Human Walk Pitch Extraction by Interactively Trainable Robot Vision for Human-Robot Synchronized Walking

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1. Introduction

This paper presents visual extraction of human walk pitch for human-robot synchronized walking. The walk pitch extraction is done by tracking human heel. The authors use their interactively trainable pattern recognition system to track the heel. This work is the first step of the authors plan to realize the synchronization. In the first step, human walk pitch is extracted visually. In the second, neural oscillator is entrained by the extracted pitch. In the third step, a walking robot is controlled by the entrained neural oscillator.

2. Pitch Extraction Experiment

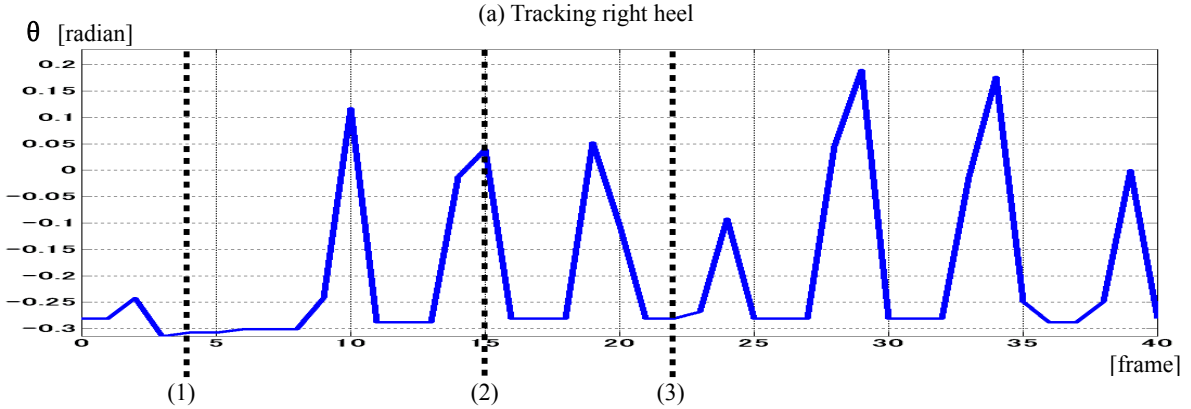
As mentioned above the authors conduct an experiment of human walk pitch extraction by using interactively trainable recognition system. Fig. 1 shows an experimental result. In this experiment, input image size is 160 by 120 pixels. The size of heel template is 19 by 19 pixels. A person is walking in front of camera.

As shown in photographs of fig. 1, the recognition system properly detects and tracks the heel of right leg. Superimposed red frame represents success of the detection. In lower part of the figure, temporal transition of the heel position is displayed. It is found that the system can extract both timings when the heel reaches the top position and the bottom.

The vertical axis of the time chart in fig. 1 (b) denotes the angle of sight line from center of eye to the target, that is the heel in this case. And the horizontal axis does time. Fig. 1 (b) demonstrates that the system succeeds to extract the pitch of the human walking.

(1) (2) (3)

(a) Tracking right heel



(b) Time chart of right heel position

Fig 1. Experiment Result of Measuring Walking Pitch