UNIVERSITY OF TWENTE.

MSc. Thesis Assignment

Title: Acoustic Lucky Imaging

What

Acoustic Lucky Imaging (ALI) is a technique that can be used to improve acoustic images obtained using the acoustic beamforming technique in wind tunnel testing. The technique originates from the field of astronomy in which it is used to enhance images taken with ground-based telescopes (see Fig. 1).

Images taken from ground-based telescopes are affected by the **turbulence** in earth's atmosphere. You can readily witness this phenomenon yourself by observing the **twinkling of stars** in the night sky. In the **Lucky Imaging technique**, images with a short exposure time are captured so that the influence of earth's atmosphere is minimal. Subsequently, **images** which are **least affected by the turbulence** in earth's atmosphere are selected. Only these images are post-processed to create a final image.

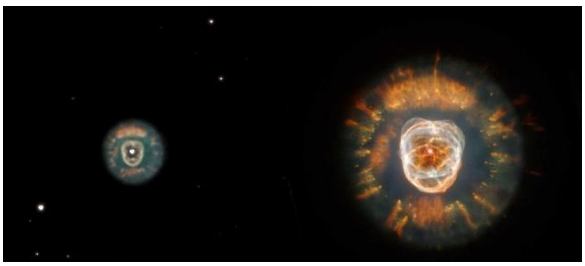
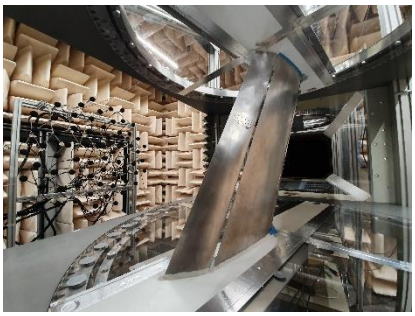


Figure 1 – Image captured by a telescope before (left) and after (right) the application of the Lucky Imaging technique

The Lucky Imaging technique can also be applied to **acoustic beamforming** used - in combination with a microphone phased array – to **improve acoustic images** of, e.g., scaled aircrafts and wind turbines models in **wind tunnel testing** (see Fig. 2). This method is called Acoustic Lucky Imaging.



Why

The University of Twente operates a unique aeroacoustic wind tunnel facility, a type of wind tunnel of which there are only a handful worldwide. **Aeroacoustic wind tunnel testing** is an **essential tool** for, e.g., validating numerical simulations and theoretical models that can predict the noise emission or noise reduction of various applications. **High-accuracy measurements** in the wind tunnel are therefore imperative. Understanding and optimizing the Acoustic Lucky Imaging technique therefore serves the purpose of improving the accuracy and reliability of sound measurements in aeroacoustic wind tunnel facilities.

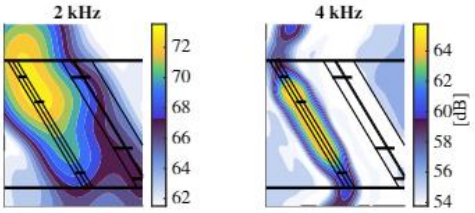


Figure 2 - Acoustic images (right) obtained using a microphone phased array (left) with acoustic beamforming.

Your qualifications

We are looking for a candidate who has:

- Strong mathematical skills
- Programming experience (e.g., MATLAB, Python)
- Basic knowledge of fluid dynamics
- Basic knowledge in turbulence and aeroacoustics (advantageous but not necessary)
- Strong communication skills
- Affiliation with fluid dynamics and wind tunnel testing
- The ability to design an experiment to validate the developed algorithm
- The ambition to publish in a scientific journal

Interested? Contact dr. ir. M.P.J. (Marijn) Sanders: m.p.j.sanders@utwente.nl

Interested? Contact dr. ir. M.P.J. (Marijn) Sanders: m.p.j.sanders@utwente.nl