STEPS Students Report

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I study at Moscow State University, Faculty of Mechanics and Mathematics, now I'm on my 6th year. I work at the laboratory of navigation and control at the MSU's Institute of mechanics. My research mostly concerns aerodynamics, particularly, small scale wind turbines. Lately we've been working on a project that requires some specific knowledge in modelling offshore support structures.

Our Japanese colleagues from Bridge and Structure laboratory have extensive experience of modelling and analysing such structures, so the main goal of my stay was to acquire some of that knowledge and to develop a model of a floating wind turbine myself so i could apply this experience to my future research.

Over the course of 2 months I studied under the supervision of Takeshi Ishihara and Atsushi Yamaguchi.

My research was spit into following stages.

Getting to know the lab's methods of reseacrh.

During that time I studied FAST's manuals (the software that is used to model the behaviour of the wind turbine) and the works of it's developer J. Jonkman, caught up on some hydrodynamics theory (Sea Loads on Ships and Offshore Structures by O. Faltinsen), refreshed my MATLAB skills, participated at lab's seminars, discussed the themes of the research with my supervisor, completed several test tasks.

Modeling the submerged support structure using ANSYS's AQWA.

I studied several models done by other students, than used OC5's geometry and mass specifications to create my own model in AQWA. Verified this model, comparing the obtained data with the results real OC5 experiments.
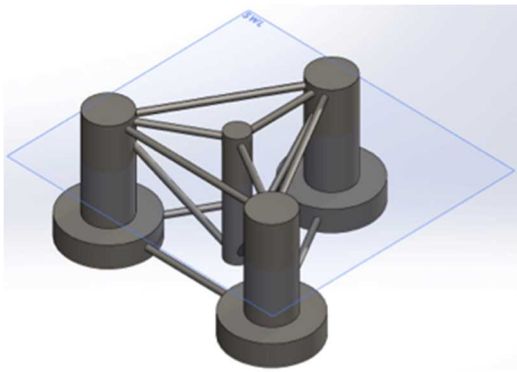
<u>Creating a BModes model.</u>

I used the geometrical and mass distribution properties of an OC5 wind turbine to do a modal analysis of the tower. The results were also verified by the real OC5 results.

<u>Finishing the FAST model</u>

That stage tied together all the data that i gathered earlier. FAST's HydroDyn module utilizes the data obtained from AQWA, ElastoDyn — data from the BModes analysis. MoorDyn uses the data from OC5 specs. On that stage my results slightly diverged from the real ones. Right now I keep in touch with my supervisor to improve the model and achieve a better matching results.

Overall, the experience was very exiting and enjoyable. The professors were extremely helpful and friendly, as well as my fellow students in the lab. I learned a lot about aero/hydrodynamics, got to know a brand new method of research and the tools to perform it.

I've also learnt a lot of new things about the culture. I went to a couple of meet-ups for foreigners and spoke with Japanese friends both in English and my beginner-level Japanese. It was an amazing experience! Japan is truly a wonderful country with wonderful people.

I'd like to thank STEPS program and the University of Tokyo for such an incredible opportunity. I am also very grateful to prof. Takeshi Ishihara and prof. Atsushi Yamaguchi for their hospitality and help.