A Development for the Design and Manufacture of Cutter's Profile

E-mail: 9611992@ mail.dyu.edu.tw

ABSTRACT

This research probes into the design and the development of the machining profile on the formed milling cutter. The computer-aid automation process will take place of the conventional method. The conventional method grinds the formed cutter by means of a ready-made mold plate to profile the workpiece. Thus, the grinding machine produces a cutter identical to the mold. The disadvantage of this method is that the cutter might be ground into unexpectedly incorrect size. It results in some problems with the cutter life, the cutting capability and the vibration. This research is based on the axis-controlled machining coordinate of the multiple axis grinding machine and the program language to develop one CAD/CAM system. By means of the setting of parameter, the program code of the grinding wheel path required for machining need will be automatically produced. Deducing the already known input conditions of the grinding path, the external form of the product after machining, the coordinate system of the servo axis of the machine, the parameter of the cutter and the machining drawing of the product can be completed by any computer-aided designing software. This is the 2D sectional drawing after machining. We get the geometric coordinate values of X and Y. Then, output them to get the servo machine coordinates of X, Y, A and B of the machining machine. During the coordinate converting process, the path offset theory is needed so as to satisfy the limitation on the machining path continuation. Then, employ the cutting simulation software of the multiple NC to verify the result of analysis. This reverse process reads the program code of the grinding path produced, and simulates the actual grinding status on the profile of the formed milling cutter. According to the researched deduction, this essay is to write a computer-aided system of the machining path for independent profile cutter value. It can read the product sectional profile, and produce a NC code. Its reverse simulating result completely conforms to the parameter size and the originally designed profile of the profile cutter. In addition to providing the profile machining technology on profile cutter, this research can shorten the production cycle of the profile cutter, upgrade the quality of the profile cutter, and reduce the development and the manufacture costs. It is expected to build a machining expert system with complete automation.

Keywords : Profile Cutter ; Tool Path ; CAM

Table of Contents

REFERENCES

[1] Martellotti, M. E.,"An analysis of the milling process", Trans. ASME 63, 667, 1941.

[2] Martellotti, M. E.,"An analysis of the milling process, part 2 – down milling", Trans. ASME 67, 233, 1945.

[3] Brown, R. H. and Armarego, E. J. A.,"Oblique Machining with a Single Cutting Edge", International Journal of Machine Tool Design and Research, Vol. 4, pp.9-25, 1964.

[4] Merchant, M. E.,"Basic Mechanics of the Metal – Cutting Process", Journal of Applied Mechanics, TRANS. ASME, Vol. 66, pp.A-168-175, 1944.

[5] Stabler, G. V.," The Fundamental Geometry of Cutting Tools", Proceedings of the Institution of Mechanical Engineers, Vol. 165, pp.14-26, 1951.

[6] Shaw, M. C., Cook, N. H., and Smith, P. A.,"The Mechanics of Three Dimensional Cutting Operations", TRANS. ASME, Vol. 74, pp.1055-1064, 1952.

[7]   "   "   Vol.5   pp.15-20   1994

[8]   "   "   Vol.37   No.5   pp.572-575   1997

[9]   "   CAD   "   Vol.29   No.12   pp.11-13   1995

[10] Shin, Y. C. and Waters, A. J.,"Face Milling Process Modeling with Structural Nonlinearity", Transactions of the NAMRI, pp. 157-163, 1994.

[11]   "   "   Vol.29   No.3   pp.24-27   1995

[12]   ? "   "   Vol.25   No.2   pp.25-29   1995

[13]   "   "   2003

[14] Loney, G. C., and Ozsoy, T. M., 1987, "NC Machining of Free Form Surfaces", Com-puter-Aided Design, Vol. 19, No. 2, pp. 85-90.

[15] Takench, T. I.,"5-Axis Control Machining and Grinding Based on Solid Model", Annals of the CIRP, Vol. 40, No. 1, pp. 455-458, 1991.

[16]   "   "   Vol.24   No.9   pp.15-17   1996

[17]   "   "   Vol.18   No.3   pp.330-335   1997

[18] Sun, Chun-Hua and Lin, Hua-Ming,"Form Principal and Algorithm for Tool Path of Elliptic Ball End-Mill",Tool Engineering, 1996.

[19] Yang, D. C. H., and Han, Z.,"Interference Detection and Optimal Tool Selec-tion in 3-Axis NC Machining of Free-form Surfaces", Computer-Aided De-sign, Vol.31,No.10, pp.303-315, 1999.

[20]   "   CAD   "   2006

[21]   "   Pro/Engineer   "   2006

[22]   "   "   1984

[23]   "   "   1996

[24]   "   "   1987

[25]   "   "   1987

[26]   "   "   1978

[27]   "   NURBS   "   2005

[28] Move-to.net User Group, http://move-to.net/Comm/default.aspx [29]   " CNC   "
                2000

[30]   "   "   2006

[31]   AlphaCAM   http://www.licom.com/tw/index.htm