ROBUST CONTROL DESIGN ON THE SERVO SYSTEM OF DIGITAL VERSATILE DISKS

江俊彥、鄭鴻儀

E-mail: 9127919@mail.dyu.edu.tw

ABSTRACT

IN ORDER TO MAKE PICK-UP HEAD CAN READ DATA CORRECTLY, DIGITAL VERSATILE DISK MOTION IS BY WAY OF MECHANICAL AND ELECTRICAL ACTUATOR MOVING OPTICS SYSTEMS,MAKE LASER POINT CORRE -CTLY FOCUS ON THE DISK.ON THIS PAPER CONSIDER PLANT PARAMETER PERTURBATION AND DISTURBAN -CE,DESIGN CONTROLLER,MAKING SYSTEM TO ACHIEVE AN OBJECTIVE FOR PERFORMANCE REQUEST.EXPLO -ITATION MANY TIMES IDENTIFICATION GET PARAMETER,SELECT AVERAGE OF PARAMETER AS PLANT,WHEN SYSTEM ON VARIATION INTERVAL CAN STABLE,OVERCOME DISTURBANCE,AND ERROR REACH PERFORMANCE SPECIFICATION. FINALLY USE MATLAB SIMULATION,CHECK CONTROLLER ACCURACY.THUS,USE TOPICAL CO -NTROL PID AND MODERN CONTROL ROBUST CONTROL DESIGN CONTROLLER. THE RESULTS OF PID DESIGN, CAN ACHIEVE AN OBJECTIVE FOR PERFORMANCE REQUEST WHEN PLANT ON PARAMETER PERTURBATION,TIME DOMAIN PERFORMANCE,SETTLING TIME IS 3*10-5 SEC,OVERSHOOT IS 1%,BANDWIDTH 50KHZ, THE ERROR VALUE OF DISCRETE DOMAIN LESS THAN 0.0122, ALL SATISFIED BANDWIDTH MORE THAN 2.4 KHZ AND ERROR LESS THAN 0.069 VOLTAGE, PROOF PID CONTROLLER CAN OVERCOME THE EFFECT OF PARAMETER PERTURBATION. WHEN CONSIDER DISTURBANCE D=500 SIN(1500T) MM, ERROR VALUE REACH 0.0745, CAN'T ACHIEVE AN OBJECTIVE FOR PERFORMANCE REQUEST, BECAUSE USE ROBUST CONTROL DESIGN CON -TROLLER. CONSIDER PARAMETER PERTURBATION AND DISTURBANCE, THE CONTROLLER MUST BE FULL INF -ORMATION CONTROLLER. THE RESULTS OF DESIGN, WHEN AT THE SAME TIME EXIST PARAMETER PERTURB -ATION AND DISTURBANCE, SETTLING IS 3*10-5 SEC, BANDWIDTH 30 KHZ, AND CAN STAND ON DESIGN CONDITION (EXAMPLE: OVERSHOOT, SETTLING TIME) GET CONTROLLER AND OBSERVER GAIN, THE ERROR VALUE OF DISCRETE DOMAIN: FOCUS IS 0.0318 LESS THAN 0.069,TRACK IS 0.0062 LESS THAN 0.0495 VOLTAGE. WE HOPE THE RESULTS OF THIS RESEARCH WILL BE REFERRED IN INDUSTRY IN THE FUTURE.

Keywords : MECHANICAL AND ELECTRICAL ACTUATOR SERVO SYSTEM , PARAMETER PERTURBATION , DISTURBANCE , ROBUST CONTROL , FULL INFORMATION CONTROLLER.

Table of Contents

REFERENCES

1. BALL, J.A. AND HELTON, J.W. " H CONTROL FOR NONLINEAR PLANTS:CONNECTIONS WITH DIFF -ERENTIAL GAMES", IEEE CONFERENCE ON DECISION AND CONTROL TAMPA FL,PP. 956 - 962, 1989. 2. BALL, J.A., HELTON, J.W. AND WALKER M.L.," H CONTROL FOR NONLINEAR SYSTEMS WITH OUTPUT FEEDBACK", IEEE TRANS. ON AUTOMATIC CONTROL, VOL. 34, NO. 4, PP. 546-559, 1993. 3. GREEN MICHAEL AND DAVID, J. N., LINEAR ROBUST CONTROL, PRENTICE HALL, NEW JERSEY, 1995. 4. HANS W. KNOBLOCH, ALBERT ISIDORI AND DIETRICH FLOCKERZI, TOPICS IN CONTROL THEORY, BIR KHAUSER VERLAG, BOSTON, 1993. 5. DOYLE, JOHN C., FRANCIS, BRUCE A. AND TANNENBAUM, ALLEN R.,FEEDBACK CONTROL THEORY,MAC -MILLAN PUBLISHING COMPANY, NEW YORK, 1992. 6. T.M.M. NASAB, "A NEW VARIABLE

STRUCTURE CONTROL DESIGN WITH STABILITY ANALYSIS FOR MIMO SYSTEMS", ELECTRONICS CIRCUITS AND SYSTEMS, VOL. 2, PP. 785 - 788, 2000. 7. CHAN, S.P., "ROBUST MOTION CONTROL USING VARIABLE STRUCTURE SYSTEM WITH PERTURBATION CO -MPENSATION", THE 25TH ANNUAL CONFERENCE OF THE IEEE, VOL.1, PP.424 - 429, 1999. 8. P. SUCHOMSKI, "ROBUST PI AND PID CONTROLLER DESIGN IN DELTA DOMAIN", CONTROL THEORY AND APPLICATIONS, IEE PROCEEDINGS-, VOL. 148, ISSUE: 5, SEPT. 2001. 9. BENJAMIN C. KUO, AUTOMATIC CONTROL SYSTEMS, SEVENTH EDITION, PRENTICE-HALL, NEW JERSEY, 1997. 10. ROLF JOHANSSON, SYSTEM MODELING AND IDENTIFICATION, PRENTICE HALL, NEW JERSEY, 1993. 11. A. FORRAI, S. HASHIMOTO, H. FUNTO AND K. KAMIYAMA, "STRUCTURAL CONTROL TECHNOLOGY: SYS -TEM IDENTIFICATION AND CONTROL OF FLEXIBLE STRUCTURES", COMPUTING & CONTROL ENGINEERI -NG JOURNAL, VOL. 12,PP. 257 - 262, DEC. 2001. 12. MASAVOSHI TODA, "ROBUST CONTROL FOR MECHANICAL SYSTEMS WITH OSCILLATING BASES", IEEE INTERNATIONAL CONFERENCE ON, VOL. 2, PP.878 - 883, 1999. 13. K. FUJIYAMA, M. TOMIZUKA AND R. KATAYAMA, "DIGITAL TRACKING CONTROLLER DESIGN FOR CD PLAYER USING DISTURBANCE OBSERVER", THE 5TH INTERNATIONAL WORKSHOP, PP. 598 - 603, 1998. 14. WU HANSHENG, "ROBUST TRACKING AND MODEL FOLLOWING FOR A CLASS OF UNCERTAIN DYNAMICAL SYSTEMS BY VARIABLE STRUCTURE CONTROL", IEEE INTERNATIONAL CONFERENCE, PP. 680 - 685, 2000. 15. K. OHISHI, K. KUDO, K. ARAI AND H. TOKUMARU, "ROBUST HIGH SPEED TRACKING SERVO SYSTEM FOR OPTICAL DISK SYSTEM", THE 6TH INTERNATIONAL WORKSHOP, PP. 92 - 97, 2000. 16. 李佩謙，唯讀光碟機之伺服系統，光電資訊，第27 期. 17. 張道弘，PID 控制理論與實務，全華科技圖書股份有限公司，1995. 18. 陳韋良，光碟機聚焦控制器參數設計之自動化，大葉大學碩士論文，2001. 19. 吳耀宗，DVD 光碟機之微動致動器伺服系統研究，大葉大學碩士論文，2001. 20. 楊憲東、蘇芳柏，線性與非線性￥ H 控制理論，全華圖書有限公司，1999. 21. 趙清風，進階自動控制設計-使用MATLAB 程式語言，全華圖書有限公司，2000. 22. 王菊南，CD 系列光碟機標準介紹，光電資訊，第27 期. 23. 劉健偉，光碟機控制器之可靠度分析，國立清華大學碩士論文，2000. 24. 郭立華，光學頭致動器機構簡介，光電資訊，第27 期. 25. 李佳洪，光碟機長程循軌馬達之適應控制，國立交通大學碩士論文，1997. 26. 沈永錤，光碟機機碟片偏擺之分析與控制，國立成功大學碩士論文，1999. 27. HTTP://WWW.CD-INFO.COM/CDIC/BIBLIOGRAPHY.HTML