PhD within the framework of the European project (ETN) "ECO DRIVE":

Join 3D and quantitative microphone array technique and sound source separation techniques for sound source contribution assessment of powertrain components

Context

This PhD position is part of the "ECO DRIVE" project, funded by the European Commission through the H2020 "Marie Skłodowska-Curie Innovative Training Networks" program (grant number 858018) and focusing on noise and vibration in eco-efficient powertrains of future vehicles. Different universities and companies in Europe are part of the project, which includes various training and exchange periods for all the PhD candidates involved.

The application context is the global design process for the next generation of electrified powertrains (including hybridized engines, electric motors, gearboxes, drivelines, etc.). The ongoing massive electrification of powertrains brings quite a large number of challenges in the car industry, particularly in engineering and design concerning acoustic issues.

Scientific framework and global objectives

We propose a research work with a strong industrial end-use in a rich collaborative context. Indeed, MicrodB has knowledge and technologies in terms of acoustic imaging which will have to be adapted technically and scientifically (INSA-LVA, Lyon) to the next generation of electrified powertrains in order to design an industrial software (Siemens PLM Software).

The ESR will apply signal processing, microphone-array techniques, in-house expertise and good practices for the vibro-acoustic troubleshooting and analysis of IC powertrains. ESR9 will focus on 3D and quantitative microphone-array techniques and sound-source-separation techniques for a sound-source-contribution assessment of the powertrain components.

The approach proposed is to:
- firstly to build a sequential response by associating sequentially blind or quasi-blind signal separation
- and then localize and quantify the sources on a 3D powertrain mesh for each separated signal component.
- Secondly, the scientific objective will consist of integrating the signal-processing step into the microphone-array step by taking into account the signal/source properties in the Bayesian technique.

This will lead in to a multidimensional Bayesian technique, taking advantage of the spatial, temporal, frequency, and statistical properties at the same time, for an efficient sound separation of the powertrain components. The ESR will conclude by validating the technique on a vehicle-powertrain test bench under a range of operating conditions.

Tasks

You perform research on signal separation and acoustic imaging.
You attend the training courses planned as part of the project.
You deliver prototype code (Python), validation data obtained on vehicle-powertrain test bench, and deliverables internally of the project.

You prepare a doctoral thesis at the graduate school MEGA.
You actively participate in the project by coordinating the partner network on your theme.

Profile
Eligibility criteria
You must meet the eligibility conditions of ETN projects:
- no residence in France longer than 12 months in the past 3 years immediately before the date of recruitment
- not been involved in research for more than 4 years (full time equivalent) starting to count the date this person graduates his/her first MSc degree.

You must have completed an M2 level in mechanical engineering with excellent academic results with solid skills in:
- vibrations and acoustics
- mathematics applied to signal processing,
- ideally developped during internships or significant projects.

Results-oriented, with solid understanding of both scientific and industrial issues at stake, your can use you versatility to listen and convince your partners in this project.

You speak and write fluent English. You master basic conversation in French, or are strongly willing to learn in order to facilitate your daily life in Lyon. A third European language is a must.

Benefits

Recruitment on the project is 36 months.

Gross Annual Salary:
- Living allowance: 31.3 k€
- Mobility allowance: 5 k€
- family allowance: 2 k€ if applicable

You will benefit from a designed training programme offered by MicrodB and the ECO DRIVE consortium. An international secondment is planned to other organization within the project network.

Supervision
Professor Jérôme Antoni (INSA-LVA) and Michael Thivant (MicrodB) will supervise the PhD.
The PhD will take place in France (Lyon), with 3 months with Siemens (Belgium).

Application is open from March to December, 2020; send your resume (1 page) and cover letter to demonstrate the consistency of your profile and professional goal with the vacancy:
jerome.antoni@insa-lyon.fr
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Selection process
A first preselection consists of a series of teleconference interviews performed according to the defined selection criteria.
Then, the preselected applicants will be invited to face-to-face interviews in Lyon [date to be defined] with the selection committee (supervisors and HR members).

Additionnal information
https://www.microdb.vibratecgroup.com/en/
http://lva.insa-lyon.fr/
https://ec.europa.eu/research/mariecurieactions/sites/mariecurie2/files/msca-itn-fellows-note_en_v2.pdf