



TEXTURE-BASED JOINT TRACKING CONTROL DURING JOINING WITH LASER RADIATION

Task

To guarantee the fatigue strength of a welded joint, the laser beam must be focused precisely in a narrow tolerance range along the joint seam of the workpieces. When the component dimensions exhibit fluctuations that are larger than the tolerances, a correction of the path is necessary, either by using a teach-in directly at the facility or, more economical for series production, by using sensors and controllers to automatically compensate for deviations. Industrially, light-section triangulation sensors have previously been used to detect joint positions, which enable laser focus to be corrected automatically relative to the joint seam. Since these sensors have to be arranged in advance, the accessibility to the workpiece is impaired due to its interfering contour. In addition, the edges on a butt joint have to be prepared and structured correspondingly, e.g. by a chamfer, so that these sensors can still recognize the joint. The light-section triangulation principle has yet to function on zero gaps.

Method

With hybrid laser-beam arc welding, the width and position of a joint is identified relative to the focal point of the laser beam with an image sensor arranged coaxially in its path and by means of texture-based image processing.

In the R&D project QuinLas, it has been proven, with an offline analysis of image data, that it is possible to reliably identify joint seams, largely uninfluenced by lighting conditions, using this texture-based approach. The effectiveness of current inexpensive PC hardware, such as graphic cards with graphic processors operating in parallel, can now enable texture-based image processing algorithms to be implemented in real time and economically (Figure 4).

With this technological approach, it is shown that with a coaxial texture-based approach,

- joint gaps can be identified reliably,
- edges do not need to be pre-structured,
- the flexibility of joining with laser radiation can be increased,
- the field of applications can be expanded to the autonomously guided joining of 3D structures, and
- the process chain, from planning the track to programming it, to the joining process can be shortened and optimized economically.

Result

By reaching this goal, Fraunhofer ILT has enhanced the ability to control joining with the hybrid MAG arc laser and, thus, promoted further industrial processing with this innovative joining process in the sector of automobile and steel construction industry.

Contact

Dr. Alexander Drenker
Telephone +49 241 8906-223
alexander.drenker@ilt.fraunhofer.de

*4 Identification of a butt joint
by means of texture gradients.*