Mechanical Engineering Thesis Defense

Use of Potential Flow Solvers for Automobile Racing Applications

School for Engineering of Matter, Transport and Energy

Sajana Ratnayake
Advisor: Dr. Timothy Takahashi

Abstract

Formula 1 car front wings have evolved significantly over the last fifty years. Looking back at the past decade shows significant changes made due to rules and regulations by the Federation Internationale de l'Automobile and an increased understanding of aerodynamic concepts. There seems to be a trend where aerodynamic design concepts, previously seen in aviation, are being applied to Formula 1 front wings; this helps race teams increase downforce and reduce drag. This thesis analyzes these changes made over the past years and relates the material back to material that was learned by the aviation industry and attempts to synthesize conceptual Formula 1 Front Wing designs using VORLAX, a vortex lattice panel method, used in the aviation industry. This insight would be beneficial for Formula 1 teams as there are budget and time restrictions applied to Computational Fluid Dynamic and wind tunnel testing, but panel methods are run in a matter of seconds as opposed to hours or days. So, if verified, preliminary designs can be rapidly tested to optimize the workflow and reduce the time required for Computational Fluid Dynamic and wind tunnel testing.

November 3, 2023; 9:30 AM; DH L1-13;
Zoom Link: https://asu.zoom.us/j/86036571233