

Motion Analysis of the Tea Whisk Concerning the Way of Tea

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Abstract. The way of tea is the Japanese tea ceremony. In this research, one super expert and an expert and beginner were employed as the behavior subject. During the tea-mixing process, the subject's motion and trace were captured by the high-speed camera system from top side of the participants. The coordinates of the right index finger in the x and y direction was captures and analyzed. Base on the data from the high-speed camera system, each key gesture of the subjects were focused, motion feature affected the final teas were extracted and analyzed. The tea-mixing process was divided into three kinds of processes according to the velocity of the tea whisk. In the case of the super expert, the action of the tea whisk was high speed at short time of the first period. And changed gesture and stirred around with uniform speed at second period. At third period, the action was decreased gradually.

Keywords: Tea ceremony · Process analysis · Motion analysis

1 Introduction

“The way of tea” called the “Japanese tea ceremony”, is a special ceremonial art preparation and presentation of green tea powder to entertain the guests. The whole process is not only drinking the tea, but also is enjoying the tea ceremony and feeling the tea making guest's heart. Each movement and gesture was always considered as an important part of ceremony. A good tea master can mix the green tea power into the hot water with a period of proper time, which ensures the mixed tea hold the optimal tasting temperature. As same with stirring speed and frequency, the movement skills and stirring track is also one of the most important features influence factors for master. The previous researches of our group were reported about the motion analysis of the way of tea [1–3].

In this research, one super expert, an non-expert and beginner were employed as the subjects. During “the way of tea” performance, the subject’s motion and trace were captured by high-speed camera system during the tea-mixing process. Base on the data from the high-speed camera system, each key gesture of the subjects was focused, motion feature effect on final teas were extracted and analyzed.

2 Experimental Procedure

2.1 Subjects and Apparatus

Three persons participated in this experiment. There were one of the grand tea masters in the “Urasenke”, a trainee and an inexperienced person. In this paper, there are called super expert, non-expert and beginner respectively. The number of experience years of the super expert was 30 years over. The non-expert has two years of experience. The tea mixing processes of all subjects were measured by a high-speed camera (MEM-RECAM Q1m/Q1v, nac Image Technology Inc.). The camera was set upper the tea bowl and the frame rate of the camera was set for 500 fps.

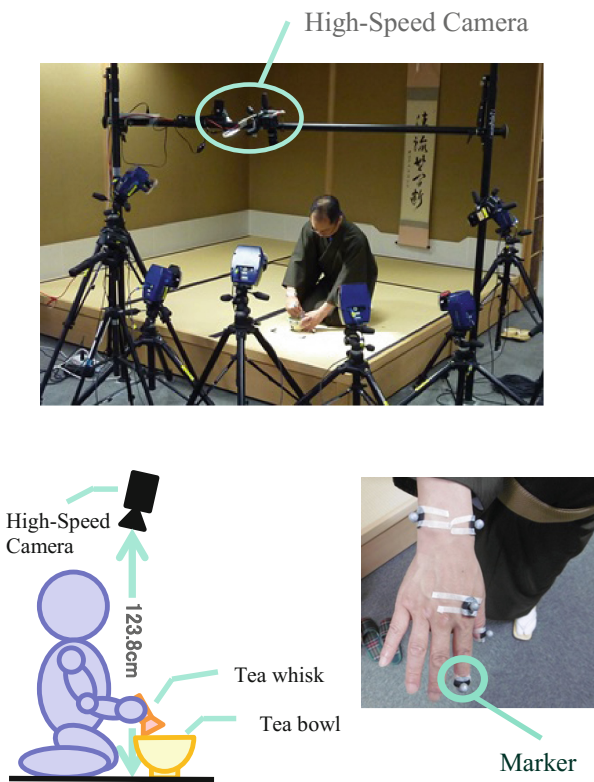
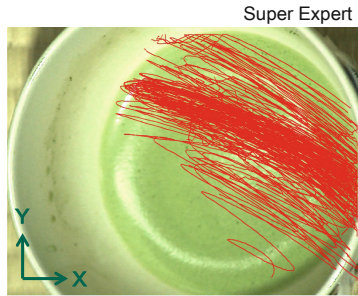


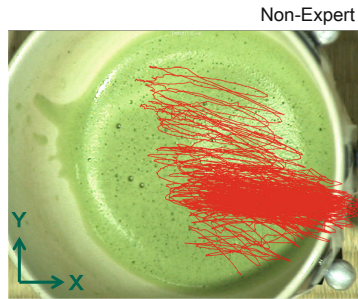
Fig. 1. Experimental situation.

2.2 Analysis Procedure

The track of subject's index finger was measured by the camera during the mixing the tea powder and hot water. The coordinates of a marker on the finger were analyzed by



(a) Super Expert



(b) Non-Expert



(c) Beginner

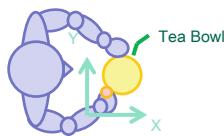
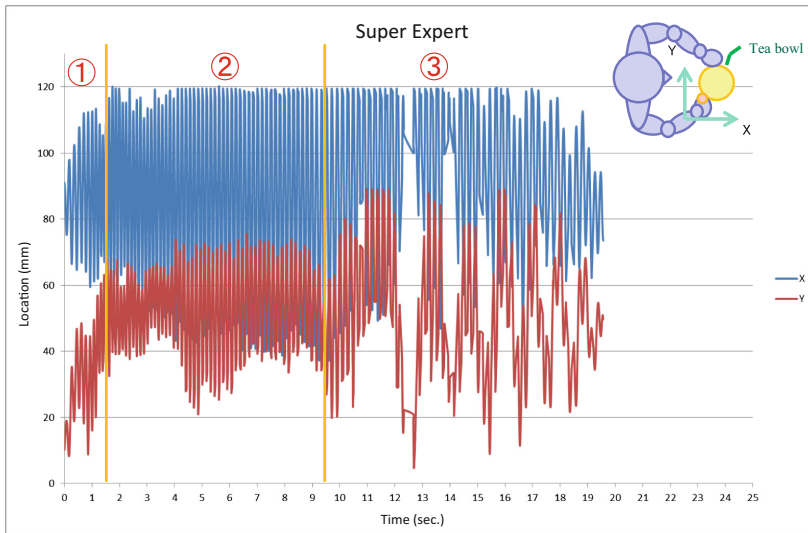
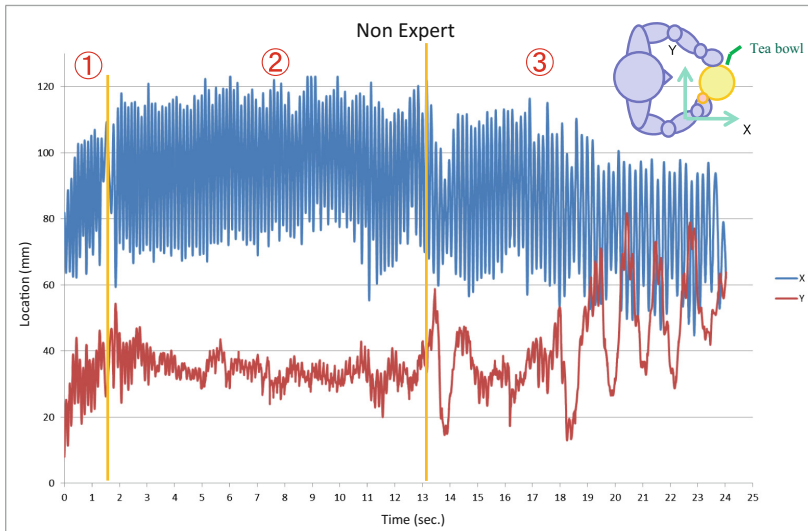


Fig. 2. Track of the tea whisk in tea bowl.

application software (TEMA, Photron Co., Ltd.). The location and velocity of the marker were calculated during the time. After checking the velocity of the super expert during the time, the working time was divided into the working types. The experimental situation is shown in Fig. 1.

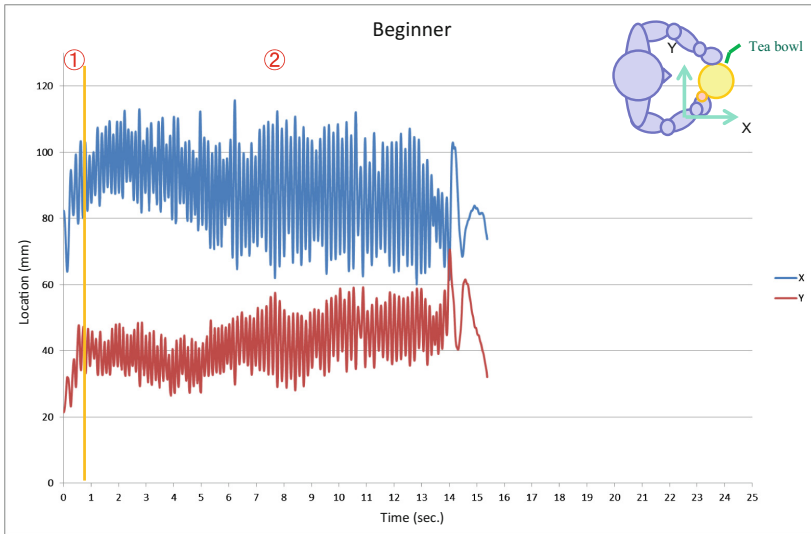


(a) Super Expert



(b) Non-Expert

Fig. 3. Track of the tea whisk about X and Y direction.



(c) Beginner

Fig. 3. (continued)

3 Result and Discussion

3.1 Track of the Tea Whisk in Tea Bowl

Track of the tea whisk in tea bowl of each subject are shown in Fig. 2. It was clear that each track was different. In the case of the super expert, the track of the tea whisk was widely and intensively in the tea bowl. However, in the case of beginner, the area of the track was very small. Track of the tea whisk about X axis and Y axis direction are shown in Fig. 3. In the case of super expert, the working behavior was divided into three kinds of processes. In the first process, the track of the tea whisk was moved from insertion point to the edge of tea bowl in a short time. In the second process, the track was moved widely from the front side to the depth side. However the track of lateral motion was small. In the third process, the track of lateral motion was widely. In the case of non-expert, the working behavior was able to be divided into three processes with according to the super expert approximately. In the case of beginner, the track was existed in the two processes, so that it was not included the final third process.

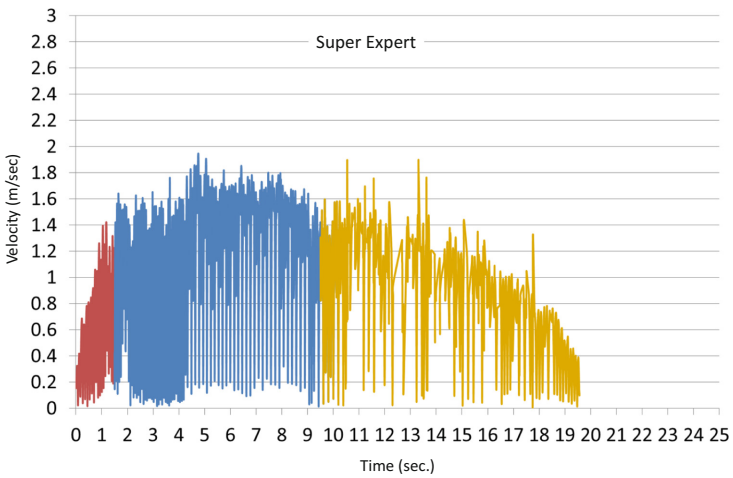
3.2 Velocity Variation of Tea Whisk

The velocity variation of the tea whisk is shown in Fig. 4. In the case of the super expert, the velocity of the first process increased rapidly from starting time. The velocity of the second process was almost stable with maximum value. The velocity of the third process decreased gradually to finishing time. In the case of non-expert, the velocity was almost stable during the working time. However, when the process was changed, the velocity decreased and increased rapidly. In the case of beginner, the

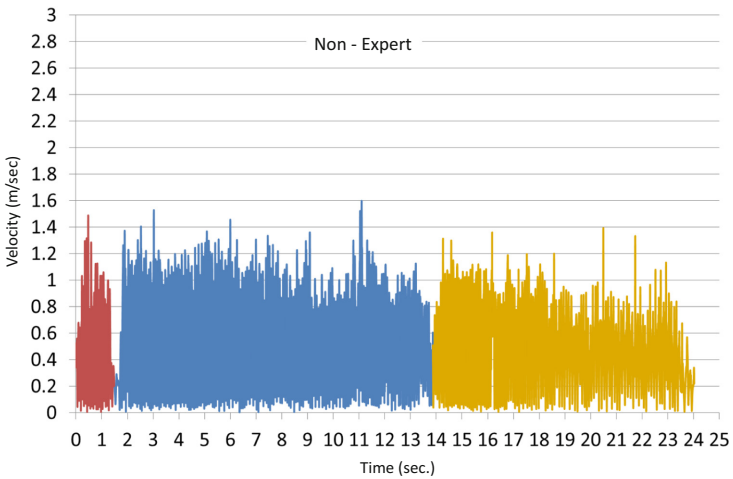
velocity increased gradually from starting time to finishing time. There was the maximum value of the velocity about finishing time.

3.3 Analysis of Each Process

In the case of the super expert, it was considered that the first process means to mix the tea powder and hot water. During the first process, the tea powder dissolved in hot

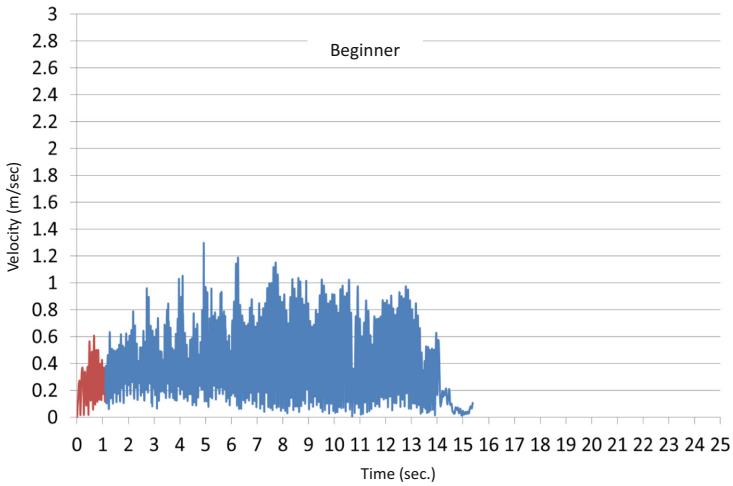


(a) Super Expert



(b) Non-Expert

Fig. 4. Velocity variation of tea whisk.



(c) Beginner

Fig. 4. (continued)

water perfectly. The second process means to make the bubble in the green tea probably at stable velocity. The third process means to arrange the bubble on the surface of the green tea, so that the tea whisk was moved whole surface of the tea with decreasing the velocity.

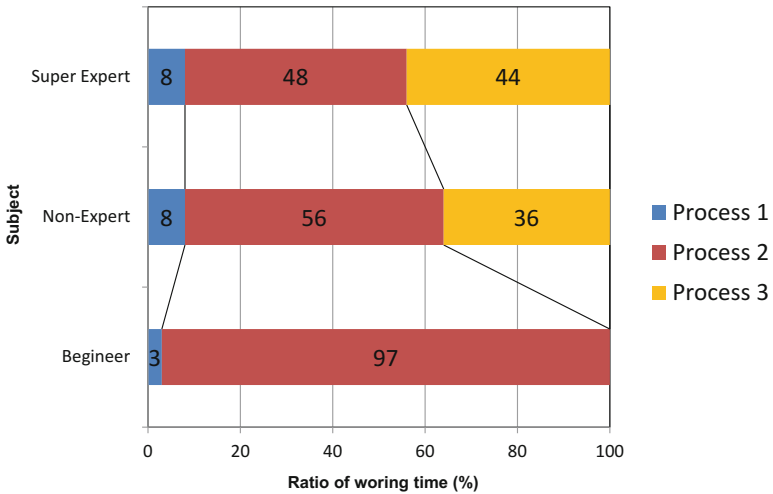


Fig. 5. Ratio of working time on each process.

3.4 Ratio of Working Time

In the case of the super expert, it was spent much time for the third process among the subjects. In the case of non-expert, the tendency of the ratio of working time was similar to the super expert. However, in the case of beginner, it was not included the time for the third process. It was spent almost all time for the second process (Fig. 5).

4 Conclusion

In the case of the super expert, it was cleared that the working time was able to be divided into three processes as follows, the first process was to mix the tea powder and hot water in the tea bowl, the second process was to make the bubble in the green tea and the third process was to arrange the bubble in whole surface of the green tea. Moreover, the third process of the super expert had much time more than non-expert and beginner.

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