PRESS RELEASE

Exploiting Minerals in Mining more Efficiently with Artificial Intelligence

Fürth, Luleå, Berlin, Santiago de Chile: Numerous ore deposits have diminishing concentrations of mineable ore. In order to access the remaining ore, the mining industry uses elaborate procedures that consume large amounts of energy and water. The Fraunhofer Institute for Integrated Circuits IIS, together with three other partners, intends to use artificial intelligence and sensor fusion in order to analyze the concentration of valuable minerals as early as possible in the process and thereby conserve resources.

Multimodal Sensors Meet Artificial Intelligence

The overall objective of the research project "REWO-SORT" is the evaluation of the technical feasibility and development of an improved sorting technology for raw materials by means of a multimodal sensor data fusion of optical and X-ray technologies.

The early separation of low-value material in the process chain should not only increase the treatment efficiency, but also reduce the water and energy consumption in the following process steps. The sensor data fusion method is based on deep neural networks (DNNs). The project will examine the robustness of the methodology under variable geological conditions, for example different rock compositions.

Complementing Technologies

The combination of laser induced plasma spectroscopy (LIBS) and multi energy X-ray imaging (ME-XRT) is particularly promising, as the technologies complement each other very well in terms of their analytical performance: LIBS is able to provide an analysis of the chemical composition of the surface, whereas ME-XRT determines elementary information of the total object volume. "The technological convergence of these two sensor technologies will enable the extrapolation of precise surface information to the entire volume. This allows us to determine representative values for the entire ore. Adaptation to varying ore types and geological parameters will be done using artificial intelligence." explains Markus Firsching, Project Manager at the Fraunhofer Development Center for X-ray Technology, a division of Fraunhofer IIS.

The fusion of sensor technologies to be developed should provide constant and accurate monitoring of the mineralogy of the mined rock. Special feature: the geological, mineralogical, rock mechanical and metallurgical properties of the ore are determined directly while the rock material moves over a conveyor belt. Additionally, these properties will be automatically fed into geological 3D models in order to facilitate mine planning.

Planned Exploitation of the Research Results

The project results will be used mainly in the fields of sorting primary raw materials. An application in the field of recycling is also conceivable. Both areas pose major challenges for manufacturers of sorting machines due to increasingly complex tasks. The results regarding the use of deep neural networks should be used to enable a flexible reaction to changing requirements, as well as to facilitate the teaching of the system and the configuration for sorting material flows. For the industrial partners, these advantages represent great unique selling propositions compared to their competitors and are thus highly interesting in economic terms.

REWO-SORT is a joint project of Fraunhofer IIS, Luleå University of Technology, Secopta and University of Chile. The work package of the German partners Secopta and Fraunhofer EZRT is funded by the German Federal Ministry of Education and Research for a period of three years with a volume of around € 520,000.

The Fraunhofer-Gesellschaft is the leading organization for applied research in Europe. Its research activities are conducted by 72 institutes and research units at locations throughout Germany. The Fraunhofer-Gesellschaft employs a staff of 25,000, who work with an annual research budget totaling more than 2.3 billion euros.
The **Fraunhofer Institute for Integrated Circuits IIS** is one of the world's leading application-oriented research institutions for microelectronic and IT system solutions and services. It is the largest of all Fraunhofer Institutes. Research at Fraunhofer IIS revolves around two guiding topics:
In the area of **"Audio and Media Technologies"**, the institute has been shaping the digitalization of media for more than 30 years now. Fraunhofer IIS was instrumental in the development of mp3 and AAC and played a significant role in the digitalization of the cinema. Current developments are opening up whole new sound worlds and are being used in virtual reality, automotive sound systems, mobile telephony, streaming and broadcasting.
In the context of **"cognitive sensor technologies"**, the institute researches technologies for sensor technology, data transmission technology, data analysis methods and the exploitation of data as part of data-driven services and their accompanying business models. This adds a cognitive component to the function of the conventional "smart" sensor.
970 employees conduct contract research for industry, the service sector and public authorities. Founded in 1985 in Erlangen, Fraunhofer IIS has now 14 locations in 11 cities: Erlangen (headquarters), Nuremberg, Fürth, Dresden, further in Bamberg, Waischenfeld, Coburg, Würzburg, Ilmenau, Deggendorf and Passau. The budget of 184 million euros is mainly financed by projects. 22 percent of the budget is subsidized by federal and state funds.
Detailed information on: www.iis.fraunhofer.de/en