Using skeletal information to help people learn how to use chopsticks properly

1910177 Shinichiro Hara

In this study, we proposed a support system for users to learn how to use chopsticks correctly. We proposed a method to support users in learning how to use chopsticks correctly, which is to hold them in the traditional way. We proposed a method to support the user to learn the correct way of using chopsticks. The system feeds back to the user the anomalies in the skeletal information of the user's fingers compared with the skeletal information of the fingers in the correct way of using chopsticks.

In our proposed method, we used OpenPose to estimate the skeletal information of the fingers while manipulating chopsticks, and analyzed the hand movements based on the obtained joint coordinates of the fingers. The posture of the hand while manipulating the chopsticks was evaluated using the cosine values of the joint angles. We defined vectors connecting adjacent joints from the coordinates of each joint, and considered the cosine values of the joint angles at the first and second joints of each finger. We detected the fingers that were moving incorrectly when compared to the fingers that were moving correctly when operating the chopsticks, and provided feedback to the user. In addition, we proposed to feed back to the user the skeletal movements of the fingers when the user is operating chopsticks and the skeletal movements of the fingers when the user is using chopsticks correctly, to help the user understand and learn the hand movements when the user is using chopsticks correctly.

We conducted an evaluation experiment to verify the proposed method. In the evaluation experiment, we counted the number of abnormal hand movements during the chopstick operation and the amount of soybean movement in one minute to measure the user's skill in handling the chopsticks. This procedure was repeated twice. The first time, the user held the chopsticks in the way he or she usually does in daily life. In the second operation, the system provided feedback to the user after the first operation, and the user confirmed and grasped the correct way to use chopsticks, and then performed the same operation. The effectiveness of this system was evaluated by comparing the number of counts of abnormalities and the number of counts of soybean movement between the first and second operations. We also conducted a questionnaire survey on the use of chopsticks and

the proposed system after the experiment.

As a result, compared to the first operation, the counts of abnormal hand movements decreased and the counts of the amount of soybean movement increased in the second operation, which strongly indicated the effectiveness of this system. In addition, in the questionnaire survey, many respondents confirmed that the feedback contents were easy to understand. In the questionnaire survey, many respondents said that the feedback contents were easy to understand. On the other hand, some respondents said that it would be easier to understand if the system had a UI to provide guidance to users and comments on the feedback contents.

As a future issue, it is thought that not only text-based feedback and guidance methods but also voice-based methods can be applied.

In conclusion, we confirmed that this system reduces the number of incorrect hand movements in chopstick usage and improves chopstick skills.