Computational Intelligence to Gait Generator for Biped Dynamic Walking

Hataitep Wongsuwarn and Assoc. Prof. Dr. Djitt Laowattana

Introduction

Bipedal walking robots have been studied by researchers for about three decades. Because, its versatile usage was more than other type of robots. How can we control a bipedal walking robot so that it walks stably and robustly in complex environment?

Problems

Bipedal walking robots are typical systems affected by uncertainty. The leg kinematics and dynamics are highly nonlinear and known with low accuracy, gait length depends on types of surfaces. Following these considerations, Intelligence system is a possible approach to deal with several problems in bipedal walking robots.

Methodology

In this research, we propose a supervised learning based on neuro-fuzzy gait synthesis strategy for a biped walking robot. The control scheme for the biped walking robot comprises three blocks (see Fig 1.): Walking planning, gait synthesizer and joint controller. The Walking planning block deals with walking planning, obstacle crossing and gait selection. The Gait synthesis block receives constant values such as the step length, walking speed, maximum foot lift magnitude from the upper level and so on. And then repetitively generate reference commands for joint controller.

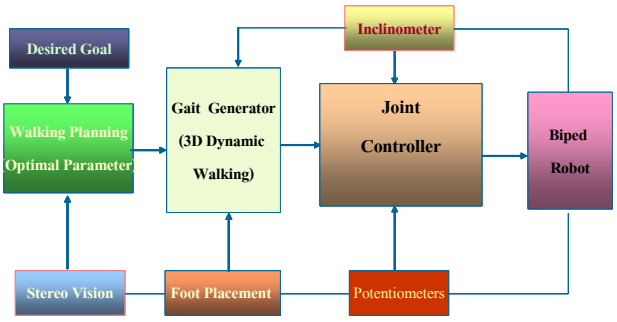

Fig 1. The Control Scheme of the biped dynamic walking.

Expected Results

The main contribution of this research is a neuro-fuzzy synthesis of gait generated algorithm with optimal learning algorithms to provide a simple but general and systematic way of implementing dynamic bipedal walking. There is no need for dynamics formulation.

Sponsor

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Reference

[1] H. Wongsuwarn and D. Laowattana, “Bipedal Gait Synthesizer Using Adaptive Neuro-fuzzy Network”, in the First Asia International Symposium on Mechatronics (AISM 2004), Xi'an, China, September, 27-30, 2004.