A new strategy of real-time thermal error prediction for a machining center using RBF network

吳國安、紀華偉

E-mail: 9501015@mail.dyu.edu.tw

ABSTRACT

The major factors that affect the machining accuracy of CNC machine tools include geometric errors and structural thermal deformation during cutting. Although being successfully demonstrated in literatures, thermally-induced error compensation techniques were not widely implemented in industries. Most of the error-predict models use temperatures as their mapping input. These mapping models are very sensitive to missing data and faulty signals. A wrong temperature reading can result in an incorrect prediction of thermal error. This research proposes a new approach for predicting spindle thermal error of a machining center. A new on line measurement system using RENISHAW TS27R tool setting probe and a RBF network model that predicts the thermal error are developed. Instead of using temperature readings, the new model uses cutting conditions as the mapping inputs. As a result, the problems occurred in the traditional temperature-error mapping model can be avoided. The experimental results showed the proposed approach can predict the spindle thermal induced error correctly and cost-effectively.

Keywords : thermal error, machine tool, compensation, radial basis function network

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