

Graduate School of Science and Engineering, Aoyama Gakuin University

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Title: Auditory Feedback to Encourage Improvement of Juggling Skills

Student Name: Kai YOROZU

ID Number: 35616171

Degree: Master of Engineering

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Thesis Advisor: Guillaume Lopez

Abstract

Juggling is a popular pastime all over the world. However, it entails a steep learning curve for self-taught novices to improve their performance, even when they are learning basic juggling techniques. One of the simplest juggling patterns, the 3 ball cascades pattern, can be used for the purpose of technology acquisition and sports science because it can quantitatively differentiate skill level, and the motion that includes difficult juggling patterns.

In this research, in order to help acquire such physical skills, we aimed to clarify the potential technologies of experienced players by analyzing juggling motions and to encourage juggling improvement by giving appropriate feedback to beginners. Specifically, we implemented three kinds of auditory feedback. We gave subjects real-time feedback to improve hand shake depth blur. Then, the objective is to mimic the movement of 3 balls cascade in beginner jugglers to the movement of skilled ones.

Firstly, we investigated how the effects on operation will be affected by implementing auditory feedback combining monophones and giving them to subjects. In the analysis, peak values of acceleration and coordinates were acquired from the movement of the arm, and from these values, the feature quantity showing the handshake of the depth was calculated and analyzed at two points of toss and catch. As a result, the feature amount showing the hand shake of the depth worsened. We hypothesized that it is difficult to recognize the feedback sound and it is confusing to reflect on the operation.

In order to solve this problem, we improved the feedback method and conducted experiment again. There are two methods, a method of making feedback sound depends on comfort and discomfort, and a method of improving recognition by song playing and stopping playback. As a result, the former feedback gave significant improvement in behavior at the toss, and other features were also shown improvement trends.

Although we could show a tendency toward improvement at toss by giving auditory feedback, we could not show significant improvement of catch operation which is said to be hard to improve. In addition, we can only analyze feature points, and we could not do motion analysis as a series of motions. In the future works, we will investigate the implementation of behavior analysis as a series of movements and feedback that can be improved, and whether improvement can be expected when giving feedback over a long term.