ERROR MODELING AND COMPENSATION OF 3D SCANNING ROBOT SYSTEM BASED ON PSO-RBFNN

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Abstract- In order to improve the measurement accuracy of three-dimensional (3D) scanning robot, a method of 3D scanning robot system error modeling and compensation based on particle swarm optimization radial basis function neural network (PSO-RBFNN) is proposed to achieve intelligent compensation of measurement error. The structure, calibration and error modeling process of 3D scanning robot system are mainly described. Cleverly using the iterative closest point (ICP) algorithm to construct input and output data pairs of neural network, and the specific process of error modeling using PSO-RBFNN is given. Finally, through the actual experiment we test and verify the correctness and effectiveness of the proposed error modeling and compensation method by measuring the distance between the centers of two standard balls. Experimental results show: the proposed error model and the compensation method can effectively compensate the measurement errors and improve the accuracy of the 3D scanning robot system.

Index terms: 3D scanning robot system, 6 degree of freedom (DOF) robot, line-structured light sensor, particle swarm optimization radial basis function neural network (PSO-RBFNN), error model, error compensation