Development of Robot Patients System for Learning Wheelchair Transfer Skill

One of the serious problems in current nursing education area is the reduction of student's experience of dealing with real patients due to the safety management and ethical issues. Our previous studies tried to solve this problem by developing the robot patient system for learning wheelchair transfer skill which is the typical skill in nursing movement [1][2]. Figure 1 shows the details of the robot patient system. Specifically, a force sensor attached to the robot's waist can measure and evaluate the force applied from nurse, and motors set in the ankle, knee, and hip joints of the robot are controlled according to it.

In this study, to achieve the "real patients like" robot motion, we measured the motion of the patient and the force applied from nurses in wheelchair transfer, and implemented the control theory based on it into the robot patient [3]. Specifically, first, we conducted the experiment to measure the motion of the patient and force applied from the nurse to the patient by using the experimental system consisting of optical motion capture camera system and a force plate. Then, we construct the control theory to achieve the real patient like motion in the robot patient, and, specifically, admittance control theory was adopted for modeling the relationship between the force applied from nurses to patients and patients' motion during wheelchair transfer movement. Owing to the nature of the admittance control theory to output the position or velocity based on the force as the input, we can express the human like patients' motion such as "falls forward when pulled with too large force" or "move slowly when weak force is applied" by using it. It is expected that nursing students learn the way of appropriate force interaction with patients through this robot.

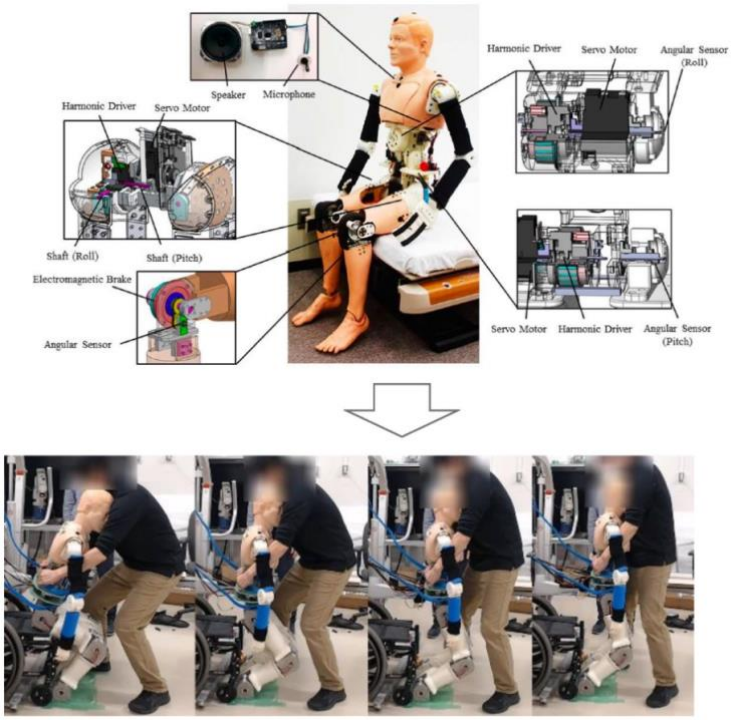

Figure 1. Details of the robot patient system

Finally, we conducted an experiment to verify the patient robot system we developed in this study. (Figure 1), and confirmed that the patient robot was able to discriminate between small and large forces applied by the nurse and provide feedback based on it (e.g., too large force). In the future, it is expected that we collect the data on patients with various symptoms, and implement it into the robot 's control theory and achieve the robot patient system for learning how to interact with patients with various symptoms.

Keywords: robot patient, modeling of human motion, nursing education

References:

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