

DEVELOPING FAST BIPEDAL LOCOMOTATION METHOD FOR INCLINED FLOORS

AHMADREZA ESHGHINEJAD

Department of Mechanical Engineering Isfahan University of Technology, Isfahan, Iran

MEHDI KESHMIRI

Department of Mechanical Engineering Isfahan University of Technology, Isfahan, Iran

This paper extends and modifies fast bipedal locomotion method for inclined floors. The fast bipedal locomotion method is a real-time method for generating the joint trajectories of a humanoid robot, it has been developed only for ideal flat floors and if the floor has a little inclination (2 or 3 degree) the robot motion will not be stable. Modification basically is done in the controlling part of the motion. The modified method is analyzed and verified by numerical simulation.

1. Introduction

Most of the robots in the world are wheeled robots. They have some advantages like simplicity, easy controlling and having high region of stability, but they also have some limitations which force us to use some other solutions to solve their problem.

For generating the motion equations of a humanoid robot, a method was proposed by Tankanish et al [1] and Dasgupta et al [2] which analyzes the walking pattern based on method of zero moment point (ZMP). If the ZMP point is in the convex hull of the contact points of the robot's foot, the robot is stable. There are a lot of methods which use the ZMP point. the disadvantages of the ZMP criterion method is that it has a large amount of calculations, so it is hard to achieve a real-time motion generation method, and we should generate the joints trajectories before the robot's motion and use this results during the robot's movement (offline motion generation). Qiang Huang et al [3] proposed a method which use some critical points of motion trajectories on the walking motion. Afterward they check their equations with ZMP criterion.

New methods are focused on real-time motion generation which enables the robot to have various motions, so these methods are focused on decreasing the amounts of calculations. A good new method which has this specification is the method which was created by Sven Behnke [4]. Some other controlling