DEVELOPMENT OF A BODY MOVEMENT DETECTION SYSTEM TO PREVENTING PRESSURE ULCER

No.2281236 Aoi Kuroshima
(Supervised by Prof. Masaya Watada)

ABSTRACT

Pressure ulcers are defined by the Japanese Pressure Ulcer Society as follows: "External forces applied to the body reduce or stop the blood flow in the soft tissue between the bones and the skin surface. If this situation persists for a certain period, the tissue becomes irreversibly heterolytically compromised, resulting in a pressure ulcer." Pressure ulcers vary in severity and are often associated with complications such as hypoproteinemia, bone atresia and sepsis. One method of preventing pressure ulcers is to change positions at intervals of two hours or less to relieve pressure on the same spot for an extended period. Measurement devices used in pressure ulcer prevention and treatment generally use pressure or acceleration sensors to measure body surface contact pressure. However, problems such as device failure due to incontinence and the inability to measure when pressure-dispersing bedding is used due to contact with the body can be cited. Therefore, they are not suitable for constant measurement in medical and nursing care settings. Posture monitoring using non-contact sensors is necessary. In this study, a body movement detection system based on posture estimation was investigated using a non-contact near-infrared camera, Azure Kinect DK, with the aim of preventing bedsores. We calculated feature values (area/angle) from the skeletal data obtained from posture estimation and judged the supine and side-lying body postures, aiming to evaluate whether body postures are changed and to prevent the patient from remaining in the same posture for a long time. In the area evaluation, a triangle was formed from three points, one at the buttocks and two at the acromion, and the evaluation was based on the difference in the size of the area projected onto the camera plane depending on the body position. As a result, the highest percentage of correct responses was obtained when judging the body position based on the ratio of the area of the triangle in the coronal plane at t[s] at both shoulders of the buttocks to the area of the triangle as seen from the camera, regardless of whether a blanket was used or not. In the angular evaluation, the body position was examined by determining the angle between the four-plane body surface and the bed surface from two points on the acromion and two points on the buttocks, respectively. As a result, it was possible to measure the body position from one plane. The area and angle evaluation proposed in this study can be used to determine the body position and evaluate whether or not the body position is changed. In this report, the development of the proposed body movement detection system and the effectiveness of the body position determination were examined from the analysis based on posture estimation.