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1 *Intuitive programming with Fraunhofer IPA sensor components.*

OPTIMIZED COBOT WELDING
USING 2D/3D SENSORS

Current situation

Sound expertise and many years of experience: that is what is needed in order to manufacture high-quality welded components. However, qualified specialists for welding tasks are becoming scarce. Especially when it comes to small lot sizes with high product diversity, which is typical for small and medium-sized production companies, automation rarely makes sense due to the amount of effort required to program robot systems and the necessary safety devices.

Recently, a number of welding robot systems have come onto the market that are based on collaborative robots, so-called "cobots". By integrating sensors in the robot's joints to monitor the force used, these systems eliminate the need to install additional safety devices such as guards or laser scanners to restrict access.

On the other hand, welding tasks for cobots has so far only been programmed by means of teach-in procedures or manual demonstration by freely moving the axes of the robot. These procedures are time-consuming and soon make the overall system uneconomical, especially as far as small lot sizes are concerned. What is more: As soon as tolerances are specified for a component, it no longer makes sense to use the robot because the part can no longer be welded "blind". What is needed is a new type of programming procedure which can be implemented to program small welding tasks quickly, easily and precisely. Furthermore, robots should also be able to call up and execute existing programs without having to be re-taught.

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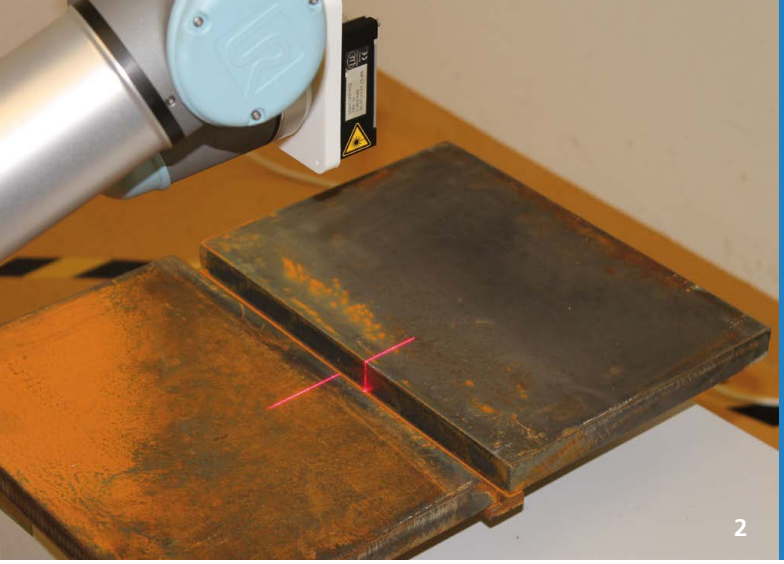

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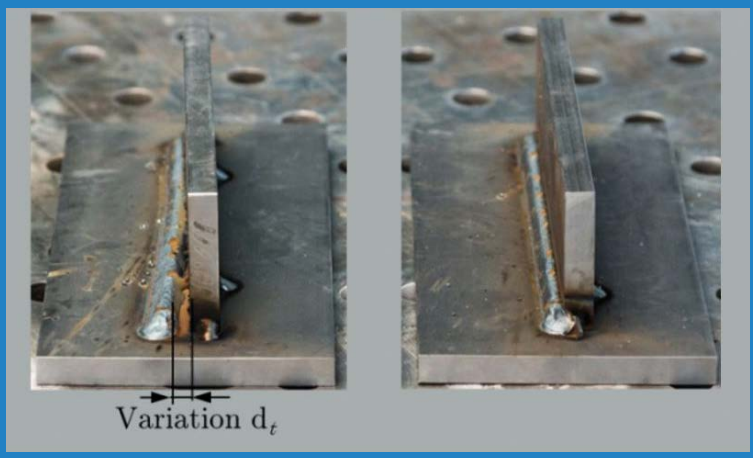

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Our approach

As part of the cognitive robotics research project (KogRob) funded by the Ministry of Economics, Labor and Housing of Baden-Württemberg, we are developing a programming concept that will enable robots to be used efficiently to execute path welding tasks for small lot sizes. To achieve this, an additional 2D laser scanner similar to those deployed in large series productions will be used parallel to the welding torch. Such sensors are generally utilized to accurately position the end effector and correct the trajectory. In this case, the sensor will mainly be used for the initial component programming, thus significantly speeding up the teach-in process. The welding torch with sensor only has to be placed at a start position in order to receive directional information. The robot can then follow the selected contour in one direction and generate the robot program at the same time.

Your advantages

Simpler, faster initial programming of collaborative welding robot systems. Existing programs can be called up without a problem. Only one or two points of the loaded robot program need to be re-taught to get the entire program running correctly because the sensors automatically correct any deviations arising.

Further possibilities

The sensor technology can also be implemented to increase path accuracy and to compensate for any assembly deviations or welding distortions (see Fig. 3). The developed technologies can also help to automate other path-controlled and tolerance-based robot applications in the production process. In principle, deburring processes and various grinding applications are conceivable in addition to different welding processes with varying seam geometries. All in all, the technology offers a new approach to solving path-controlled applications with tight component tolerances.

Of course, the technology is not only limited to applications with collaborative robots; with just a few adjustments, it can also be transferred to other suitable types of robot, such as conventional industrial robots.

Our services

As your partner, Fraunhofer IPA assists with the following topics:

- Designing systems and software for welding tasks
- Individual advice on 2D and 3D sensors for welding applications tailored to your requirements
- Integrating sensors and modifying existing software or developing new software plug-ins to accurately measure deviations and tolerances
- Automatic generation of robot programs from CAD data for your welding application
- Implementing robot systems together with system partners
- Transferring the technology to other applications such as grinding or deburring
- Technical and economic feasibility studies

Discuss your application scenario with us! We are looking forward to hearing from you.

2 *Tracking a weld seam with laser line sensor and cobot.*

3 *Improving quality by modifying the trajectory.*