Under pressure…

Hannover Messe 2022: Detecting pneumatic actuator leakage by means of intelligent audio technology and innovative AI methods

The acoustic sensor systems of the Fraunhofer Institute for Digital Media Technology IDMT are used in industrial error and condition monitoring as well as automated quality control. In the »KI-MUSIK4.0« project, experts are further developing their technologies for use in highly integrated multi-sensor systems. One such application is the detection of pneumatic actuator leakage. At Hannover Messe 2022, the institute's Oldenburg branch will provide practical insights into the results so far as well as its portfolio of products and services for industry.

Oldenburg, 2 May 2022. Already today, production processes are extensively digitalised. Smart sensors, high-performance microelectronics and embedded software gather and process huge amounts of data, which are then used to optimise industrial processes. Fraunhofer IDMT's Oldenburg Branch for Hearing, Speech and Audio Technology HSA is also exploring and developing application-specific sensor systems of this kind – for example for monitoring machines. The »KI-MUSIK4.0« project (»Microelectronics-based Universal Sensor Interface with Artificial Intelligence for Industry 4.0«) is dedicated to the next generation of intelligent, increasingly autonomous manufacturing systems. Coordinator of the

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project, which is funded by Germany's Federal Ministry of Education and Research, is Schaeffler Technologies AG & Co. KG. »The objective of the project is to improve the collection and processing of data on the spot in order to ensure secure, decentralised analysis and forecasting. Apart from the development of innovative, energy-efficient sensor concepts, we're looking at aspects of machine learning. For use 'in real time', the technology must be robust, energy-efficient and integrable in production environments«, explains project manager René Grünke, senior expert for sensor technology at Schaeffler.

Showcase: Detection of pneumatic actuator leakage

To generate particularly application-oriented results, the »KI-MUSIK4.0« consortium is developing and testing new IIoT technologies (Industrial Internet of Things) on the basis of real use cases. For example, Fraunhofer IDMT, together with Festo SE & Co. KG, is looking at the condition monitoring of pneumatic actuators and especially the early and automated detection of compressed air leaks, which mostly develop gradually. Rising operating costs, diminished machine efficiency or isolated machine failure can only be brought into connection with compressed air loss at a late stage. »Reducing compressed air losses offers potential savings for customers and raises the energy efficiency of components and production plants«, says Stefan Saller, project manager in the Advanced Development Mechatronic Systems Division at Festo SE & Co. KG. The company and the developers from Oldenburg see extensive added value especially in the intelligent processing and provision of data for predictive maintenance applications. By mean of a technology demonstrator, Fraunhofer IDMT will present such an application on its stand at Hannover Messe 2022.

Intelligent acoustic sensors and AI methods »made in Oldenburg«

In the framework of the project, Fraunhofer IDMT is further developing its intelligent acoustic sensor systems for use in large sensor networks. Signal pre-processing techniques reduce application-specific disturbance variables, render innovative AI methods more robust and considerably reduce the quantities of data to be transmitted.

In addition, the new sensor solutions use on-premises software to process large volumes of data before transmitting the relevant information to the network. »All this greatly accelerates communication between components, improves the acoustic error and condition monitoring of machines and production plants even further, prevents the transmission of potentially sensitive audio data – and contributes to achieving our set goal of reliable real-time monitoring at all levels of modern system architectures,« explains Danilo Hollosi, Head of Acoustic Event Detection at Fraunhofer IDMT.

Other solutions from Fraunhofer IDMT in Oldenburg

»Our solutions for the status monitoring of machines and production plants are part of an overall concept for the use of audio technology in the production world of tomorrow. We're looking here to tap the potential of audio technology at all levels of interaction between machine and human, human and human as well as human and machine, for example through error detection by the machine itself and acoustic signalling to the human, good speech intelligibility in noisy environments and over a distance in communication between humans as well as robust and targeted voice control of machines by humans,« explains Dr Jens Appell, Head of Department, Oldenburg Branch for Hearing, Speech and Audio Technology HSA. In addition to the detection of pneumatic actuator leakage, Fraunhofer IDMT is therefore also showing other solutions, for example for

quality assurance for the clicking into place of plug connectors in automotive production.

You can find more information on solutions for industry and production by Fraunhofer IDMT in Oldenburg on our website or visit us on our stand at Hannover Messe from 30 May to 2 June 2022. We look forward to welcoming you to ***Stand A06 in Hall 5****!*

Exchange ideas with Fraunhofer IDMT and other companies on the use of audio technology in industry and production. You can find further information (in German) about our ***Industrial Working Group »Audio Technology for Intelligent Production«*** *at:*
https://www.idmt.fraunhofer.de/aip

Hearing, Speech and Audio Technology HSA at Fraunhofer IDMT in Oldenburg

Founded in 2008 by Prof. Dr. Dr. Birger Kollmeier and Dr. Jens-E. Appell, the Fraunhofer Institute for Digital Media Technology IDMT's Branch for Hearing, Speech and Audio Technology HSA stands for market-oriented research and development with a focus on the following areas:

- Speech and event recognition
- Sound quality and speech intelligibility
- Mobile neurotechnology and systems for networked healthcare

With in-house expertise in the development of hardware and software systems for audio system technology and signal enhancement, over 100 employees at the Oldenburg site are responsible for transferring scientific findings into practical, customer-oriented solutions.

Through scientific cooperation, the institute is closely linked to the Carl von Ossietzky University, Jade University of Applied Sciences, and the University of Applied Sciences Emden/Leer. Fraunhofer IDMT is a partner in the »Hearing4all« cluster of excellence.

Further information on www.idmt.fraunhofer.de/hsa

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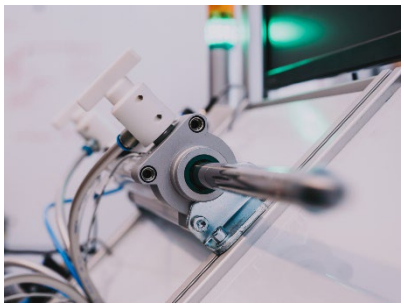
Captions:



Picture 1: © Fraunhofer IDMT/Anika Bödecker
In the project »KI-MUSIK4.0«, Fraunhofer IDMT and Festo SE & Co. KG are working on the condition monitoring of pneumatic actuators - in particular for the early and automated detection of compressed air leaks.

The Fraunhofer-Gesellschaft based in Germany is the world's leading applied research organization. Prioritizing key future-relevant technologies and commercializing its findings in business and industry, it plays a major role in the innovation process. A trailblazer and trendsetter in innovative developments and research excellence, it is helping shape our society and our future. Founded in 1949, the Fraunhofer-Gesellschaft currently operates 76 institutes and research units throughout Germany. Over 30,000 employees, predominantly scientists and engineers, work with an annual research budget of €2.9 billion. Fraunhofer generates €2.5 billion of this from contract research.