Press Release

Calibration and cloning system for robots
EISENMANN VarioClone allows robots to be programmed more accurately and more effectively

Böblingen, 9 February 2010. Industrial robots must be set up individually and thoroughly for use in production. This is a very time-consuming and costly process, especially when absolute accuracy in the order of a few millimeters has to be realized, such as for welding or sealing. The internationally operating plant manufacturing company EISENMANN has now developed a system with which robots can be calibrated quickly and efficiently. They subsequently produce absolutely accurate results with a deviation of less than three millimeters. In addition, programs can be transferred from one robot to another in the production shop.

Robot programming – State of the art

With the methods commonly used today to program industrial robots, a distinction is made between offline simulation on a personal computer and online programming directly at the robot controller. Offline simulation yields the advantage of allowing robot programs to be created in a virtual world without directly having to access the robots in production. This eliminates the expensive stoppages necessary for time-consuming online programming directly on the robot.

Considered in terms of tolerance, every real robot is unique. In other words, the real robot always differs from the idealized robot model used in the simulation. For this reason, it was hitherto not possible to transfer new or optimized programs created through offline simulation directly to the real robot, with the result that the robot programs had to be laboriously modified with the aid of online teach-in processes or costly and time-consuming measurements.

The automotive industry in particular uses parallel production lines in order to achieve high throughput rates and minimize the impact of a robot failure on production as a whole. This fact has given rise to demands for straightforward transferability of robot programs from one production line to another. So far, however, this can only be done to a limited extent, once again due to specific tolerances and fault effects of the individual robots.

Principle of operation

The fault effects to which each robot is subject are normally subdivided into geometrical and non-geometrical fault factors. VarioClone restructures this vantage and distinguishes the influencing variables according to individual faults and faults in the robot series. The latter need only be determined once for all robots in a series. Fault effects due to elasticity in the joints are investigated in this context and used as the basis for a gravitation model. To determine the robot's individual faults, all axes of the robot are measured individually. VarioClone only requires three measuring points...
in each robot axis. In the case of a six-axis articulated arm robot, this means that 18 measuring points need only be defined once in the robot's working area. The time needed for this measurement is no more than about 30 minutes.

The data obtained from measurement of the robot concerned are loaded into the VarioClone system and used to design a model. This individual robot model compensates the tolerances existing in the real robot. In this way, the robot programs created in a virtual world are converted via VarioClone on the basis of individual robot models and then transferred to the real robot. VarioClone consequently links the virtual world with the real world and can compensate up to 89% of the outlined fault effects.

When a robot is now to be programmed for the same tasks as its counterpart in a parallel production line, its robot program can be transferred with the aid of VarioClone. In this cloning process, the program to be copied is converted into a master program with the data saved in VarioClone for the first robot. The master program is then adapted to the individual model data of the robot to be programmed and transferred to the production line.

User-friendly, absolutely accurate and transferable

Implementation and handling of VarioClone are simple. All the necessary conversion processes are saved in the system and do not require any special programming skills. Interaction and adaptation by a machine operator or maintenance personnel is not required. All that is needed in order to set up a robot for its task quickly and efficiently is to measure the robot once in order to determine its individual faults.

With VarioClone, the plant manufacturing company in Böblingen has developed a user-friendly and time-saving system allowing robot programs to be optimally transferred to several robots. Maximum deviation from the robot's required position is no more than three millimeters with VarioClone. In this way, conventional industrial robots can produce results with absolute accuracy. VarioClone can be used on standard robot types made by all manufacturers.

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Further information for editorial staff:

EISENMANN
Press and Public Relations
Katrin Renz
Tübinger Str. 81
71032 Böblingen
Tel.: +49 7031 78-1185
Fax: +49 7031 78-1188
E-Mail: katrin.renz@eisenmann.com