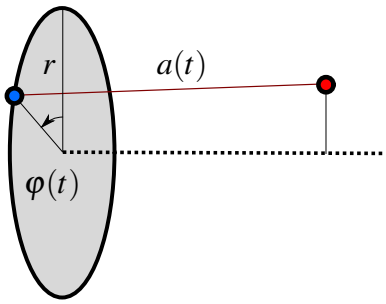
Chair of Vibroacoustics of Vehicles and Machines
TUM School of Engineering and Design
Technical University of Munich

Semester project, Bachelor Thesis, Master Thesis

Rotating Sound Sources - Inbetween Doppler Effect and Beating

Topic

One of the most commonly known effect in acoustics is the so-called Doppler effect which is best experienced when an emergency vehicle is passing by while its sirens are active. Here, the sound waves are compressed when the vehicles is coming closer and stretched when the vehicles moves away. This results in time varying shift in frequency of the sound source. Now lets imagine the vehicle moves along a circle, while we position ourselves away from the axis of rotation at a certain distance, see the Figure to the right. In this case, we would experience the same Doppler effect as long as the source (blue dot) keeps revolving.



However, if we add a number of similar sources equally spaced around this circle, it is not fully clear how the single sound waves of each source superimpose and whether this interaction leads to a beating sound experience at the receiver position (red dot). Therefore, this circumstance must be analyzed and understood in more detail. The results would close a gap between the Doppler effect and the beating effect.
In this work, the student will improve her/his basic skills in literature research, programming (Matlab and/or Python), physical understanding of wave propagation, and wave interaction as well as scientific writing. If outstanding results can be achieved, it is intended to publish the work in an international journal.

Tasks

- Literature research
- Understanding single rotating sources
- Developing Solutions for distributed rotating sound sources
- Writing Report or Thesis

Requirements

- High interest in cutting edge research
- High interest in theory, sound, vibration, wave propagation
- Solid knowledge of math and engineering mechanics

Additional Information

- Basic literature available at the chair
- Courses in dynamics, vibro-acoustics, computational acoustics, system dynamics and other related courses beneficial

English or German language is possible for this work.

TUM Contact Person

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