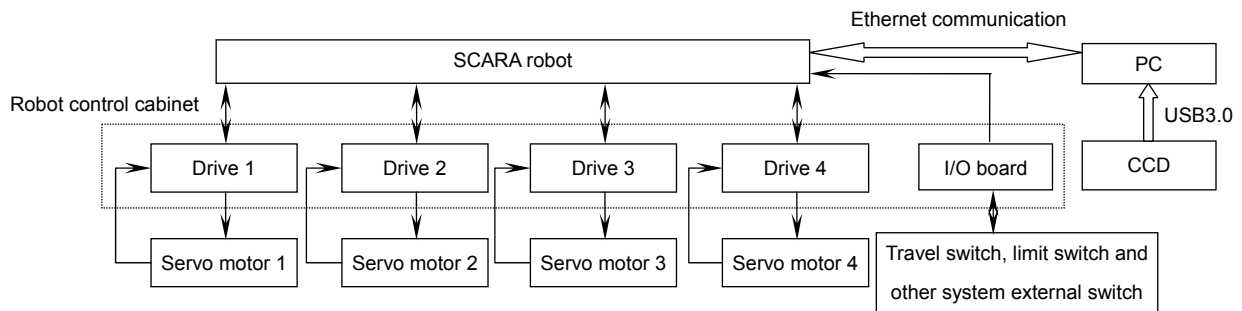


Design and research of automatic plug-in system based on machine vision

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SCARA industrial robot hardware system based on machine vision.

Abstract: The machine vision is introduced into the field of the plug-in robot system as a new type of sensor, and the function of the environment visual information (color, shape and attitude of the target workpiece) is realized by machine vision to achieve fast crawling and precise positioning. This method for the realization of fully automated plug, reduces the insertion error rate, improves the efficiency of plug-in workpiece, which is of great significance. The system uses SCARA robot, mechanical jaw and camera CCD as the hardware base, building a SCARA robot automatic identification and positioning plug-in system platform based on monocular vision, which mixed with a variety of colors of the insurance piece in a circular feeding tray. Under the vibration of the disk motor, the insurance piece is sent to the linear feeder in turn, and then the CCD camera is used to obtain the image information of the insurance piece, the contour shape and coordinate information are extracted from the image and the camera parameters are calibrated and parameterized model is established. The workpiece image coordinate information is transformed into the robot coordinate system under the crawl position information. The Visual Studio software is used as the development platform, and the visual recognition and positioning algorithm is developed by using the OpenCV visual database function. The visual algorithm prepares the image of the fuse piece, the image segmentation, the color recognition, the corner detection and the center point extraction. The center point of the workpiece is determined. Finally, the coordinates of the target point are obtained by calculating the scale ratio and the conversion of the coordinates. The visual algorithm can realize the color recognition of the workpiece and obtain the position information of the workpiece, and control the robot jaws to grasp the target workpiece accurately, which meets the general industrial production in the real-time requirements of the workpiece. In the field debugging, the visual algorithm can identify the color of the workpiece, get the workpiece coordinate information, and control the robot jaws for fast target positioning and accurate crawling. The results show that the system has high positioning accuracy, fastness and stability, and can meet the high precision and high reliability requirements of automatic plug-in inserts under robot operation. It can achieve a variety of colors and multi-station fully automated plug-in operations, without manual participation, reduces the number of recycling, improves the efficiency of the plug and has the advantages of high efficiency.

Keywords: SCARA robot; monocular vision; plug-in system; color recognition; positioning; precision crawl

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See page 919 for full paper.