

Analysis of Hula Hoop Skills by using Dynamic Time Warping and Meta Cognition

Tomonobu Ozaki

Department of Information Science, Nihon University,
Sakurajosui 3-25-40, Setagaya-Ku, Tokyo 156-8550, JAPAN
tozaki@chs.nihon-u.ac.jp

This study aims at discovering useful insight on an acquisition process of hula hoop skills. We employ two approaches to achieve this objective. The first approach is the motion analysis. We analyze time series datasets of body motions by effectively utilizing dynamic time warping(DTW)[1] and try to detect some critical points or changing points in the acquisition processes. The second approach is the meta-cognition. We employ a hexagonal memo pad named ‘hex’[2] which provides cycles of ”write, layout, and think” for users to recognize interactions between one’s own body and the surrounding environment. By considering the results from two approaches of motion analysis and meta-cognition simultaneously, we can expect to effectively analyze the process of skill acquisition.

As a target skill for the analysis in this study, we select the most fundamental motion of hula hoop, *i.e.* hooping around the waist. In addition, as one of the advanced skills, we also discuss the developmental process of chest hooping, *i.e.* hooping around the chest.

By a careful consideration of the hex on the basic skill, we derive a hypothesis that the acquisition process of the basic skill consists of the following five stages. First, subjects rotate hula hoop only several times by using acceleration. Second, they take notice of the rhythm of rotation. Third, they perceive a sense of going down of the hoop. Fourth, they obtain a technique to return the hoop to the original position. Finally, they acquire an energy-saving method for the hooping. The results of the motion analysis also support this hypothesis partially. By applying DTW to the motion of torso, three periods with two changing points are found in the acquisition process of basic skill of a certain subject. We confirm the correspondence between the five stages from meta-cognition and three periods from motion analysis.

As similar to the basic skill, six stages are indicated in the acquisition process of chest hooping. Compared to the process of the basic skill, there are two notable characteristics. The subjects find out unrelated body parts in an early stage and they focus on the motion of the hoop. The results of motion analysis show a time lag between a changing point and skill acquisition point. This time lag can be explained naturally by the six stage process.

Acknowledgement: We express our special thanks to Mr. Nishiyama from Keio University for providing a careful instruction of hex. We also sincerely thank Ms. Nene Yamagishi and Ms. Reina Kato, former students in Nihon University, for conducting all experiments on this study.

References

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