KITE//KRAFT

Vacancy: Master Thesis on Computational Fluid Dynamics (CFD) in 2D and 3D Using OpenFOAM (m/f/d)

Full-Time, remotely or on-site in Munich (Rudolf-Diesel-Straße 26, 85521 Hohenbrunn), Starting from immediately.
Kitekraft GmbH, Germany

What We Do

Kitekraft is developing advanced wind power systems: power-generating kites, a.k.a. flying wind turbines, that require 10x less construction material than a conventional wind turbine. A Kitekraft unit will generate electricity cleaner, almost invisible, and at least 50% cheaper than conventional wind turbine of the same power rating, and eventually cheaper than any other alternative. Kitekraft develops and will build, sell, and operate flying wind turbines in the 100kW to 5MW+ range, for both grid-scale energy production and off-grid applications. Further information and videos: https://www.kitekraft.de/

Why We Do What We Do – Our Mission

Our mission is to help solving the climate and energy crisis. Today still 84% of primary energy comes from fossil fuels. All that has to be replaced with renewables. Electrification of most sectors is in full swing, additional capacities are required for production of e-fuels and hydrogen for transportation, especially shipping and flying, but also for CO2-neutral steel production and more. We have to at least 10x the current renewable energy capacities. Wind energy will be a backbone of this because of its scalability and availability over the globe. Our flying wind turbines will accelerate adoption and provide a major portion of this since it is cheaper, feasible at more locations, simpler to deploy & maintain, and less visible.

Why write your Master Thesis with us?

- Work on real hardware and really build something that has an impact.
- Work on exciting topics and challenges relevant to solving the energy and climate crises.
- Tackle unknown challenges and deliver something that has never been done before.
- Be at the center of an agile and dynamic team of highly motivated aerospace/wind energy/climate-tech enthusiasts.
- Huge learning potential and the opportunity to build things from the ground up.
- You'll enjoy a high level of freedom and autonomy.
- Flat hierarchy and open communication.

Your Master Thesis Topic in Detail

The currently available 2D and 3D CFD simulations and studies done in OpenFOAM and accessed over GNU Octave scripts shall be extended (see image below). Specifically, a previous master thesis study optimized the airfoil in 2D with and without taking into account the interactions of the adjacent airfoil of the boxplane/biplane. Further studies and constraints have to be added to obtain a resulting optimal airfoil for the next kite generation. Another previous master thesis study built the Octave-OpenFOAM toolchain and added 3D simulation possibilities with rotor-wing-interactions. Further parts of the kite must be added to the simulation (e.g. fuselage and tailplane) and characterizations of the effect of rotor placements and flap deflections for efficiency, stability, and controllability in the different flight phases (hovering and figure-8 flight) must be conducted.

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In a final step, computationally runnable optimizations of the entire kite aerodynamics in 2D and/or 3D shall be conducted to arrive at a proposal of an optimal kite design, taking into account constraints from other disciplines (e.g. mechanics, control). Cloud computing on university clusters, or AWS/Google Cloud or similar provided by Kitekraft, shall be used. If the work processes quick enough, there is also the possibility of wind tunnel and flight test validations conducted with the help of the Kitekraft team. Besides the documented scripts and codes, the master thesis as theory documentation and test reports are important outcomes. Guidelines and templates can be downloaded from https://github.com/floba/StudentGuidelines. This multidisciplinary task is supported by the members of the Kitekraft team and scientifically by your university (in case of TUM, see below). Upon start of your thesis, you will be supplied with further information, literature, and other material.

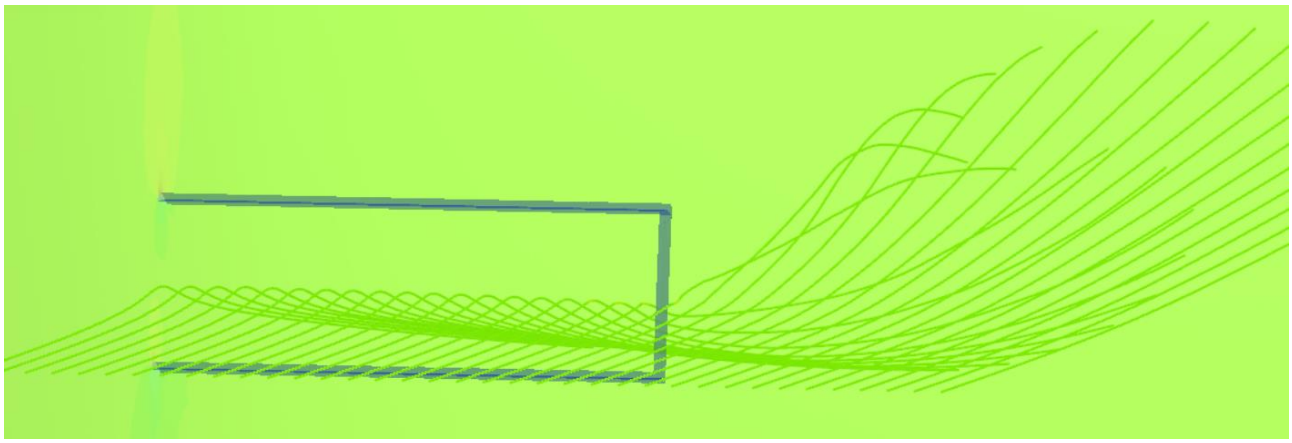

Image: CFD result visualization of velocity and streamlines around boxplane wing.

Who You Are and What You Bring – Requirements

This student work is jointly supervised by the Technical University of Munich (TUM) Chair of Wind Energy of the Technical University of Munich (https://www.epe.ed.tum.de/en/wind/home/) and the TUM spin-off Kitekraft. The ideal candidate

- is a student in mechanical engineering, aeronautics, mechatronics, or related fields,
- has experience/knowledge in CFD simulations, ideally OpenFOAM,
- has good skills/background knowledge in CAD, ideally SolidWorks,
- has good skills/background knowledge in MATLAB, GNU Octave, or related,
- is motivated in the respective field of science and engineering,
- has good English or German language skills.

Equal Opportunity

We are open to all groups of people without regard to age, color, national origin, race, religion, gender, sex, sexual orientation, gender identity and/or expression, marital status, or any other legally protected characteristics. Further details: https://www.kitekraft.de/about#code-of-conduct

Interested? Please apply!

Send your CV, transcript of records, and letter of motivation to work@kitekraft.de and filippo.campagnolo@tum.de. Keep your letter of motivation short (max. 1 DIN A4 page with normal borders and font size), tell us concisely and with past examples why you can be successful in this master thesis challenge and fulfill the requirements. Ideally, you tell us about your hardest ever encountered challenge and how you solved it. We will then conduct a video call, ask you questions, give further details, and give you the chance to ask us anything. After that, we make a decision.