Dynamic Analysis and Control for a HEXAPOD Parallel Platform

鄧琪曄、陳俊達

E-mail: 9224499@mail.dyu.edu.tw

ABSTRACT

The robot types of nowadays almost open up machine of series connection mode, for all to have advantages of nice working property and larger working space, but have some defect：（1） because of the cantilever structure the static rigidity is so bad.（2）because of the series connection mode, the drive in back to change into the front driver’s load, so the structure load to increase, make the turn-inertia to be higher , therefore the error to accumulate at the back.（3） inertia-quality and turn-inertia are more higher, therefore the accelerate is so bad when the same thrust. Consequently, our laboratory to bring up based on Stewart parallel connection mode mechanism, to set up HEXAPOD parallel connection mode platform, to conquer the defects of the series connection mode. Therefore, the paper is aimed at HEXAPOD parallel connection mode platform, to use Larange method of the absolute coordinates system to pour out motion equation, in order to carry movement analysis. Finial, design the PD control rule to control the HEXAPOD parallel connection mode platform.

Keywords : Stewart、parallel connection mode mechanism 、HEXAPOD、parallel connection mode platform、PD control rule.

Table of Contents

REFERENCES

[1] D. Stewart, "A Platform with Six Degrees of Freedom" Proceedings of the Institution of Mechanical Engineering.vol.180,part1,pp.371-386 ,1965.
[2] J.E McInroy., J.C. Hamann, "Design and control of flexure jointed hexapods", pp.372-381, IEEE Aug 2000.
[3] U. Saranli, M. Buehler, D.E. Koditschek, "Design, modeling and preliminary control of a compliant hexapod robot", pp.2589-2596, [4] N. Koyachi, T. Arai, H. Adachi, K. Asami, Y. Itoh, "Geometric design of hexapod with integrated limb mechanism of leg and arm", pp.291-296, IEEE Aug 1995.
[5] G.M. Nelson,Quinn R.D.,Bachmann R.J.,W.C. Flannigan, R.E. Ritzmann ,"Design and simulation of a cockroach-like hexapod robot",pp.1106-1111,IEEE Apr. 1997.
[6] T. Donald Greenwood, "Principles of Dynamics",1988.
[7] F. Behi, "Kinematic Analysis for Six-Degree-of-Freedom 3-PRPSParallel Mechanism ",pp.561-565,IEEE 1988.
[8] J.D. Geng, Z. Lee, R.L.Carroll, L.H.Haynes, "Learning Control System Design Based on 2-D Theory – an Application to parallel Link Manipulator",pp.1510-1515 IEEE 1990.
[9] A.Codourety, E.Burdet, "A Body-oriented Method for Finding a Form of the Dynamic Equation of Fully Parallel Robots",pp.1612-1618 IEEE 1997.
[10] M.Honegger, A.Codourey, E.Bourdet, "Adaptive Control of the Hexapod a 6 dof Parallel Manipulator"pp.543-548 IEEE 1997.
[11] Wang,Jian,Masory,Oren, "On the Accuracy of a StewartPlatform-Part 1 The Effect of Manufacturing Tolerances",pp.114-120 IEEE 1993.
[12] Takanori MASUDA, Motoyoshi FUJIWARA and Tatsuo ARAI,"Kinematics Analysis of the Parallel Mechanism with Vertically Fixed Linear Actuators", Series C, Vol.44,pp.731-739 NO. 3, 2001.
[13] 羅華強，MATLAB 5.3 範例入門SIMULINK3.0，全華科技圖書股份有限公司,2001.
[14] Haim Baruh "ANALYTICAL Dynamics ",1989.
[15] Chun-Ta Chen,Chieh-Chuan Feng "Inverse Dynamics of the General 6-6 Stewart Platform",2002.
[16] B. Dasgupta, T.S. Mruthyunajaya, "Closed-Form Dynamic Equation of the General Stewart Platform Through the Newton-Euler Approach",pp.993-1012 ,1998.
[17] K. Sugimoto, "Kinematic and Dynamic Analysis of Parallel Manipulators by means of Motor Algebra ",ASME PaperNo.86-DET-139 1986.
[18] 王世明、康淵， "六自由度SPBM 工具機之設計應用原理與誤差分析"，機械月刊， Vol.29，No.3，pp.75-83，2003.
[19] 張道弘編譯， PID 控制理論與實務，全華科技股份有限公司,1995.
[20] 陳朝光、陳介力、楊錫凱編著，自動控制，高立圖書有限公司,2001.
[21] C.KUO BENJAMIC, " Automatic Control Systems",1995.
[22] 鄭永福編譯，自動控制系統，文笙書局，1983.