IPID4all Doctorate Research Exchange with the University of Maryland
Feedback report

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Fluid-structure coupling for wind turbine
aerodynamics

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Introduction

The department of aerospace engineering at the University of Maryland has a strong focus on CFD in connection with rotorcraft like helicopters. This includes work on computational fluid dynamics for rotor aerodynamics and mufti-disciplinary coupling. These topics are also of high interest to the wind energy CFD group of ForWind at the University of Oldenburg. As the group of Professor Baeder is currently expanding their field of research into wind energy, one goal of the exchange was to find common research topics, which could be a base for future cooperation. Furthermore the knowledge in Maryland about multi-physics coupling, which is used there for high fidelity helicopter simulations, is crucial for my own PhD topic. Both reasons were the main motivation for the four weeks exchange.

Research Undertaken

The activities during the research can be divided into 2 parts. Within the first two weeks, the work of our CFD group here in Oldenburg was presented in detail and conversations with most group member took place in order to find common research activities. It turned out, that the research group in Maryland is currently investigating airfoils with different trailing edge shapes to improve the performance of the latter. Furthermore a lot of effort is being spend on developing a CFD code which works with GPUs instead of traditional CPUs. Using this code also rotors are planned to be simulated in Maryland.

In the second part of the stay, I used the new knowledge I gained from the conversations to the PhD student and post docs in the group to improve my own code. My main plan was to prepare the dynamic coupling of my implemented structural solver to the open source CFD code OpenFOAM. Concerning this, I could get several new ideas, which I used for the implementation of the dynamic coupling after I came back to Oldenburg. It can therefore be said, that the time in Maryland provided the base for my current work and future research for my PhD.

Personal Experience

Personally, I enjoyed the time in Maryland a lot. First of all, it was very interesting to see the way how research works at the Universities in the USA. Especially the close cooperation with the industry was very impressive. Furthermore, I met a lot of really nice and supportive people inside the University but also outside of it. During my stay I lived in a small house with other international students. Our rooms were hired out by the house owner, who showed us the 'American style' of living. We had a lot of interesting discussions about different topics and it was a pleasure to live there. Not to forgot are of course also the cities of Washington DC and New York, which are located close to Maryland!

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Conclusions

To summarize, the stay was a great success! I learned a lot in Maryland, which had a clear pushing effect on my PhD work. Furthermore, we found some common topics on which we want to cooperate. This is now intensified with an incoming PhD student from Maryland this winter. Last, but not least, I really enjoyed to live there for one month and I will never forget my time in Maryland.

Outlook

- o   We will host an incoming PhD student from Maryland this September.
- o   There is a clear possibility to cooperate with the University of Maryland on several topics in the field of wind energy CFD.

Acknowledgement