fewer traction compared to the other types of water or land transport. Furthermore, the cushion contains a flexible skirt that allows the hovercraft to travel over small resistances without being damage.



Figure 1.1: Hovercraft

Other than that, hovercraft also has lift fan which is able to perform for long period so that the hovercraft can move at certain speed. The fan in the hovercraft is used to produce a large volume of air below the hull that is slightly above the atmospheric pressure where the ambient air above it, will produces lift, which causes the hull to lift upward above the running surface. When stationary, the air under the vehicle will continuously forced by a fan and the cushion generated greatly reduces friction between the moving vehicle and surface. Besides, the hovercraft also has its own weaknesses such as it needs plenty of air and has loud sound