

PRESS RELEASE

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Boosting efficiency in mining with AI and automation

“Doing instead of procrastinating”. This is the AI strategy presented by Prof. Constantin Haefner, Director of the Fraunhofer Institute for Laser Technology ILT, at the “AKL’24 – International Laser Technology Congress” in Aachen, Germany. Experts at the institute are putting this pragmatic strategy into practice in the German-Canadian AI-SLAM project, for example, in which an AI tool for the automated laser cladding of wear parts for the mining industry is being developed.

AI-SLAM: Five letters stand for the ambitious German-Canadian project "Artificial Intelligence Enhancement of Process Sensing for Adaptive Laser Additive Manufacturing". Ambitious because it aims to take Laser Material Deposition (LMD) to a new level with AI. AI software is to automatically record geometries in real time during the coating process, regulate deviations in the process parameters and iteratively improve the process by analyzing extensive amounts of data.

The idea came from Amit Varma, co-founder and CEO of Braintoy Inc. from Calgary in Canada, who sees the Canadian mining industry as the primary target group. It faces a dilemma: every year, millions of wear parts such as rock crusher teeth, drill bits and ripper teeth have to be repaired and recoated. Although Laser Material Deposition has proven its worth, the companies require highly experienced machine operators. These include Apollo Machine and Welding Ltd. from Alberta in Canada, which is a typical user participating in the project launched in 2022. "For job stores like this, it is impossible to hire many experienced laser operators," explains Varma. "We now want to use AI to simplify the tasks of operators."

Zero-defect production: perfect laser coating of every component

The basic software used is OpenARMS (Open Adaptive Repair and Manufacturing Software) from BCT Steuerungs- und DV-Systeme GmbH, Dortmund, which was specially designed for adapting the machining paths in manufacturing processes. It works on the mIOS web platform from Braintoy, which, according to Varma, is the only technology in the world that can capture any type of data and execute it in the same pipeline: "The AI first recommends the parameters that the machine operator needs to set. It then adjusts these parameters to the second so that the coating turns out perfectly every time."

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The Fraunhofer ILT plays an important role in the project, relying primarily on its many years of expertise in laser coating with the LMD process. Project Manager Max Zimmermann: "We qualify the LMD processes to be able to say whether it is a good or a bad coating. The main task is to visualize and digitalize our expertise." To achieve this, the Aachen-based company runs LMD processes and records the data in a form that an AI can read and process.

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Real-time process: avoid rejects with AI

The machine learning process stands and falls with this correctly recorded data. Only with this data can AI-SLAM avoid errors during the coating process: Ideally, the AI classifies all errors in real time and tells the operator what to do. Varma: "So the machine gets a brain that explains how to avoid errors!"

The first models are already in use; the integration of further sensors and the development of a "recommendation engine" for users is currently underway. It will work similarly to the streaming platform Netflix, which recommends films that its customers might like. By the end of the project in March 2025, a real-time process is planned that will recommend optimal parameters for error correction and enable every user to avoid errors preventively.

Zimmermann is certain that the project will also have an impact on laser coating: "The project streamlines the LMD process by automating it from tool path planning to execution. You scan the surface, set the parameters and simply start the process. This improvement in efficiency is important for both experienced and new users because the optimization lowers the barriers to entry into LMD technology."

Wanted for AI-SLAM

Although the project is not running for much longer, Braintoy is keen to work with additional partners. Varma: "It's a relationship between many partners, supported by the Canadian and German governments. But we are also trying to work with others because we don't want to keep our R&D results a secret."

Potential interested parties can contact Braintoy or Fraunhofer ILT directly. Experts from Fraunhofer ILT will provide information on the current status of the AI-SLAM project at Formnext 2024 in Frankfurt am Main from November 19 to 22, 2024.

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Image 1:
Coating of excavator teeth
using Laser Material
Deposition (LMD).
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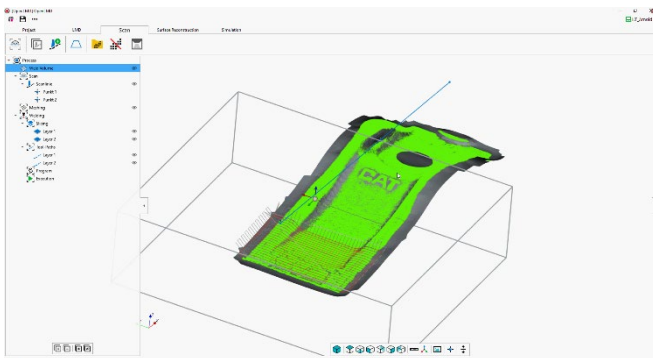


Image 2:
The AI-controlled LMD
process simplifies the role of
the operator when coating
excavator teeth.
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Germany.



Image 3:
Amit Varma, co-founder of
Braintoy Inc. in Calgary,
Canada: "We want to work
with other partners in the
future, because we don't
want to keep our R&D
results to ourselves."
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Image 4:
Max Zimmermann,
Fraunhofer ILT: "We are
making the process more
efficient so that it can be
operated more easily and
cost-effectively in industry."
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