PROJECTE DE DOCTORAT INDUSTRIAL EXPEDIENT 2016 DI 075

DADES DE L'EMPRESA I DE L'ENTORN ACADÈMIC

Títol del projecte
Immersive Audiovisual Production Enhancement based on 3D Audio

Empresa
Fundació Eurecat

Responsable de l'empresa
Adán Garriga Torres

Universitat
Universitat Pompeu Fabra

Director/a de tesi
Emilia Gómez Gutierrez

Treballador/a de l'empresa i doctorand/a
Andrés Pérez López

BREU DESCRIPCIÓ DEL PROJECTE DE RECERCA

The present project is an Industrial PhD co-supervised between the Music Technology Group (Universitat Pompeu Fabra) and the Multimedia Research Department of Eurecat Technological Center.

One of the research topics from the Multimedia Research Department is the 3D audio technology for creative applications, such as music, videogames or virtual reality. As an upcoming new technology, immersive sound still presents many theoretical and practical challenges. Some of them are based on ambisonics recording techniques: source identification/separation based on spatial cues, sound image spatial transformations, reverb/room acoustics reconstruction, ambisonics microphone design, etc. From a more applied perspective, the integration of these improvements on the creative industries' workflow also presents specific challenges related to human-computer interaction and user experience. Furthermore, in the case of audiovisual experiences (virtual and augmented reality), multi-modal processing including image information might significantly enhance the immersive possibilities based on the development of innovative production tools.

The Music Technology Group is a reference institution on the field. Among other topics, there is a remarkable experience on sound and music processing, including research on source separation, multi-modal information retrieval and machine learning applied to sound.
As academic supervisor of the Industrial PhD, the Music Technology Group will provide the required expertise on applied research required for the project.

For the present project, we propose the following tasks to be conducted by the candidate:

- Identification and state-of-the-art review of current technologies and workflow for audiovisual immersive productions, focusing on spatial audio for Virtual/Augmented Reality and Videogames. Identification of potential improvements that recorded and synthetic spatial audio, specially Higher Order Ambisonics (HOA) based techniques.

- Theoretical design and prototype implementation of a system for source separation based on HOA recordings. Evaluation and comparison with existing multichannel source separation techniques, such as stereo or microphone array.

- Extension of the proposed system with multi-modal information provided by state-of-the-art image recognition systems, if appropriate.

- Implementation of the results in a standardized format for multimedia immersive production. Evaluation of the usefulness and potential for the tools.

Apart from the aforementioned tasks, the candidate might consider as well to complement the project with related research and development, as for example:

- Research on HOA microphony construction and fundamentals.

- Research on user interaction patterns for audiovisual immersive productions.

- Research on the spatial transformations of HOA recordings, and their application for immersive environments.

- Development of an applied use-case scenario for the resulting tools, in the form of an immersive experience with potential collaboration of professionals and artists on the field.