THE STUDY OF NUMERICAL CONTROL ON ELECTRIC DISCHARGE SCANNING MACHINE

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ABSTRACT

THE PURPOSE OF THIS RESEARCH IS TO UTILIZING THE GAP CONTROL ON THE ELECTRIC DISCHARGE OF SCANNING PROCESS ALLOWED THE ELECTRODE TO AUTOMATICALLY COMPENSATE ITS SYSTEM RATHER THAN CALCULATED ITS COMPENSATION FOR EACH SINGLE ENTRY. FIRST OF ALL, A ED-SCANNING PROCESS OF SERVO CONTROL HAS TO BE IN SEQUENCE. 1. DISCHARGE GAP CONTROLLER：THE CONTROLLER CAN RECEIVE THE GAP SIGNALS FROM THE DISCHARGE GAP MONITOR AND GENERATE THE COMMAND OF Z-AXIS TO CONTROL THE ELECTRODE ALONG THE MAIN AXIS. IT CAN COMPENSATE THE ELECTRODE WEAR AUTOMATICALLY AND INCREASE THE ERODING PERFORMANCE. 2. INTERPOLATOR：IT CAN GENERATE THE COMMANDS OF XY AXIS ACCORDING TO THE PRESET FEED RATE AND THE DIMENSION DEFINITION. 3. POSITION CONTROLLER：ACCORDING TO THE COMMANDS FROM THE GAP CONTROLLER AND THE INTERPOLATOR THE CONTROLLER CAN DRIVE THE ELECTRODE TO THE POSITION PRECISELY. THE ED-SCANNING PROCEDURE WILL DEPLOY STAGE BY STAGE UNDER THE SMALLEST ELECTRIC PARTICLE FOR ACCUMULATION, SUCH ACCUMULATION HAS TO BE IN UNALTERABLE STAGE IN ORDER TO BE A STANDARD MODE HOLE SIZE. ALSO IN OUR RESEARCH SHOWS THAT, BY UTILIZING THE GAP SERVO CONTROL METHOD WHEN THE ELECTRODE MOVES HORIZONTALLY, IF CAN ALSO BE REGULATE TO COMPENSATE THE WEAR ALONG Z-AXIS, FOR THAT IT CAN BE GUARANTEE EACH LEVEL OF ELEVATION MEASUREMENT STANDING CONSISTENT. LAST OF ALL, WE HAVE ALSO ATTEMPTED TO ENHANCE A ROUND CONE SHAPE. THE EXPERIMENTAL RESULT, IT IS VERY CLEARLY THAT THE CONE SHAPE WAS FORMED, IT CAN BE VISUALISE AND DISTINGUISH THE SHAPE WAS NOT COMPLETELY FORMATTED. OUR STUDIES DEMONSTRATE THAT BY UILITILIZAING THE ABOVE CONTROL STRATEGY, THE RESULTS HAS REACHED IT ESTIMATION.

Keywords : ED-SCAN、GAP CONTROL、SERVO CONTROL

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REFERENCES

[1] Bayramoglu, M. and Duffill A. W.," Systematic Investigation on the Use of Cylindrical Tools for the Production of 3D Complex Shapes on CNC EDM Machines," Int. J. Mach. Tools Manufact., Vol.34, No.3,pp.327-339, 1994.

[2] Takeshi Masaki, Koichi Kawata and Takahisa Masuzawa," Micro Electro-Discharge Machin -ing and its Applications," CH2832-4/90/0000, IEEE, PP.21-26,1990.

[3] 三菱電機湯澤隆,真柄卓司,後藤昭弘,今井祥人,佐藤達志,千代知子, "使用小徑電極做微細輪廓 放電加工," 電氣加工技術(日文), Vol.19, No.63, pp.-6, 1995.

[4] "創成放電加工機," 中國機械工程學會雙月刊,pp.55-57, 第212期.

[5] T. Masuzawa and T. Takawashi," Recent Trends in EDM/ECM Technologies in Japan," 12th International Symposium for Electromachining (ISEM), pp.1-15, 1998.

[6] T. Kaneko, M.Tsuchiya and A. Kazama "Improvement of 3D NC Contouring EDM Using Cylind -rical Electrodes and Optical Measurement of Electrode Deformation And Machining of Free-Curves" EDM Technology Transfer, VOL.3, 1996.
[7] Z. Yu, T. Masuzawa and M. Fujino," 3D Micro-EDM with Simple Shape Electrode, part 1: Machining of Cavities with Sharp Corners and Electrode Wear Compensation," Int. J. of Electrical Machining, No.3, pp7-12, Jan. 1998.
[8] Z. Yu, T. Masuzawa and M. Fujino," 3D Micro-EDM with Simple Shape Electrode, part 2: Machining and Error Analysis of Conical and Spherical Cavities,"Int. J. of Electrical Machining, No.3, pp71-78, Jan. 1998.
[9] 高道鋼," 微孔放電加工," 機械技術, 2-120, pp.22-30, 1995.
[10] 張義芳,"使用於數位訊號處理運動控制板的放電加工插值器研究," 國科會87年度案 NSC87-2212-E-212-003， 1998。
[11] Rajurkar, K. P. and Wang, W. M.," A New Model Reference Adaptive Control of EDM," Annals of the CIRP Vol.38/1, 1989, pp.183-186.
[12] Wang, W. M. and Rajurkar, K. P., "Modeling and Adaptive Control of EDM Systems," Journal of Manufacturing Systems Vol. 11, No. 5, 1992, pp.334-345.
[13] 張義芳," 放電加工機伺服進給控制器設計," 第六界全國自動化科技研討會, pp.909-915, 82年七月。
[14] 張義芳,"The VSS Controller Design for Edm'ing Motion Control Systems," 中國機械工程學 會第十一屆學術研討會, pp.95-104， 83年11月。
[15] Koren, Y,"Computer Control of Manufacturing Systems," McGraw-Hill,Inc.,1983.
[16] 施慶隆和李文猶,"機電整合與運動控制",高立圖書,86年。
[17] 張義芳," 放電加工機行星加工運動控制法," 84年第八界全國自動化科技研討會， pp.893-904。
[18] 張義芳、粘永峰" CNC放電加工方形搖動擴孔控制法研究," 86年第十屆全國自動化科技研討會。
[19] 楊信生 "智慧型雕模放電伺服控制研究" 大葉大學機械工程研究所碩士論文, 87年7月。
[20] 遊志男和賴森祿, "實用C程式語言-入門篇",松崗電腦圖書,81年。
[21] 遊志男和賴森祿, "實用C程式語言-進階篇",松崗電腦圖書,81年。
[22] 紀瑞芳,"Microsoft C 程式庫手冊6.0版",1991年3月。
[23] 周文成,"Master cam 入門與範例應用",全華科技圖書,89年。