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How locomotion sub-functions can control walking at different speeds?

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Abstract

Inspired from template models explaining biological locomotory systems and Raibert's pioneering legged robots, locomotion can be realized by basic sub-functions: elastic axial leg function, leg swinging and balancing. Combinations of these three can generate different gaits with diverse properties. In this paper we investigate how locomotion sub-functions contribute to stabilize walking at different speeds. Based on this trilogy, we introduce a conceptual model to quantify human locomotion sub-functions in walking. This model can produce stable walking and also predict human locomotion sub-function control during swing phase of walking. Analyzing experimental data based on this modeling shows different control strategies which are employed to increase speed from slow to moderate and moderate to fast gaits.

Keywords: Bipedal walking, locomotion control, stance leg axial function, swing leg adjustment, posture control, conceptual models.

1. Introduction

Legged locomotion in biological systems is a complex and not fully understood problem. Employing template models (Full and Koditschek, 1999) can

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