Fraunhofer IDMT

FRAUNHOFER INSTITUTE FOR DIGITAL MEDIA TECHNOLOGY IDMT

ACOUSTIC QUALITY ASSURANCE FOR INDUSTRY MEETS AI

Who we are

Fraunhofer IDMT is doing applied research in the field of audiovisual media. As a competent partner of economy, we are developing groundbreaking technologies for the digital media domain and most recently for industrial processes and products. Together with our contracting partners, we develop cutting-edge solutions consistently designed to meet user requirements and expectations. The business unit Industrial Media Applications IMA combines the institute's long-standing expertise in the fields of intelligent acoustic measurement technology, audio-visual signal analysis, machine learning and security-related technologies in order to generate new solutions for industrial applications.

What we are looking for

We, as part of the business unit Industrial Media Applications IMA, are looking for an existing project consortium that needs a project partner like us and wants to address one of the following EU Horizon 2020calls:

- ICT-38-2020: Innovative AI in manufacturing (deadline January 16th, 2020)
- ICT-48-2020:European Network of Artificial Intelligence Excellence Centres (deadline November 13th 2019)
- CORNET (Partner can be from Brazil, Turkey, Austria, Japan and Czech Republic) (deadline March 25th 2020
- COSME Clusters Go International: develop and implement a joint internationalisation strategy (October 31st 2019
- Eurostars: supporting SME's innovative product development by international cooperation (deadlines in 2020, February13th or September 3rd)

What we contribute

We are able to show how we can recognize different material properties or machine conditions by their acoustic fingerprints. With the help of properly annotated data, we constantly adjust and develop our analysis methods for industrial audio recordings using ML.

What we aim for

- Becoming more flexible to the usage context and using existing solutions once the usage context is changing (i.e. airborne sound analysis into structure-borne sound) by addressing transfer learning strategies.
- Addressing small data solutions.
- Minimizing supervised or semi-supervised learning solutions and addressing non-supervised approaches.
- Parameterizing the ability of humans (experienced machine operators) to hear, detect and define the kind of problems or errors of a product or production process and make this knowledge usable for machine learning processes.

What we do

We are supporting acoustic quality monitoring for smart manufacturing. Therefore, we work with machine learning (ML), sensor combinations, and data from all levels to improve production processes that are constantly evolving. One advantage of our approach is the non-destructive quality control that does not interfere with the (production) process or demolish the inspected object.

How we do it

This combines various measurement and analysis steps: precise sound recording, pre-filtering of noise and useful sound, as well as intelligent signal analysis and evaluation using ML. Therefore, several preparations are necessary. For example the definition concerning data acquisition (i.e., type of microphone, position of sensors, description of the context, definition of recording length, etc.), context specific synchronization with additional and other (sensor) data, and the definition of an annotation policy. Once we defined these requirements, the actual recording of data considering different conditions for the later classification training takes place.

Where we apply it

We use this approach, for example, in in-line quality assurance and predictive maintenance scenarios for industrial use cases. Here, the acoustic monitoring system can provide additional and at that even more precise information about the quality and condition of products or processes. Both, either integrated in existing measurement systems or used as a completely independent monitoring system will generate more benefit for producing plants.

Where it derived from

The human auditory system is able to detect and distinguish individual sounds, even in noisy environments, and place them in specific contexts. In industrial manufacturing processes, it is often possible to make statements about the operating status of a component, engine or even an entire machine by attentively listening. In the industrial context, the experienced machine operators can hear problems or errors. However, so far it is quite difficult to detect these indications of faulty processes or products in any other way. Our basic premise is that everything that is audible (and interpretable, e.g. recognizable as a difference) is also measurable as an indicator for quality.

»We are listening!« Please contact us for more information.

Fraunhofer Institute for Digital Media Technology IDMT

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1 In-line acoustic condition monitoring