

Research on the Motion Technique of Japanese Tea Ceremony

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Abstract. In this paper, the tea making of motion skill by tea master of “The way of tea” was investigated by High speed camera. The most important process at beginning of tea making, which using tea whisk to mix the hot water and tea powder with high speed, was focused and recorded. The tea master’s motion track of tea whisk was clarified and analyzed by software. The final tea also was recorded by camera. The surface of bubbles was measured by numerical method. The expert regular move up and down tea whisk was considered the important Characteristics for the tea making motion.

Keywords: Motion technique · Japanese tea ceremony · The way of tea · Tea making skill

1 Introduction

“The Way of Tea” (“Chado”) is one of traditional artistic activities accumulating long Japanese ancient culture. Japanese tea ceremony is developed based on “daily after-meal”. “The Way of Tea”, also called the “Japanese tea ceremony”, is a special ceremonial art preparation and presentation of “matcha” (a kind of green tea powder) to entertain the guests, through the tea ceremony people will achieve temperament, improve the cultural quality and aesthetic view. The essence of “The Way of Tea” is meant to demonstrate reverence and respect between host and guest, both of them can truly experience the artistic conception and taste the most primitive taste of green tea during tea-tasting activity and service process with the tallest state of the etiquette.

“The way of tea” is a special art performance to entertain the guests, through the tea ceremony people will achieve temperament, improve the cultural quality and aesthetic view, which consisted of many specific and strict procedures, whose basic skill just only handed over by oral instructions by expert. However, until now the scientific explanation for the detail process skill is limited. Therefore, it is valuable to conduct some scientific

comparison and motion analysis to keep this country cultural treasure and inherit to the next generation effectively.

In previous research, the cluster of small bubbles in the surface and suitable temperature was considered to be an important symbol of a bowl of delicious and aesthetic Japanese tea (“The way of tea”).

The experience factors influence on motion technique of “The way of tea” was clarified by numerical method. During tea ceremony process, each process’s point of degree of mixing and bubble distribution were focused, relationship between timeliness and different tea whisks were extracted and analyzed according to four stages, 100 %, 80 %, 50 % and 30 % of tea making finishing time. And the whole tea making process was recorded by high-speed camera. Finally, both the relationship between the bubble distribution and stirring frequency was clarified.

It was presented that the expert stirred hot water and tea powder by tea whisk with quickly motion in the first period so that produced the most widespread bubbles quickly at the beginning of tea making. Afterwards, use slowly motion to mix tea to break large bubbles to become small bubbles until the final tea finishing.

Therefore, it was considered that stirring hot water and powder at beginning was one of most important key motion for tea making. The expert was able to perform high stirring speed during the first process in order to agitate the tea powder in hot water quickly.

In this research stirring action influence on bubble formation at beginning of tea making process was paid attention.

A tea master was employed as the behavior subject, who has more than 20 year experiences, who was called as expert in Kyoto. The subject was required to make a tea, mixing tea powder and hot water until she was satisfied for it. The motion and trace of the subject at beginning of tea making process (14 s) was captured by high-speed camera. The bubble of tested tea was recorded by camera. The photo was processed by numerical method in order to measure the bubble size and summary distribution in this study. The mixing frequency and amplitude of stirrings were calculated by software. The features of bubble distribution and motion characteristics were comprehensive analyzed and compared in the end.

Furthermore, the key motion characteristics was found out and discussed. The conclusion was able to provide a reference for learners.

In a word, this study through clarified the tea master’s movement during the most important production process of the way of tea in order to find the effective mixing method and obtain the excellent finished tea finally.

2 Experiment

2.1 Participants and Subjects

One Japanese tea master from Kyoto were employed as a participant, who had more than 20 years experiences in “The way of tea”, which was called as tea master in this paper. One classical type of Japanese tea whisks was selected for proceeding the experiment called as “Kankyuan” as shown in Fig. 1, whose number of brush was 62.



“Kankyuan”

Fig. 1. Japanese tea whisks

2.2 Experimental Process

The participants were required to whisk together green tea powder and hot water. 1.5 g of “Matcha” tea powder and approximate 56 g of hot water were dumped into the bowl, and the moisture content of tea was controlled at approximately 97 % steadily. The first 14 s of whole tea making finishing time were clearly recorded by a high-speed camera (FASTCAM SA4 Photron Co. Ltd) as shown in Fig. 2. The shutter speed was 3600 frames per-second.



Fig. 2. High-speed camera system

2.3 Processing Analysis

The two marks were affixed to the participant’s hand with different colors, the other one mark was affixed to the tea whisk as shown in Fig. 5. The coordinates of three marks in

the x or y direction was captured and analyzed by TEMA 3.5 software (Photron Co. Ltd) as shown in Fig. 3.

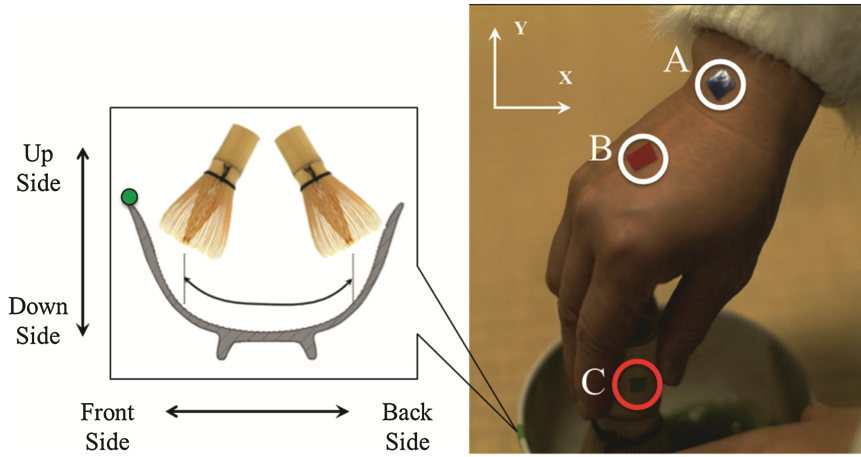


Fig. 3. Location of record markers (Color figure online)

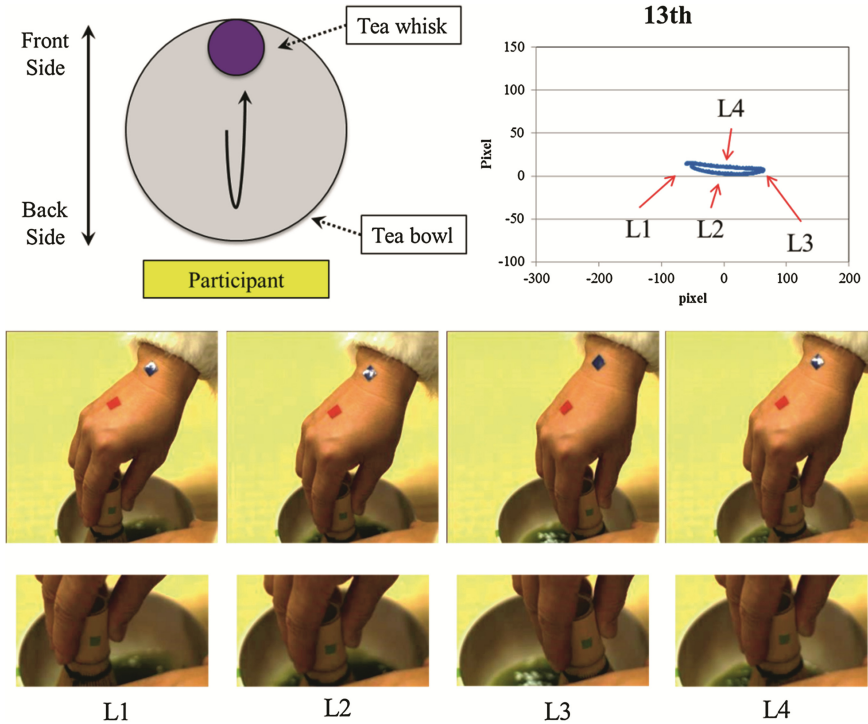


Fig. 4. The schematic diagram of tea whisk stirring process

The first fourteen seconds of tea master's movement was counted and summarized by watching the High-speed video. In order to make the further analysis by software, the four directions were defined according to the tea master's location. In front of tea master's location was defined as front side, which was identified by green mark. The side of closed to tea master was defined as back side. And the up and down in vertical direction were called up side and down side as shown in Fig. 3.

The tea mixing movement was consisted of many times stirrings according to each vibration as shown in Fig. 4. During one stirring, the tea whisk was moved in front side of tea bowl (L1), then move to the back side of location L3 through the Location L2. Finally, return to center of tea bowl (L4).

2.4 Image Processing

In this research, the surface of final tea was recorded by camera, the size of the bowl was selected as a reference for calculation, diameter: 12.6 cm. Afterwards, circle region of all bowl were analyzed and transferred by numerical processing from Fig. 5(a) to (b). It should be mentioned that only bubble forms larger than 0.01 mm^2 area was marked. Furthermore, marked bubbles were transformed by the binarization processing method into a white and black two colors as shown in Fig. 5(c). The outlines of bubble form and bubbles' distribution state were also sketched on the processed image. Finally, the areas of the bubbles were calculated and converted to the area unit.

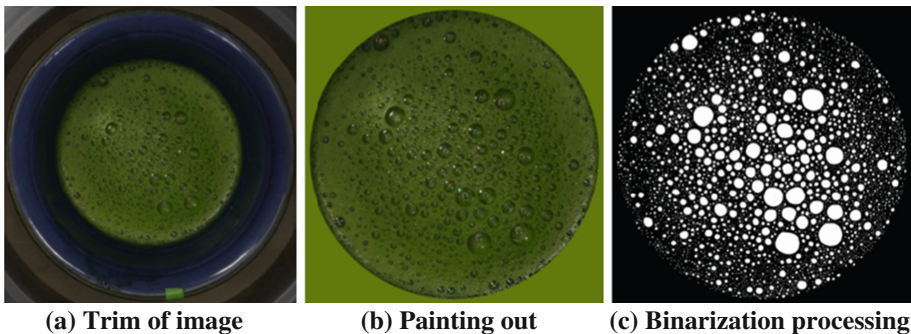


Fig. 5. Procedure of image processing

3 Results and Discussions

3.1 Result of Process Analysis

As the mention above, first fourteen seconds of tea making process was recorded by high speed camera. The movement track of tea whisk was illustrated in Fig. 6. According to Fig. 6, the horizontal direction was working time of fourteen seconds. The depth direction was front side and back side. And the vertical direction was up side and down side. It is easy to found that the tea whisk was moved up and down during tea making

process, which was considered as a periodic cycle of mixing movement. During first fourteen seconds, nine cycles were separated each periodic movement.

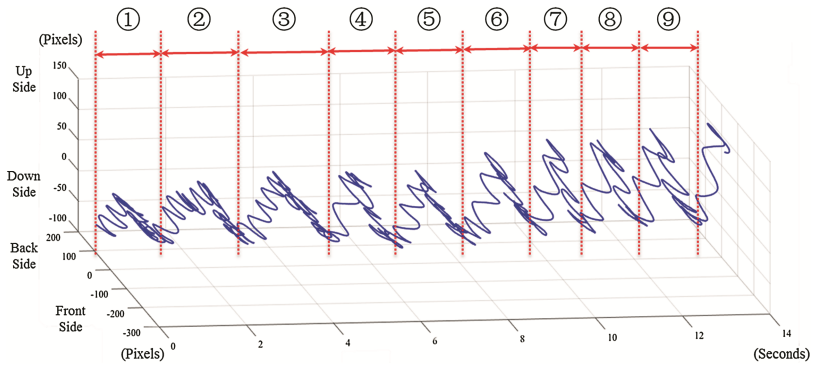


Fig. 6. Movement track of tea whisk

The first periodic cycle was extracted and illustrated in Figs. 7 and 8. The first cycle was consisted of eight stirrings. The all stirring track of tea whisk was shown a slight concave trajectory during moving to back side (from L1 to L3), which was considered that more conform to the shape of the bowl. The track of tea whisk was shown a slight lift when tea whisk return to the center from back side (L3 to L4).

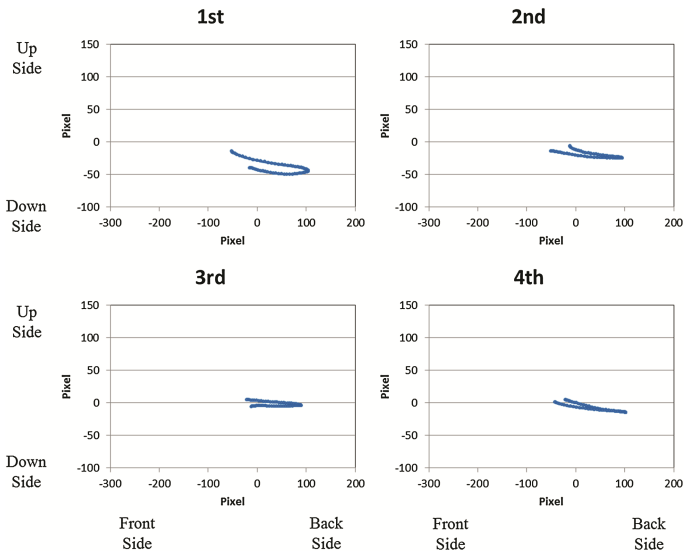


Fig. 7. The 1st to 4th of movement track of tea whisk in first cycle

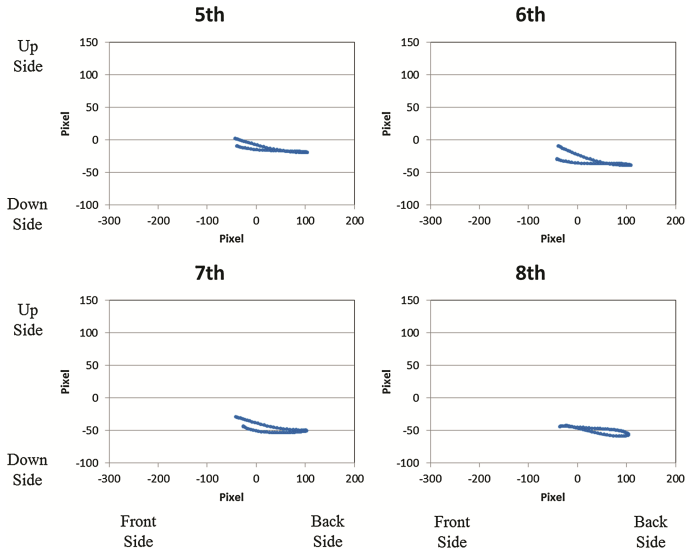


Fig. 8. The 5th to 8th of movement track of tea whisk in first cycle.

3.2 Result of Image Analysis

The final proceeded product by tea master after image process and distribution were illustrated on Figs. 9 and 10, which bubbles bigger than 1 mm^2 was marked. It is can found that the bubbles of final tea made by tea master were concentrated on the range of from 0.01 mm^2 to 0.9 mm^2 . All the bubbles were presented small sizes, which had

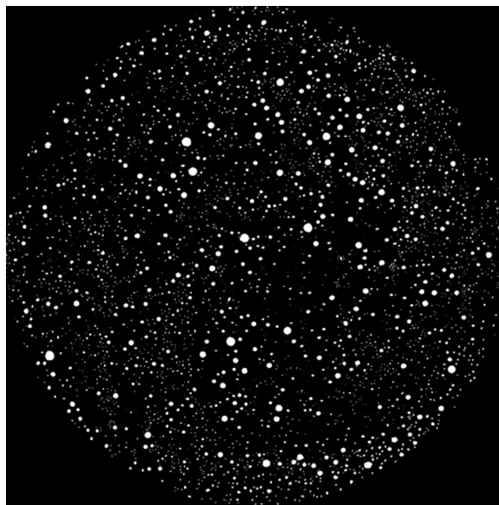


Fig. 9. The proceeded photo of tea surface

more bubble's size closed to the range of $0.01 \text{ mm}^2 \sim 0.9 \text{ mm}^2$. There was few bubbles was bigger than 0.9 mm^2 , which located at the range of $1 \text{ mm}^2 \sim 9.9 \text{ mm}^2$. Comparing the previous research, the tea masters' bubble was shown a very ideal distribution.

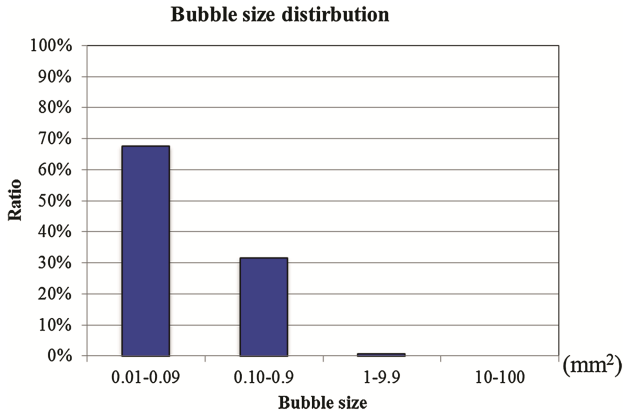


Fig. 10. The bubble distribution of bubble on surface of tea

4 Conclusions

In a word, the tea master was shown regular move up and down during tea making during high speed stirring process. And the tea whisk of each stirring was also presented stable movement. The bubble distribution of final tea was concentrated on the range of small size. It can be considered that, tea masker's motion can achieve a good tea.

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