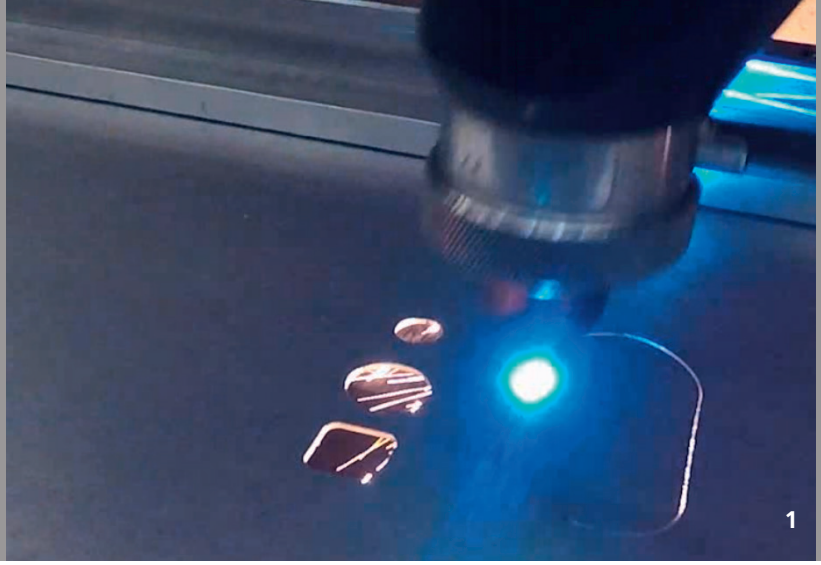

IMPROVING PROCESS RELIABILITY IN LASER CUTTING AND WELDING THROUGH ARTIFICIAL INTELLIGENCE

Task

Laser-based production technology can make common manufacturing processes such as cutting and welding much more efficient and flexible. By adding automatic and robust monitoring, quality assurance, as well as optimizing laser machines, research can economically meet the increasingly volatile demand for varying products in changing manufacturing tasks. These changes can also improve the safety, stability and reliability of laser machines and shorten or altogether eliminate their commissioning, start-up and setup times.

Method

Scientifically coordinated by Fraunhofer ILT, the joint project DIPOOL aims to face these challenges by combining the unique temporal and spatial programmability and controllability of laser tools with suitable machine learning (ML) and artificial intelligence (AI) methods. To obtain meaningful data quality, "minimally invasive" laser modulation patterns are imposed on the machining process. The process continuously responds to them with particularly characteristic, state-dependent signals. When such response signals are made available and fused with further sensor data from the machine, ML algorithms can efficiently be trained and AI system can make reliable decisions and draw valid conclusions.

Results

The newly launched collaborative project DIPOOL has already achieved successful preliminary results with the minimally invasive modulation technique in monitoring high-speed cutting processes. Important features of the process response signatures have been identified and will now be refined and extended by machine learning. Furthermore, the range of applications will be expanded to include remote welding of car body parts. Detailed specifications for the demonstrators will form a solid basis for subsequent development.

Applications

The innovations planned in DIPOOL will increase the overall productivity of laser systems, particularly for cutting and welding sheet metal materials in vehicle manufacturing, the construction industry, the consumer goods industry and, of course, in mechanical and plant engineering. Additive and microtechnical laser applications will also benefit from the DIPOOL developments.

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1 Application: laser blanking.