

Report on research projects under the IDEA League Student Grant

<i>Personal information</i>			
Full Name:		Sihyeong Lim	
Field of study:		Aerospace Engineering	
Degree pursued:		BSc.	Current year of studies: 4
Home University:		TU Delft	
Sponsoring professor at home university	Name:		
	Email address:		

<i>Information about the research stay</i>			
Host University:		RWTH Aachen	
Sponsoring professor at host university	Name:	Prof. Heinz Pitsch	
	Email address:	office@itv.rwth-aachen.de	
Dates of research stay		from: 25/07/2018	to: 19/10/2018

Summary of the research project (200 words max.)			
<p>The aim of this research project is to analyze numerical methods for boundary treatment in wall-bounded turbulent flow simulations with a focus on the direct forcing immersed boundary (IB) method.</p> <p>Although using IB method gives advantage of simpler grid generation compared to the body fitted grids, it is more difficult to satisfy conservation laws of fluid flow exactly. Hence, one of the most important parts of this project is to rigorously examine the IB methods with respect to the accuracy and conservation properties through simulations.</p> <p>From the literature, suitable simulation test cases are selected. Then, for both velocity and scalar boundary conditions, numerous interpolation/reconstruction schemes are tested. These include reconstruction schemes where the near-wall region is fully resolved, as well as normal probe based interpolation schemes which employ the law of the wall.</p> <p>Throughout the validation simulations, general IB schemes are improved and few of the issues with regard to the IB method are identified and treated, which leads to improved results in Large-Eddy Simulation of internal combustion engine flows. All simulations are carried out by using ITV's in-house software CIAO.</p>			

Experience report

Please tell us about your experience at the host university and give us an evaluation of the benefits of the research stay for the course of your studies

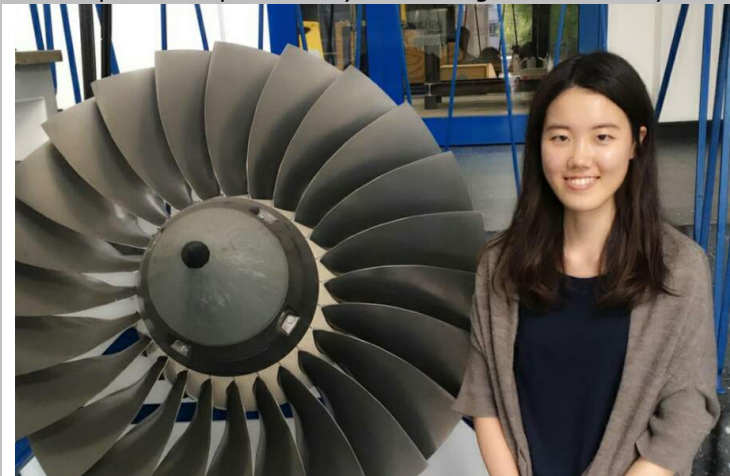
My overall experience of working at the Institute of Combustion Technology (ITV) in RWTH Aachen is very positive. From this research stay, I was able to broaden my knowledge and my perspective on the numerical analysis and its application. And, I am certain that what I have experienced and learned during this research stay will be a powerful source of motivation and inspiration for my future studies.

General working environment at the institute was excellent. Linux workstation was provided. And, the institute's HPC clusters enhanced the project by providing sufficient computing power. Also, my supervisor Tobias was very helpful.

The greatest benefit of this research stay is that I could learn aspects of numerical methods and CFD validation that can hardly be learned from textbooks. Particularly, I learned about various numerical techniques from the application and more practical point of view, for instance, how to deal with the unforeseen problems that occur for certain numerical methods. Moreover, it was very enriching to observe how the numerical methods should be controlled in a sophisticated manner for its effect on the application.

Picture

Please provide a picture of you at the guest university



The report should be signed by both professors involved. (The signatures will be deleted when the template is published on the IDEA League web page.)

Sihyeong Lim
Students Name

Sending Professor

Host Professor