DEVELOPMENT AND RESEARCH OF A ROBOT WHEELCHAIR FOR ALL TERRAIN

鄭嘉森、陳俊達

E-mail: 9018472@mail.dyu.edu.tw

ABSTRACT

THERE ARE SEVERAL DESIGNS FOR MOBILE ROBOTS. AMONG THEM, THE WHEEL DESIGN IS UNFAVORABLE FOR NAVIGATION OF STAIRS OR OVER OBSTACLES, THE LEG DESIGN DEMANDS VERY INTRICATE CONTROL SYSTEM AND IS NOT EFFICIENT ON FLAT SURFACES, THE CATERPILLAR DESIGN IS UNSTABLE IN STAIR NAVIGATION. IN THIS THESIS, A NEW TYPE OF QUADRUPED-LIKE DESIGN FOR A MOBILE ROBOT IS DEVELOPED. THE MOBILE ROBOT ENABLES TO ASCEND OR DESCEND STAIRS BY LEG-CREEPING, AND NAVIGATE ON FLAT SURFACES BY WHEELS. MOREOVER IT CAN ALSO BE APPLIED TO A WHEELCHAIR. FROM LOCOMOTION EXPERIMENTS, THE ROBOT WHEELCHAIR VALIDATE THAT IT CAN ADAPT TO ALL TERRAIN WITH BODY HELD HORIZONTAL AND LOWER CENTER OF WEIGHT.

Keywords : ROBOT WHEELCHAIR, STAIR, QUADRUPED.

Table of Contents

REFERENCES

[1] WATKINS, J & WATKINS,STAIR VEHICLE,1983。

[2] BIHLER & ABELE, STAIR-CLIMBING APPARATUS FOR WHEELCHAIR,1985 [3] 陳國全，中華民國專利，1997。

[4] 賴耿陽，新機械人設計製造，A NEW INDUSTRIAL ROBOTS CONTROLLED MANIPULATOR,MECHANISM MECHINE,DESIGN AND MANUFACTURING，復漢出版社。

[5] M.VUKOBRATOVIC，步行機械人與人工腳，臺隆出版。

[6] 金田周平、木下源一郎，機械人工程學，臺隆出版。

[7] 林崇賢，江耀宗，機器人應用實務，1989。

[8] J. D. MARTENS, WS. NEWMAN, "STABILIZATION OF A MOBILE ROBOT CLIMBING STAIRS," IN PROCEEDINGS OF THE IEEE INTERNATIONAL CONFERENCE ON ROBOTICS & AUTOMATION, PP2501~ 2507, 1994.

[9] 日本工業調查會, "A NEW INDUSTRIAL ROBOTS, CONTROLLED MANIPULATOR, MECHANISM MACHINE, DESIGN AND MANUFACTURING,".

[10] S.HIROSE, K. YONEDA, K. ARAI AND T. IBE, "DESIGN OF A QUADRUPED WALKING VEHICLE FOR DYNAMIC WALKING AND STAIR CLIMBING",1995。

[11] T.KAGIWADA, ""STABILIZATION OF A MOBILE ROBOT CLIMBING STAIRS," IN ROBOT DESIGN FOR STAIR NAVIGATION," JSME INTERNATIONAL JOURNAL, SERIES C: DYNAMICS, CONTROL, ROBOTICS, DESIGN AND MANUFACTURING, V39, NO3, 1996.

[12] JOHN J.CRAIG,INTRODUCTION TO ROBOTICS,ADDISON-WESLEY PUBLISHING COMPANY。
[13] 宮城政雄，內田干城，米田隆志，小山浩幸，舟久保熙康， "DEVELOPMENT OF STAIR CLIMBING WHEELCHAIR WITH LEGS AND WHEELS SYSTEM (1ST REPORT)-DEVELOPMENT OF STAIR CLIMBING MECHANISM,"精密工學會誌,VOL.64, NO.3, 1998.
[14] G.WIESSPEINER,E. WINDISCHBACHER, "DISTRIBUTED INTELLIGENCE TO CONTROL A STAIR-CLIMB -ING WHEELCHAIR," IN PROCEEDINGS OF THE IEEE INTERNATIONAL CONFERENCE ON ROBOTICS AND AUTOMATION, PP1173~1178, 1997.
[15] S.HIROSE, K. YONEDA, K. ARAI AND T. IBE, "DESIGN OF A QUADRUPED WALKING VEHICLE FOR DYNAMIC WALKING AND STAIR CLIMBING," ADVANCED ROBOTICS, VOL. 9, NO. 2, PP107~124, 1995.
[16] N.KOYACHI, H. ADACHI, T. NAKAMURA, E. NAKANO, "S MOTION SWITC ENSOR-BASED HING CONTR -OL IN STAIR-CLIMBING OF HEXAPOD," PROCEEDINGS OF THE JAPAN - USA SYMPOSIUM ON FLEXI -BLE AUTOMATION, 1992.
[17] D.J. PACK, "PERCEPTION-BASED CONTROL FOR A QUADRUPED WALKING ROBOT," IN PROCEEDINGS OF THE IEEE INTERNATIONAL CONFERENCE ON ROBOTICS AND AUTOMATION, PP 2994~3001, 1996.
[18] N.G. BOURBAKIS, "KYDONAS-AN AUTONOMOUS HYBRID ROBOTS: WALKING AND CLIMBING," IEEE RO -BOTICS & AUTOMATION MAGAZINE, JUNE, 1998.
[19] G.WIESSPEINER AND E. WINDISCHBACHER, "DISTRIBUTED INTELLIGENCE TO CONTROL A STAIR-CL -IMBING WHEEL CHAIR," PROCEEDINGS OF THE IEEE ENGINEERING IN MEDICINE AND BIOLOGY, VOL2, PP1173~1174, 1995.
[20] K.TAGUCHI, "ENHANCED WHEEL SYSTEM FOR STEP CLIMBING," ADVANCED ROBOTICS, VOL. 9, NO. 2, PP137~147, 1995.
[21] P.WELLMAN, V. KROVI AND V. KUMAR, "AN ADAPTIVE MOBILITY SYSTEMFOR THE DISABLED," IN PROCEEDINGS OF THE IEEE INTERNATIONAL CONFERENCE ON ROBOTICS & AUTOMATION, PP2006~ 22011, 1994.
[22] SHUE-SHU WU, CHING-SHIOW TSENG, CHENG SAN CHENG, "GAIT PATTERN ANALYSIS OF A QUADRUP -EDAL JOINTED WALKING ROBOT" JOURNAL OF TECHNOLOGY, VOL. 13, NO. 1,PP. 49~57, 1998.