The Laboratory for Aero & Hydrodynamics of the Delft University of Technology has a vacancy for a

Ph.D. Student in Experimental Fluid Mechanics

for the project “Development and application of volumetric velocity measurement techniques”.

The project

The Laboratory for Aero & Hydrodynamics runs a research project that aims to develop new technology for the recording of instantaneous, time-resolved, fully three-dimensional (‘volumetric’) fluid velocity fields. This technology will enable an experimental study of the complex physics of turbulence, a flow condition that is inherently three-dimensional. Additionally, these measurements will be very useful in e.g. biological systems, which often have complex geometries with moving walls.

The principle of the method consists of a holographic recording of the images of small ‘tracer’ particles that are suspended in the flow. Subsequently, a second recording is made a short time later. The fluid velocity is estimated from the displacement of the tracer particles. In recent years, significant progress has been made in finding new ways of recording holograms of tracer particles in flows. Examples include the use of a biological material (bacteriorhodopsin) as a high-resolution, reusable medium for the recording of the holograms. An advantage of this technique is the fact that it does not need (time-consuming) processing and the hologram can be read directly after recording. An alternative technique that receives attention is **Digital Holographic Particle Image Velocimetry**. While this technique does currently not have the same spatial resolution as conventional recording media, the optical set-up and processing is significantly easier. This will make fluid mechanics research applications in the laboratory more within reach.

Recently, another volumetric technique has emerged: **Tomographic Particle Image Velocimetry**. In this technique, the particle field is reconstructed from multiple camera views. It combines a relatively straightforward experimental set-up with the robustness of conventional Particle Image Velocimetry algorithms. This technique is related to the holographic technique in some aspects and an exchange of ideas and methods between the two will be beneficial for both.

In this project, you will work on the further development and refinement of these techniques. You will collaborate with the Optics group of the Applied Physics Department (prof. J. Braat) for the Holographic techniques, and with the Aerospace Engineering Department (prof. F. Scarano) for the Tomographic techniques.

Some recent publications from our group related to this project:

Job requirements

We are looking for a candidate holding a M.Sc. degree in (Applied) Physics, Mechanical Engineering, Aerospace Engineering or an equivalent field of study. A background in optics, flow measurement techniques or fluid dynamics is advantageous but not a strict requirement. The applicant should have some experience in programming (Matlab, C++) and have a good command of the English language (both written and spoken).

Conditions of employment

The position is based on an employment contract of 4 years (48 months) and is for a maximum of 38 hours per week (1 FTE). After the first year an evaluation will take place. The estimated monthly PhD starting salary is based on scale P, building up from €1956 to €2502 gross per month based on a full-time appointment. Secondary benefits and other employment conditions are in accordance with the Collective Labour Agreement for Dutch Universities. Assistance with accommodation can be arranged.

About the Laboratory for Aero & Hydrodynamics

The Laboratory for Aero & Hydrodynamics, founded in 1918 by J.M. Burgers, performs experimental and numerical research in a wide range of topics, with emphasis on turbulence, multiphase flows, microfluidics and biological fluid mechanics. The group is directed by prof. J. Westerweel and employs 6 staff members and, on average, two post-docs and 18 Ph.D. Students. The Laboratory for Aero & Hydrodynamics houses the Fluid Mechanics section of the Process & Energy department, Faculty of Mechanical, Maritime and Materials Engineering (3ME). The Delft University of Technology is the largest technical university in The Netherlands, with over 13,000 students and 2,100 scientists (including 200 professors). More information about the lab and the university can be found on www.ahd.tudelft.nl and www.tudelft.nl, respectively.

Application details

For information regarding this position, you can contact prof. J. Westerweel (J.Westerweel@tudelft.nl, +31 15 2786887) or dr. C. Poelma (C.Poelma@tudelft.nl, +31 15 2782620). To apply for this position, please send a resume, including the names of at least two references, to:

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The Netherlands

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