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Systems approach for visualization of somatic balance restoration therapy to alleviate pain of human musculoskeletal system

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Statement of the Problem: Chronic pain and general physical discomfort are common symptoms among those seeking medical or physiotherapy treatment, as it relates to disorders found in the Human Musculoskeletal System (HMS). Since this system is highly complex and large in scale, clinical pain research has been confounded by many complex factors. To tackle with such a complex problem, the authors have applied a system engineering approach to examine a therapist-guided exercise method for restoring human musculoskeletal balance called the *Somatic Balance Restoration Therapy* (SBRT). The SBRT is a simple but effective self-exercise therapy with minimal assistance by a trained therapist. As shown in Fig. 1, the SBRT starts with diagnoses of a series of voluntary motions self-excited by patient and the results are recorded in a systematic way in which the motions are categorized according to the patient reactions; painful, hard or comfortable. The voluntary motions are usually accompanied by involuntary motions that are utilized in the SBRT. The results of the diagnosis are analyzed by matrix manipulations leading to identification of malfunctioning part of HMS. The process is to relate 80 voluntary motions and 58 associated motions to joint motions, which are converted to the functional anatomical terms. This realizes smooth communication between specialists of three different disciplines: therapy, conventional medicine and systems engineering. It is noted that each voluntary motion accompany more than one anatomical motions. This step is extremely important to integrate conventional medicine and oriental therapy. Furthermore, joint DOF expression is immediately linked to robotics, which leads to computer-aided support of the therapy process. Some examples will be given to demonstrate the proposed therapy.

Biography

Yoshiaki Ohkami obtained his Engineering from Tokyo Institute of Technology and joined National Aerospace Laboratory of Japan (1968-1992). During the period of 1972-1974, he worked at UCLA as NASA International Fellow, in 1985-1986 Deputy Director for International Space Station Program Office at Science and Technology Agency. He served as a professor of Tokyo Institute of Technology in 1992-1999, and was invited by JAXA to manage the overall R&D activities of the Tsukuba Research Center from 1999 to 2006. In 2000, he was invited as a professor of graduate school of Keio University to augment the higher education programs in system design engineering, and now he is the Dean of Graduate School of Systems Design and Management, Keio University. He took the initiatives in establishing this new graduate school that started in April, 2008.

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