

Robotic rehabilitation tool supporting up and down motions in the bathroom – analyses of the catapult-assisted taking-off mechanism

M Sone¹, H Wagatsuma^{1,2}, K Tachibana³, K Sakamoto⁴

¹Department of Brain Science and Engineering, Graduate School of Life Science and Systems Engineering, Kyushu Institute of Technology, 2-4 Hibikino, Wakamatsu-Ku, Kitakyushu, JAPAN

²RIKEN Brain Science Institute, 2-1 Hirosawa, Wako, Saitama, JAPAN

³Department of Physical Therapy, School of Health Sciences, Ibaraki Prefectural University of Health Sciences, 4669-2 Ami, Ami-Machi, Inashiki-Gun Ibaraki 300-0394 JAPAN

⁴Research Institute of Electrical Communication, Tohoku University
2-1-1 Katahira, Aoba-ku, Sendai 980-8577, JAPAN

*sone-masafumi@edu.brain.kyutech.ac.jp, waga@brain.kyutech.ac.jp,
tachibana@ipu.ac.jp, sakamoto@riec.tohoku.ac.jp*

¹www.kyutech.ac.jp, ²www.riken.go.jp, ³www.ipu.ac.jp, ⁴www.riec.tohoku.ac.jp

ABSTRACT

Flexibility and quickness of biological muscles are of interest to people developing welfare robots and studying physiotherapy procedures. We focus on the transition process from sitting to standing in human motions, which needs to generate an instantaneous force at the moment of standing, and propose a robotic device to help the up-and-down motion in the bathroom by assisting the force when the backside is taking off from the lavatory basin. Our lightweight construction device allows disabled persons to move easily from the living space to the bathroom and assist its motion from the viewpoint of rehabilitation. In the prototype experiment, the artificial muscle—based on elastic-plastic materials by using rebound characteristics in an S-shaped structure—demonstrated that a cyclic motion triggers a generation of instantaneous force large enough to launch a ball. This suggests that the combination of the movable frame with the human body and the artificial muscle mechanism provide a user-friendly tool for self-supporting life of disabled persons.

Full papers will be published in the Conference Proceedings and will be available to delegates at the conference on Sept. 10.

Full papers will be released on-line in the ICDVRAT archive on March 15.