

基于最小二乘支持向量回归的小零件精密测量技术Precision Measurement Technology for Small Parts Using LSSVR

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关键词: 齿形链板 精密测量 图像处理 最小二乘支持向量回归

摘要: 以圆销式齿形链板为研究对象, 提出了结合图像处理技术和最小二乘支持向量回归的小零件精密测量方法。以CCD作为传感器采集图像, 通过去噪和二值化等图像预处理技术获得待测零件单像素边缘轮廓信息。根据零件特点确定待测区域, 并取出该区域中图像点的坐标作为最小二乘支持向量回归的训练点集, 进行直线和圆的亚像素回归。对回归结果进行处理得到待测直线间夹角、圆孔直径、圆度误差和圆心距等几何参数。实验结果表明提出的方法不仅收敛速度快, 而且精度高、稳定性好。With the study object of tooth shaped chain board, a precise measurement technology for small parts was proposed using image processing technologies combined with least square support vector for regression (LSSVR). Electric coupling apparatus (CCD) was adopted as the sensor to collect images, single pixel edge information of the undeterminate part was obtained after image preprocessing such as image denoising and image binaryzation, etc. Afterwards, on the basis of structure feature analysis of the part, candidate regions were searched automatically where the coordinates of the points were taken out as training point set to train LSSVR. Then the candidate geometry parameters, such as the included angle between every two lines, diameters of the round holes as well as errors of the two round holes were gained through experiment results. The last two geometry parameters with millimeter unit were obtained through unit transmitting from pixel to millimeter by camera calibration, and the precision can attain the micron level. The experiment showed that the proposed solution has a high convergence speed as along with the high precision and excellent stability.

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