

ABSTRACT

SLEEP MONITORING SYSTEM BASED ON BODY POSTURE MOVEMENT USING MICROSOFT KINECT SENSOR

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Sleep activity is one of important factors to determine the quality of human life. It also closely related to sleep quality which is influenced by several factors such as daily activities, mental condition, and physical condition. Device that currently used to monitor sleep activity is called polysomnography. This device is used in sleep monitoring systems at hospital by attaching electrodes to the subject's head. However, the usages of this tools leads to feeling of discomfort by subject and affect the sleep monitoring result.

In this study, a sleep monitoring system using Microsoft Kinect Sensor v.2 was designed. Microsoft Kinect Sensor v.2 is a sensor that able to capture human's movements. Subject's sleep quality is determined by the count of posture movement within 105 minute sleeping time. The sleep posture is determined by using boundary information method. Boundary information method divides the body into three parts with by using 3-base line algorithm (middle, upper, and lower line). This method use 4 joints (right palm, left palm, right knee, and left knee) as key points. The postures are categorized as foetus, log, yearner, soldier, and starfish.

The analysis results of sleep monitoring system output are classification of subject's sleep quality along with the dominant sleep posture. The system tested in a duration of 105 minutes and number subject's posture changes per minute is called Minutely Posture Movement (MPM). Sleep quality is classified into 3 categories, namely: Approximately Good, Aproximately Normal and Aproximately Bad. The classification constants of Approximately Good, Aproximately Normal and Aproximately Bad are obtained from Q1 and Q3 of 10 subjects MPM. Value Q1 is 0.08 and value Q3 is 0.15. Subject's sleep quality is categorized as follows: Aproximately Good if $MPM < 0.08$; Aproximately Normal to $0.08 \leq MPM < 0.15$; and Aproximately Bad if $MPM \geq 0.15$. Based on results from 10 subjects, the sleep quality of 20% subjects is categorized as Approximately Good, 50% Aproximately Normal and 30% Aproximately Bad. Based on dominant posture, 70% subjects has dominant yearner posture, 20% subjects has dominant soldier posture, 10% subjects has dominant foetus posture. The designed system has an accuracy of 87.38% with a relative error value of 12.62%.

Keywords: polysomnography, microsoft kinect sensor v.2, boundary information, Minutely Posture Movement.