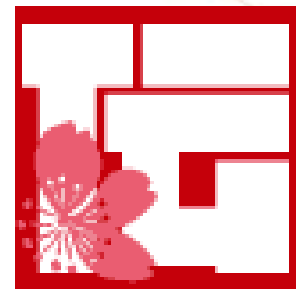




# 大学との取り組み

(匠の技編)



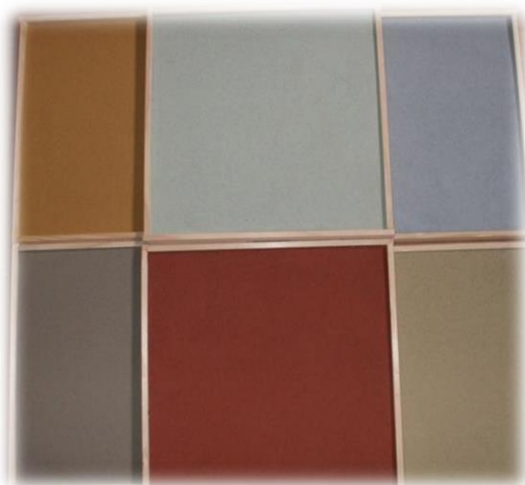
株式会社中央ビジネスグループ・代表取締役

株式会社伝統みらい・代表取締役

博士(学術) 太田智子



# 伝統工芸

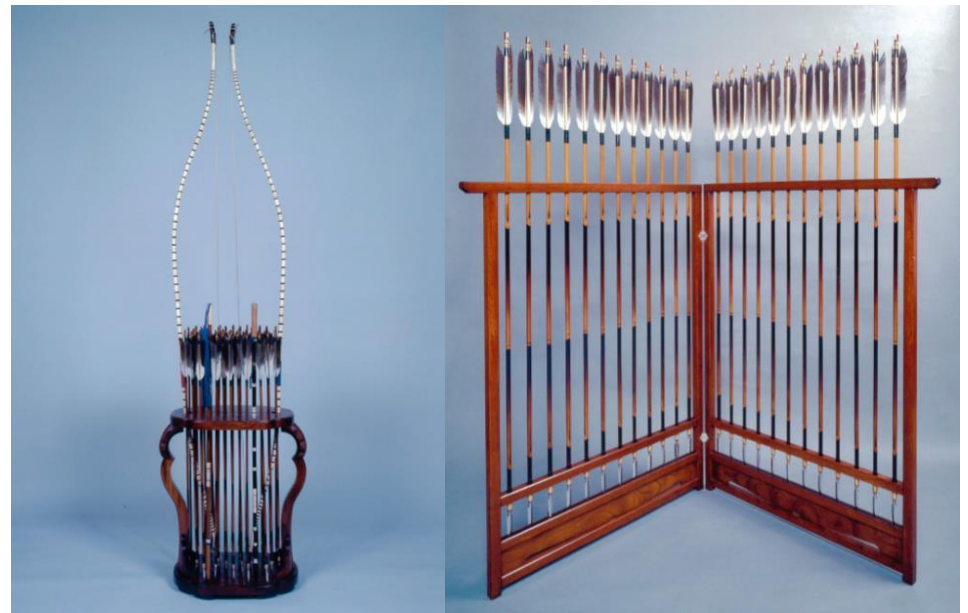


# 京弓：御弓士21代目柴田勘十郎氏

- 材料は竹
- 断面は、5つの竹の貼りあわせ
- 瞬時にしてより分ける
- まっすぐな竹が曲がる
- 弓は複合材料構造
- 求められる特性は動的
- 体が検査機能を持っている
- 塑性加工のひとつ



柴田勘十郎氏が弓を作っている様子



定価1000万円超の作品

# 漆：京蒔絵漆芸（下出蒔絵司所）

- 刷毛の毛先がまるい
- 厚さの測定
- 道具の工夫＋塗る作業のコツ
- 美しさと色と膜厚の関係
- 膜厚一定Coating



ブルガリと下出祐太郎氏との交流



「悠久のささやき」お香合

# 刷毛とアクリルボードの角度



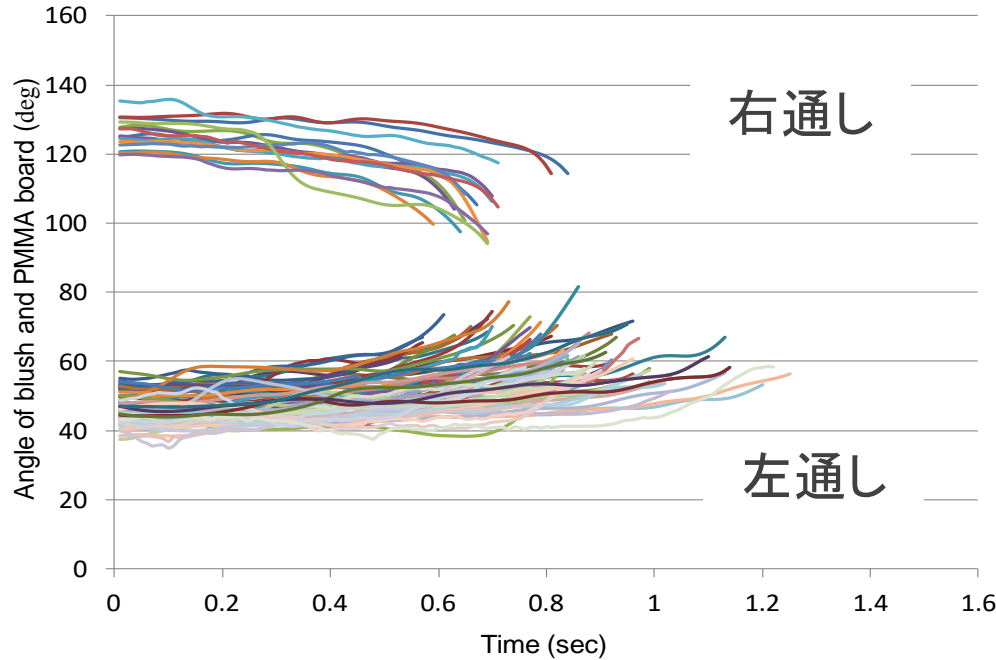
熟練職人



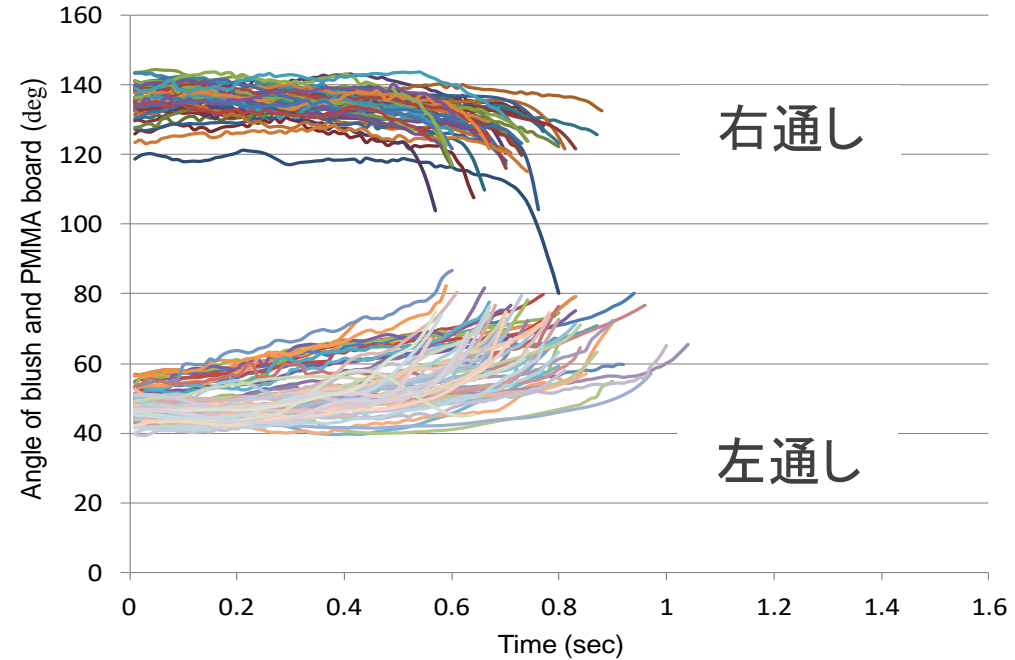
非熟練職人

# 熟練職人，非熟練職人の刷毛角度

熟練職人



非熟練職人



熟練職人の刷毛角度は，左通し，右通しともに，  
非熟練職人よりも小さい。

# 京瓦：浅田製瓦工場

- 瓦のリサイクルを実施
- 古い瓦の粉充填により強度向上の可能性を探る！



AGENDA / DE LA CONNAISSANCE TACITE À LA CONNAISSANCE EXPLICITE

Conférences - ven. 16 mar. 2018 à 18h

DE LA CONNAISSANCE TACITE À LA CONNAISSANCE  
EXPLICITE



2018年3月 パリの日仏会館にて講演会が開催された

# マーカー装着位置

頭部の4箇所  
頸部  
左右の肩峰  
肘頭  
橈骨  
尺骨  
手の甲  
腰骨  
計17箇所



# 測定時の映像



# 京壁：京壁井筒屋佐藤

- 従前から土壁と相対する  
ときの「心の落ち着き」
- 混入しているわらはは2週間  
たったほうが、塗りやすい
- 調湿材料としての土壁の  
特性測定を実施
- 耐震構造としての土壁
- 天然素材複合材料界面



# 京壁の物性と機能および施工法に関する研究

- 1章 京壁の物性と機能および施工法に関する研究
- 2章 複合材料としての京壁
- 3章 和風伝統建築の土壁における細菌コミュニティの解析
- 4章 左官職人の土壁塗作業における動作解析
- 5章 京壁耐久評価のための繰返し戴荷試験
- 6章 京壁の調湿特性－寝かしの効果－
- 7章 京壁に関する研究の考察および結論



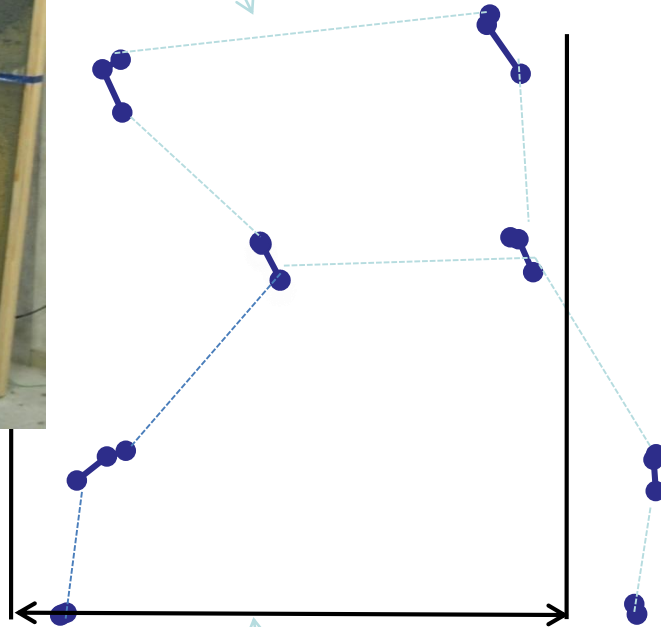
佐藤 ひろゆき



# Comparison of Body Movement between Expert and the Non-expert Clay Plasterers



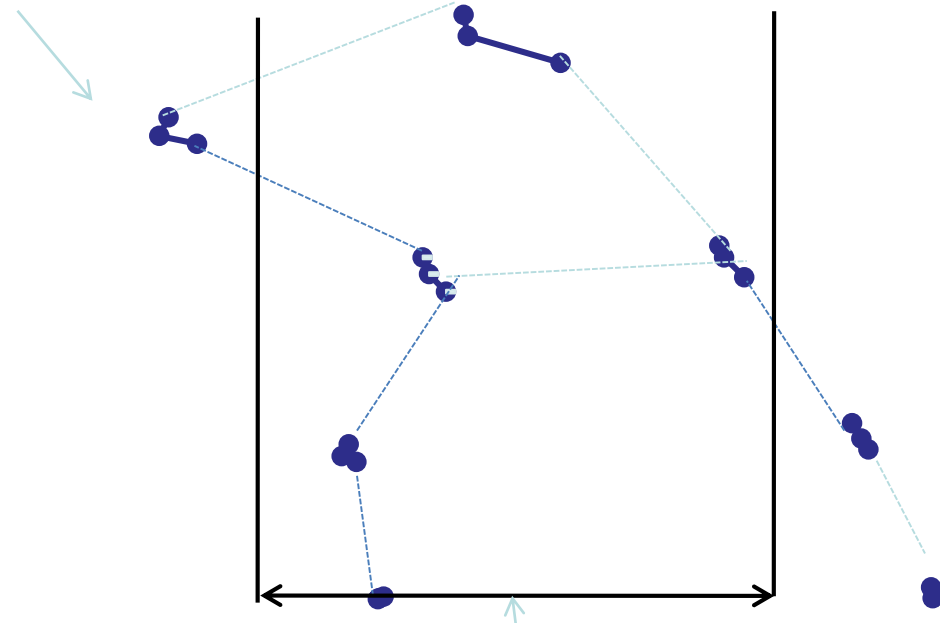
**Expert**  
Shoulder line



Ankle distance

**Non-expert**

Shoulder line



Back view

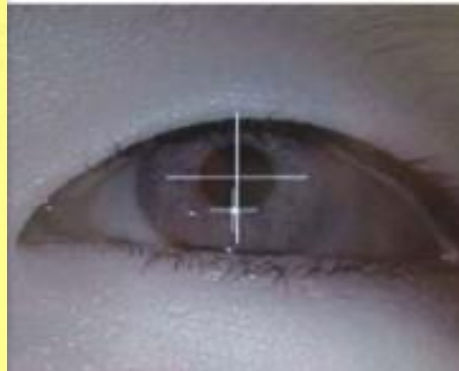
Ankle distance

# 京金網：金網つじ

- 実用性と美しさ
- 誰が見ても美しいと思う
- 金網の特徴とは？
- 熟練者と未熟練者が作製した金網の違いとは？



# 眼球運動



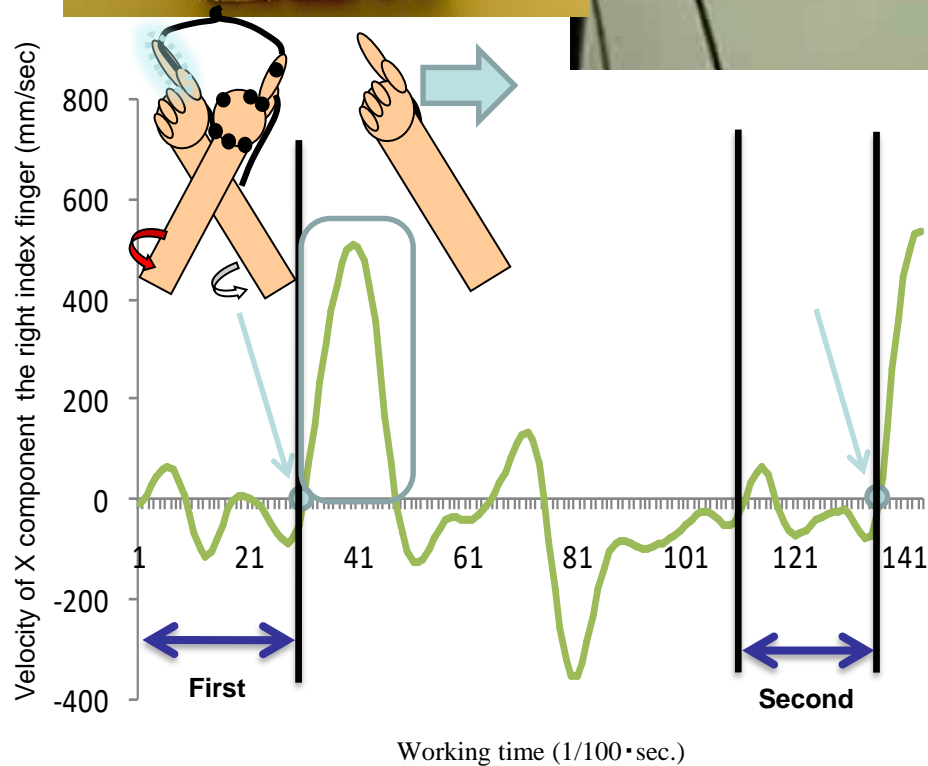
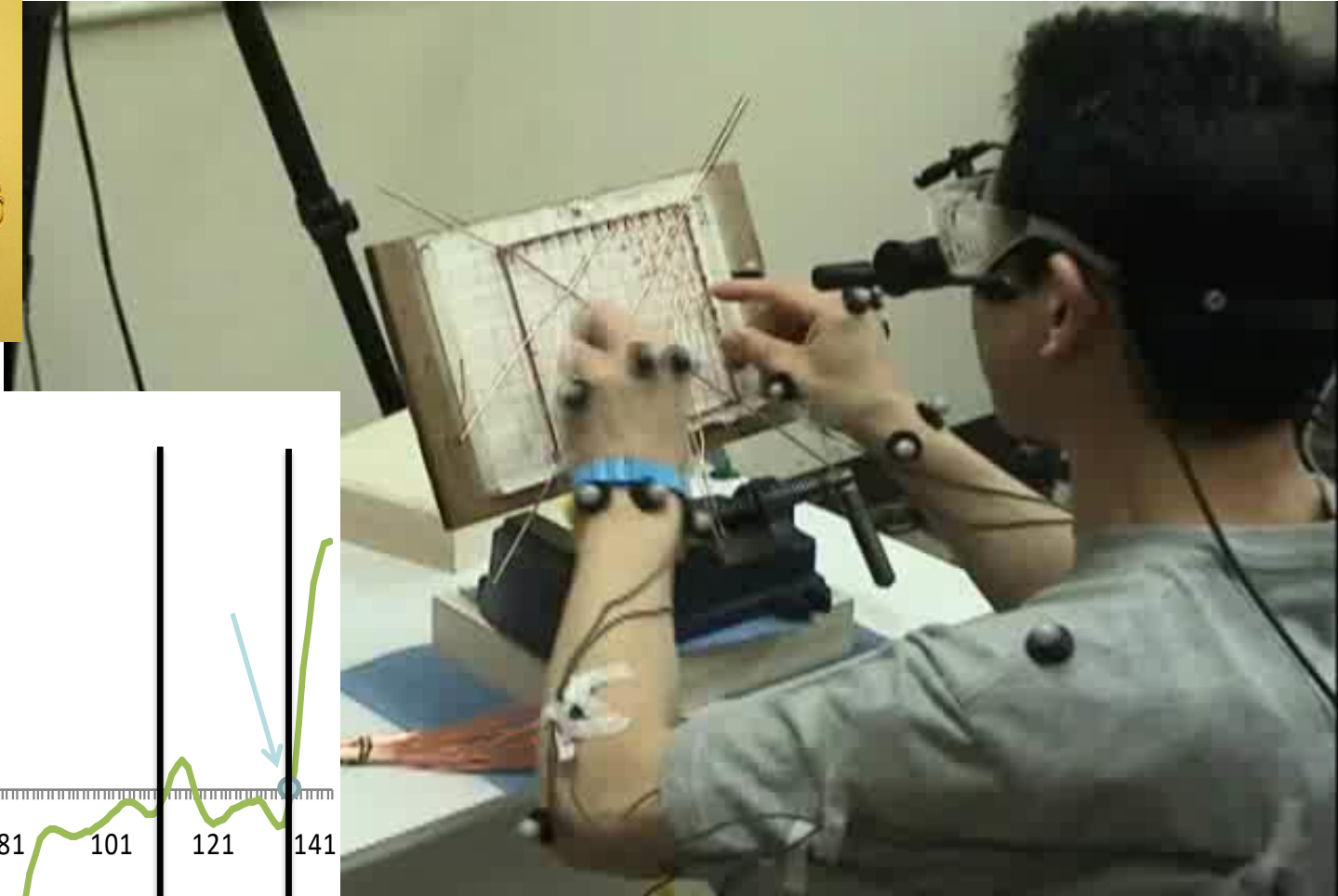
Talk Eye II

(Takei scientific Instrument Co, ltd)

Eye motion was measured by a infrared ray from the goggle type equipment.



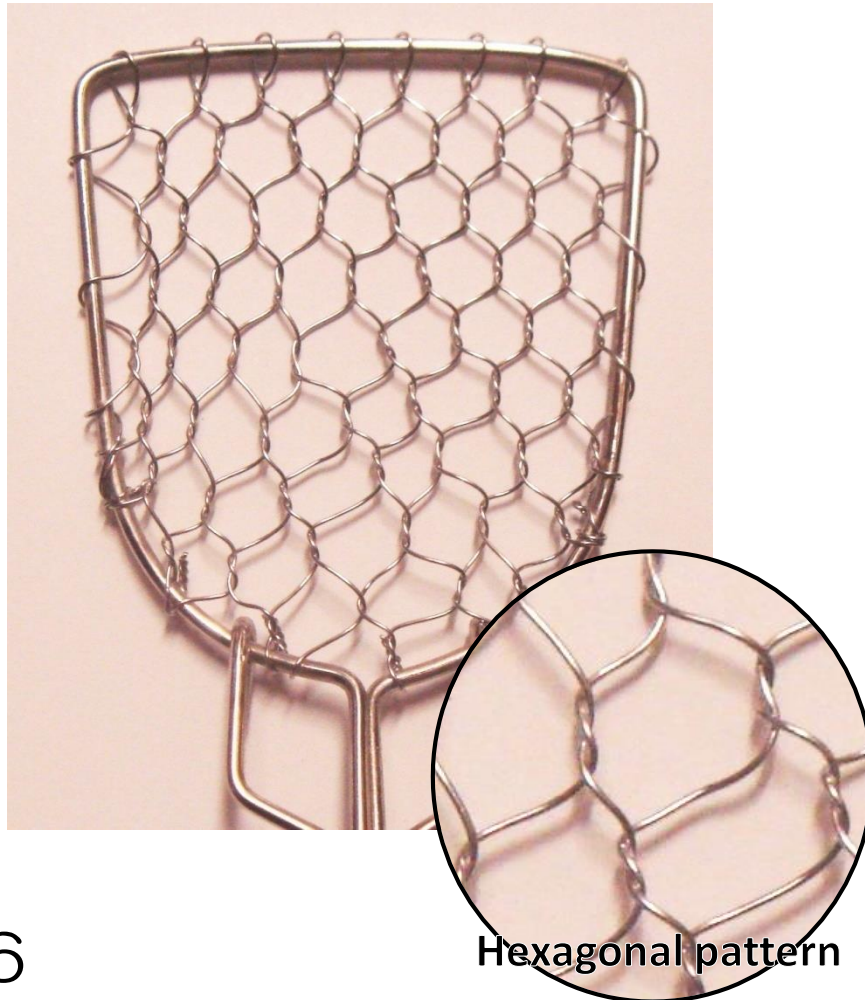
# Human Motion of Weaving “Kana-ami” Technique by Biomechanical Analysis



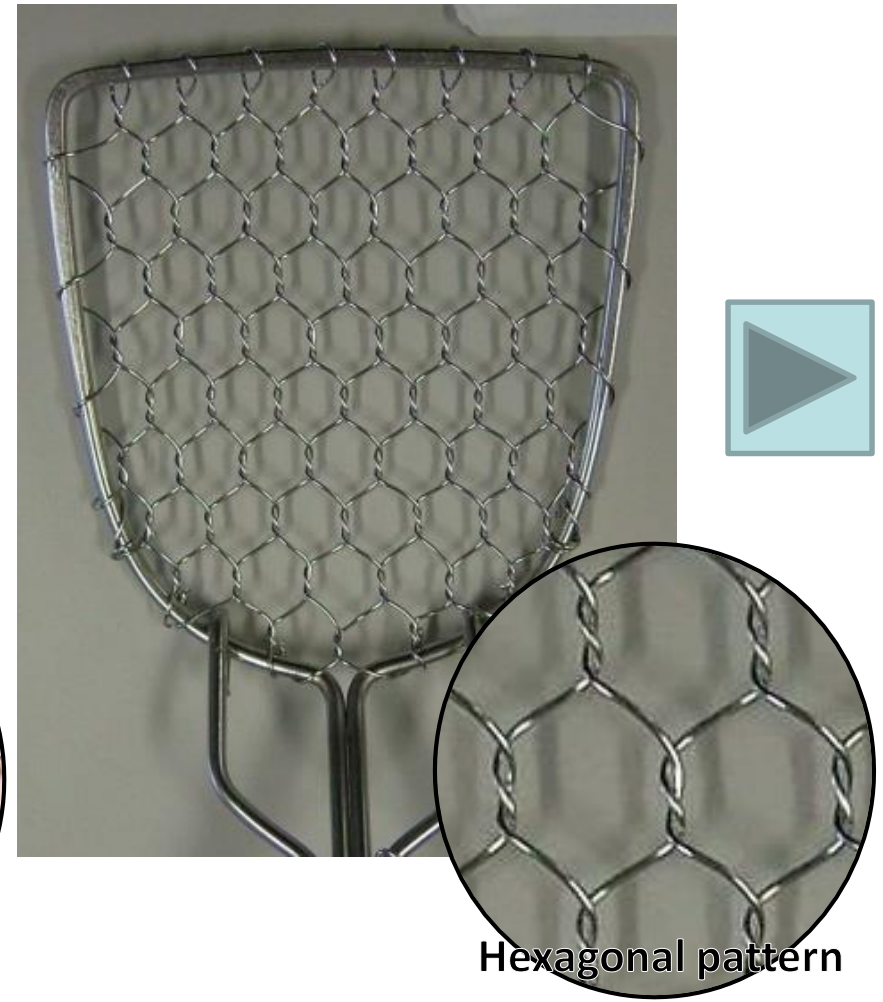
# Traditional Craftwork “kana-ami”

**Boiled tofu scoop(stainless)**

**Non-expert-made**

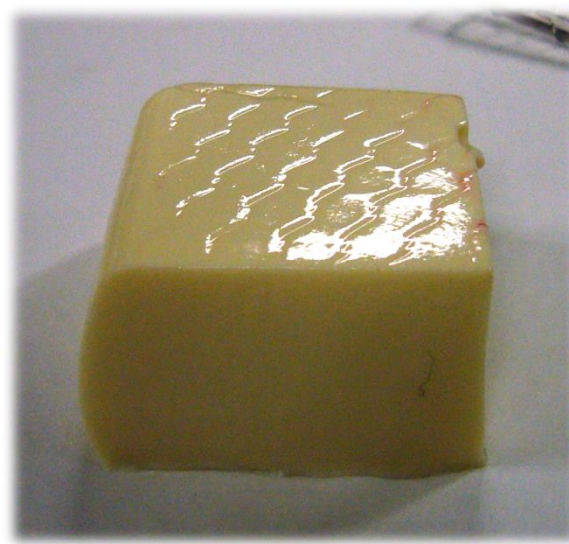


**Expert-made**





(a) 熟練者(父親) 1回目



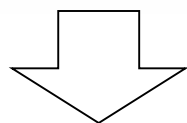
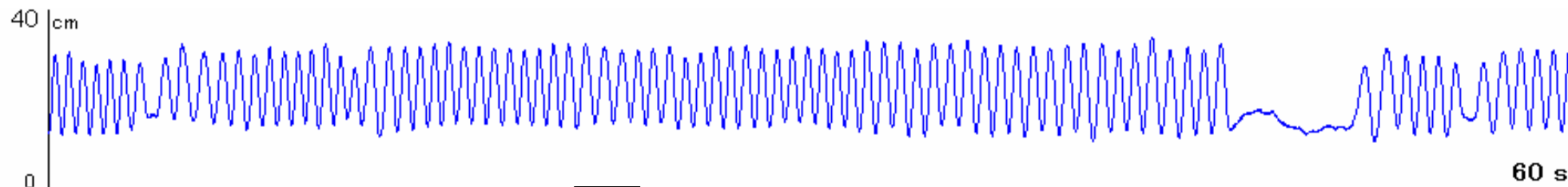
(b) 非熟練者(息子) 1回目

図1 豆腐すくいに豆腐をのせた後の豆腐に残された亀甲形状

- 刃物はものづくりの基本
- 包丁を砥石を使って研ぐ行為において、
- 力の入れ方、動かし方、コツを解明
- 仕上がった刃先の形状、切れ味、切った
- ものの食感など人の感性との結びつき

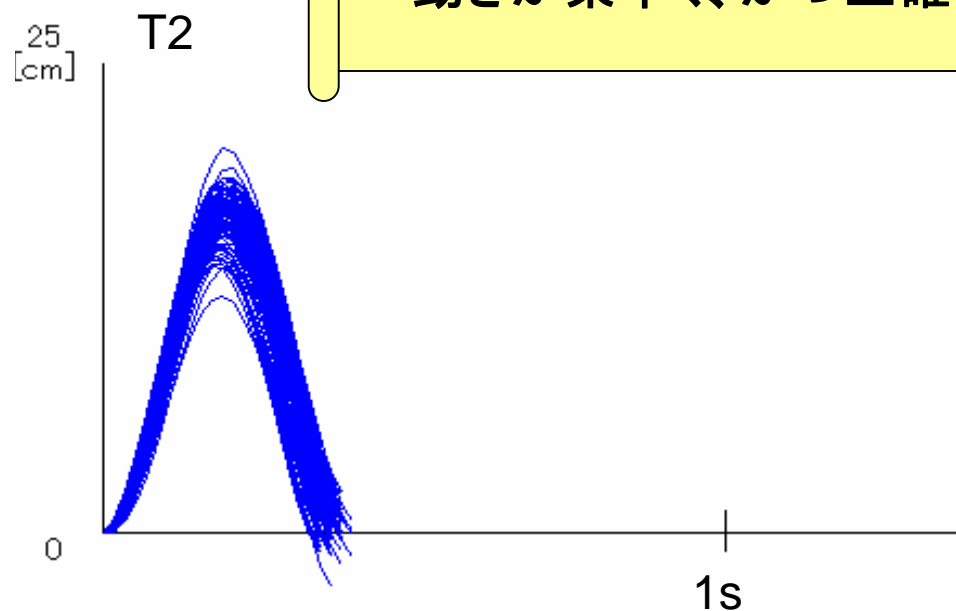
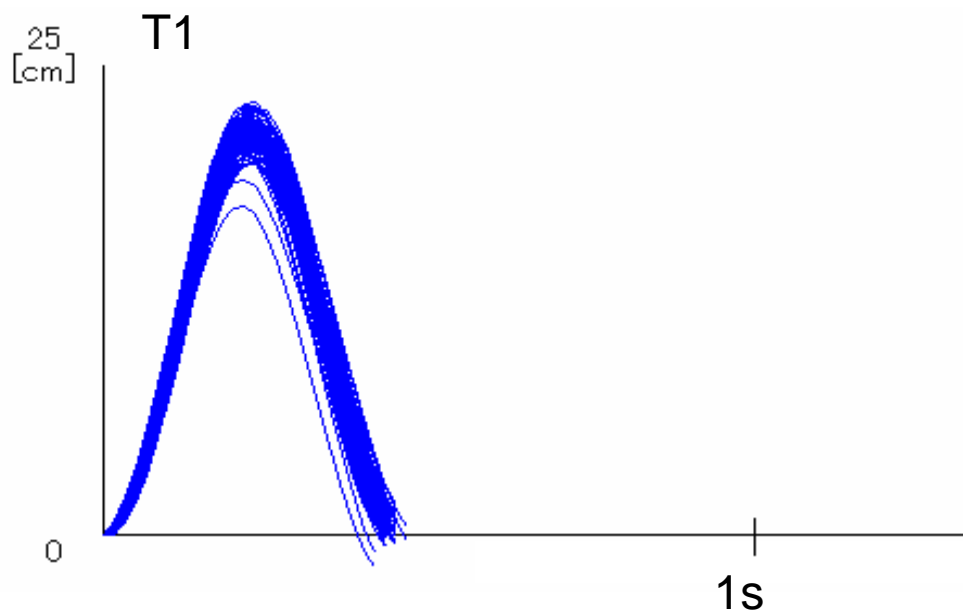


# 包丁の前後方向の動きの時系列データ(典型例)



1 研ぎ動作 (1 ストローク) 毎に分割

## 熟練者の包丁の動き

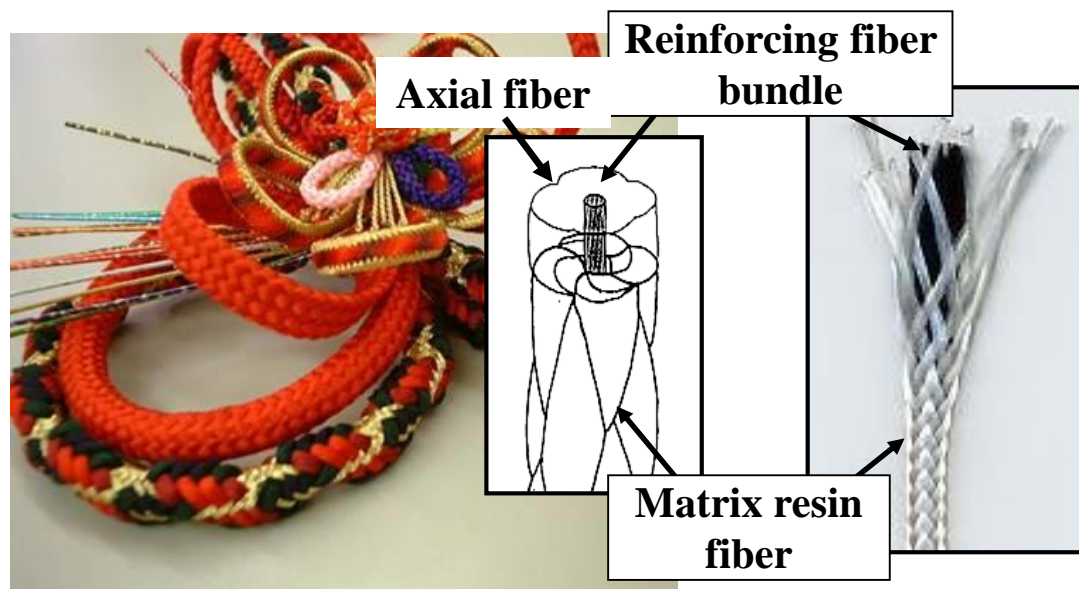


動きが素早く、かつ正確

伝統技能に内在している**暗黙知**  
**形式知化**  
**新技術**

：様々な形状・特性のひもを用途に合わせて展開  
：材料、内部構造、変形メカニズムと物性の関係  
：多様な力学的特性設計、機能設計

京都工芸繊維大学の組ひも技術を応用した熱可塑性複合材料の開発研究に参画  
2005年9月研究成果を元にベンチャー企業「京都先端組紐製作所」設立  
自動車メーカーの試使用材料の提供、医療用テキスタイルの販売を行っている



## 1. 緒言

# 旗金具とは？



## 2. 実験方法

# 被験者

- 被験者
  - 旗金具職人1名  
(42歳, 162cm, 65kg,  
職歴24年, 右利き)



- 材料は麻
- 中国の麻
- 手で撚っている
- しなやかにかたく緬え
- それでは、音はでん！
- ひもの構造分析
- ひもの物性
- 手の力の入れ方は・



調べ緒：山下慶秀堂宗家五世家元  
山下雄治

### 3. 調べ司の縄を絞う動作



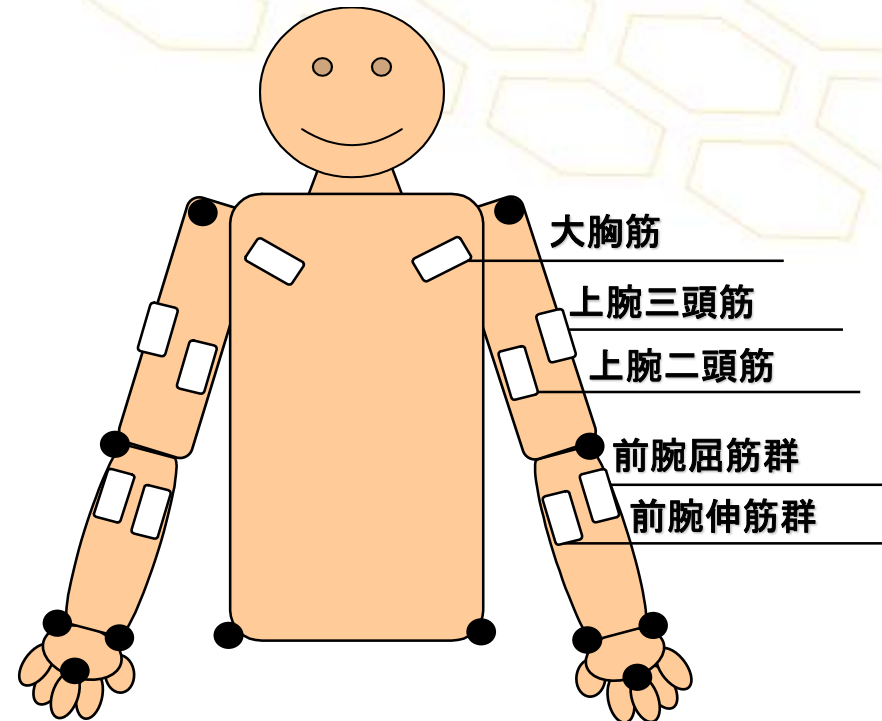
# 方法 1. 筋電図と動作解析の実験方法(測定例)

## 【筋電図】

- ・左右の前腕屈筋群、前腕伸筋群、上腕二頭筋、上腕三頭筋、大胸筋 計10部位
- ・使用機器  
データロガ(FA-DL-2000, 4Assist)  
筋電センサー(DL-141, 4Assist)

## 【3次元動作解析】

- ・反射マーカ―は左右の肩峰、肘頭、橈骨茎状突起、尺骨茎状突起、第三中手骨頭、大転子 計12マーカ―
- ・使用機器  
MAC 3D SYSTEM(Motion Analysis)



筋電図センサー

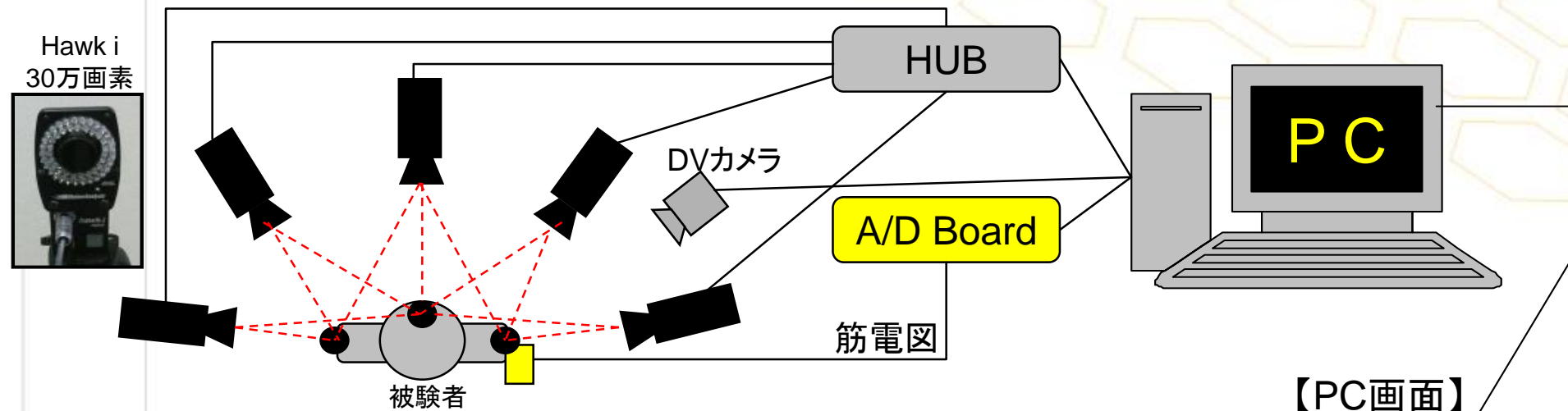


反射マーカ―



# 方法

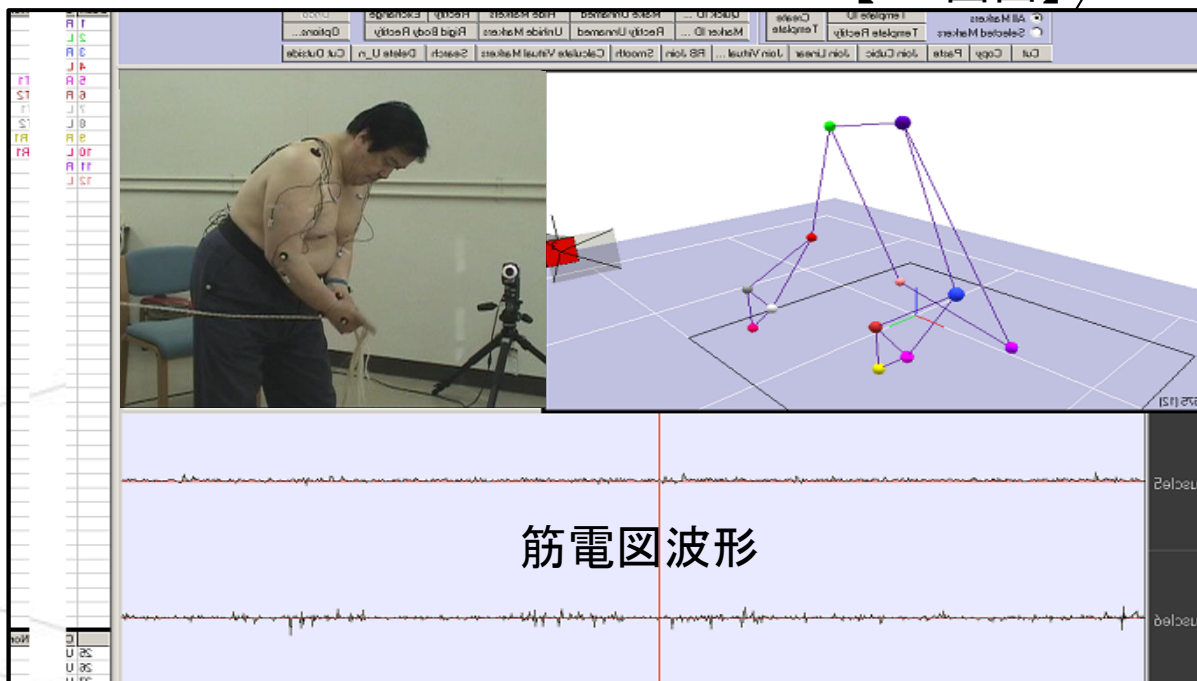
## 2. 測定環境



【PC画面】

● 反射マーカ

■ 筋電図センサー



# Analysis of Techniques of Kyoto Sweets

Hiroyuki HAMADA

Kyoto Institute of Technology



# 実験方法

## 被験者

京菓子職人 1名(職人歴14年)

## 材 料

生地 こなし

〔 白小豆餡に粉類をまぜて蒸し、  
さらに砂糖を加えてこなししたもの

餡 小豆餡

割合 餡20g・こなし30g 合計50g

## 計測内容

(39回)

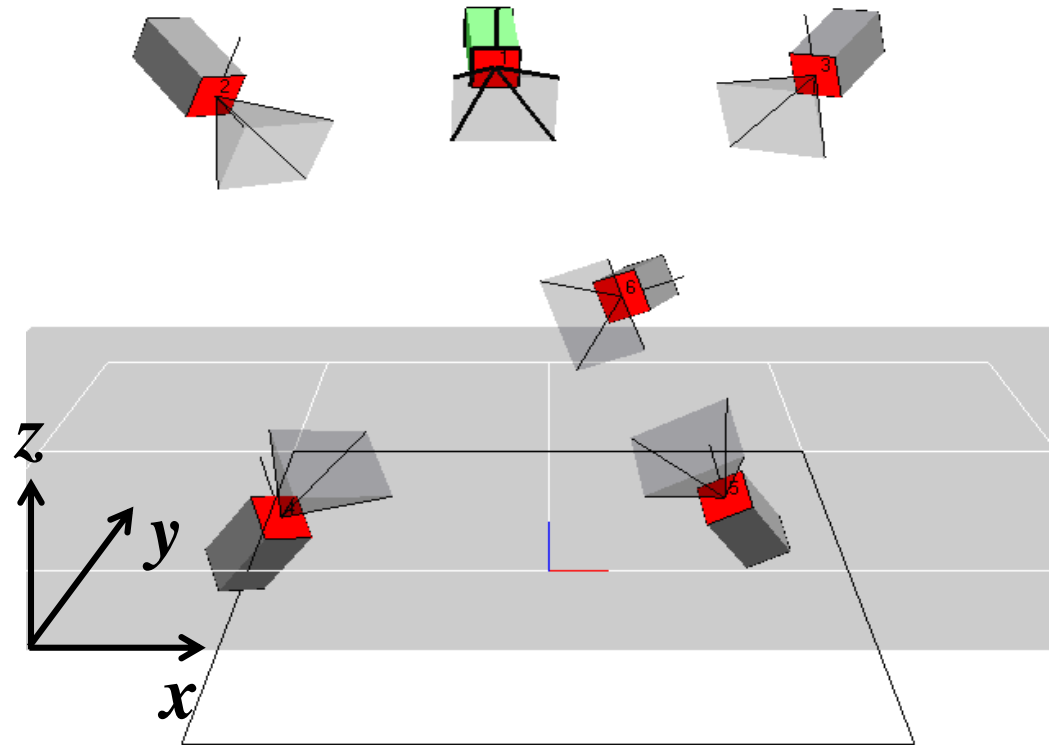
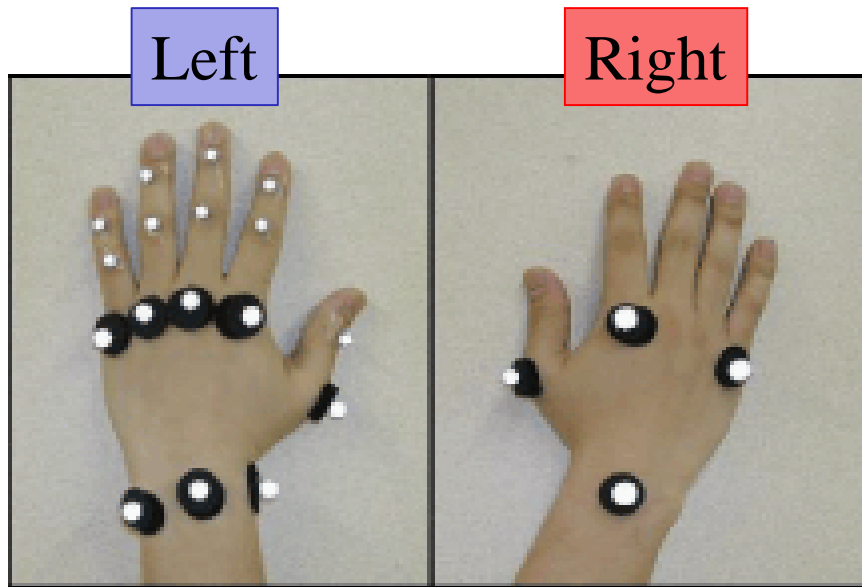
- 1 包餡動作の計測
- 2 包餡時間の計測

# Measurement methods

- **Motion capture system**

Six infrared cameras with 100Hz (MotionAnalysis., Co.Ltd)

- **Markers set-up**



# 実験方法

## Top画像



0



1



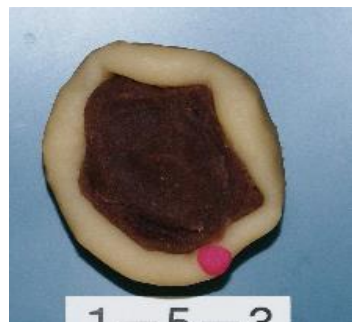
2



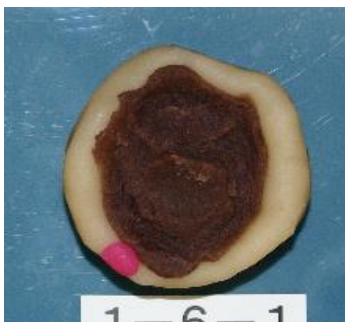
3



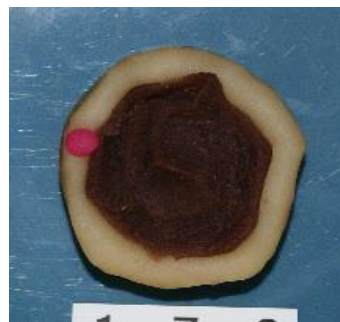
4



5



6



7



8



9

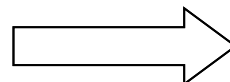
(数字は工程を示す)

# 包餡動作を3相に分割

## 第1相

### 包み上げ過程

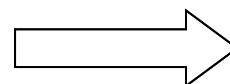
すこし広げたこなしの上に餡玉をのせ、左手をくぼませ時計回りに回しながら餡を押し込む



## 第2相

### 閉じ過程

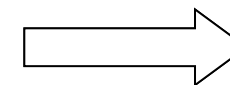
反時計回りに菓子を回しながら、両手の拇指と示指で生地をとじるまで



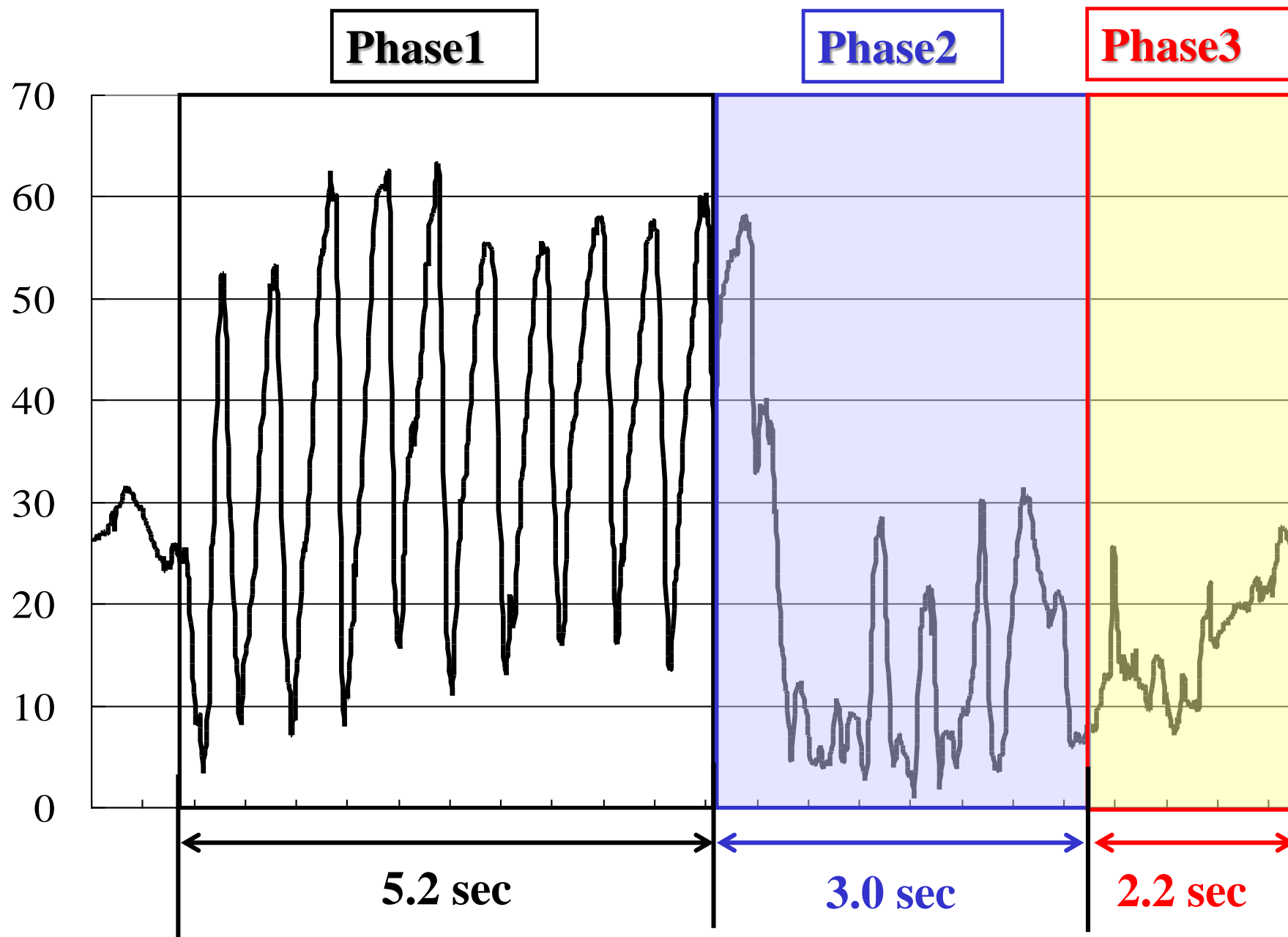
## 第3相

### 成形過程

菓子を反転させ、両手掌のなかで時計回りに転がしながら、一度低くした後、左手拇指球にあてながら成形



The flexion angle of left index finger in PIP joint (deg)



# Introduction: *Sado*

- “*Sado*” or “*Chado*” is one of the most traditional activities in Japan
- The manner to serve and the procedure for making a bowl of *matcha* tea are assumed to be the art

performance and they are called “*otemae*.”

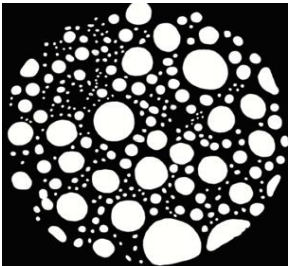
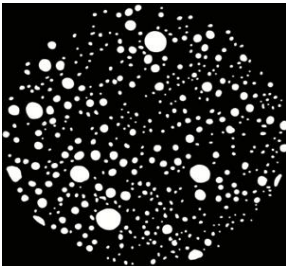


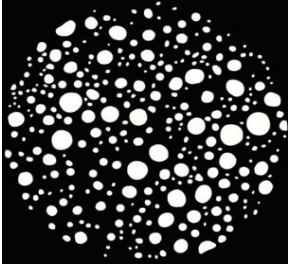
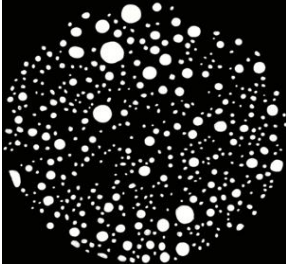
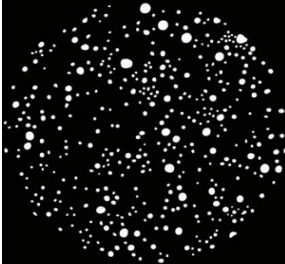
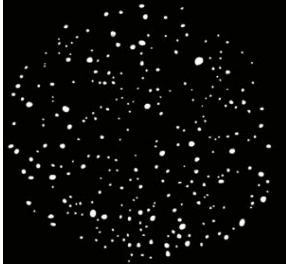
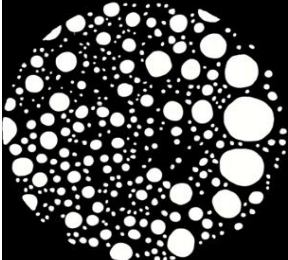
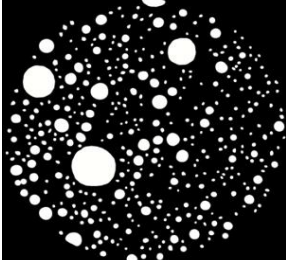
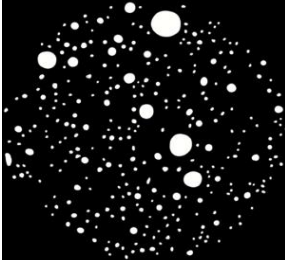

- The skills of making *matcha* tea are one of the important factors that affect the taste of *matcha* tea.



# RESULT

The part of binary image  
with largest bubbles in each trial.

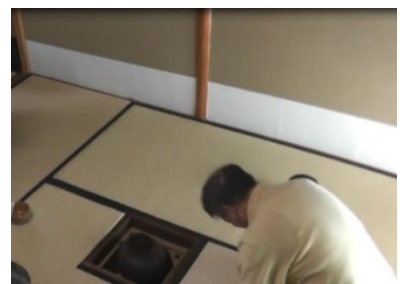
## The comparison between **four stages**

	30%	50%	80%	100%	Working time
Yabunouchi					17.91 Seconds
Kankyuan					19.43 Seconds
Ensyu					23.14 Seconds

# Process division



1, Enter the room and sit down 2, Sweets are served 3, Tea-serving manners begin 4, Eat sweets



5, Tea is served

6, Drink tea

7, towards the end

We performed process analysis. Tea ceremony can be divided into 7 processes. Those are these 7 processes.

1, Enter the room and sit down 2, Sweets are served 3, Tea-serving manners begin 4, Eat sweets  
5, Tea is served 6, Drink tea 7, towards the end

## Process division



2, Sweets are served

This is photo of process 2; sweets are served. This person is me.

# Example photos just before and after drinking tea.



3 minutes before



very nervous



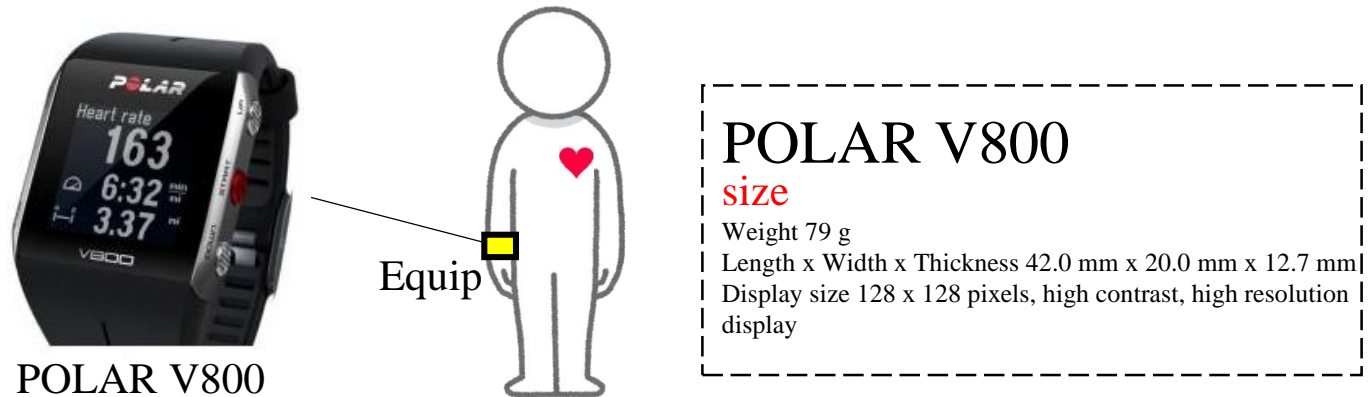
3 minutes after



smile on his face

Please see these photos just before and after drinking tea. This white shirt man was focused. Before drinking tea, his face was very nervous, on the other hand after drinking we can found smile on his face.

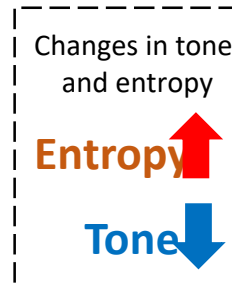
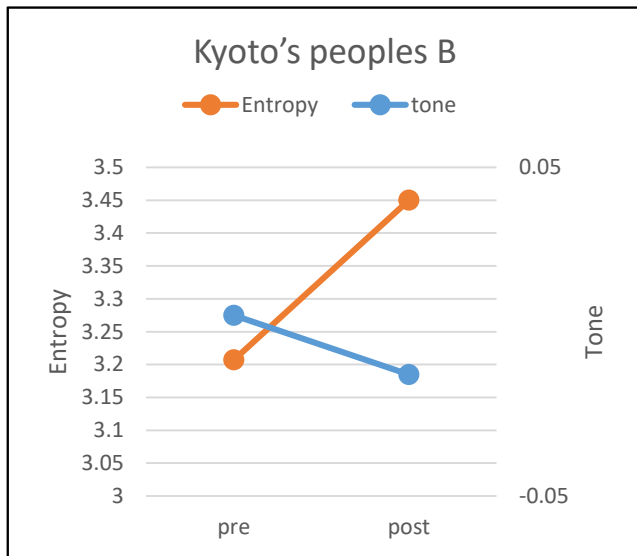
## In our series of research



- heart rate meter and measured the R-R interval.
- peace of mind in the tea ceremony,  
we will be able to enjoy Omotenashi.

Therefore we conducted experiments. Each customer set heart rate meter and measured the R-R interval.  
After the experiment we analyze the peace of mind on each step of the tea ceremony.

# Changing graph of Tone and Entropy



- vertical left axis and Tone on the vertical right axis.
- whether Entropy and Tone.
- conducted for 25 groups of 5 groups.


This is the figure Entropy and Tone before and after drinking  
In this case Entropy increased and Tone decreased, which means relax state.

## Conclusion

- 3 minutes before and after drinking tea was focused.
- after drinking tea,  
the tone decreased and Entropy increased.
- mentally settled by drinking tea.

The process analysis was made during tea ceremony and 3 minutes before and after drinking tea was focused. Comparing Tone and Entropy, the tone decreased and Entropy increased in most subjects.

This shows that it is mentally settled by drinking tea.

Thank you very much  
for your kind attention! 



Traditional handicraft industry is facing serious problems

(1) As for traditional handicrafts main processes are handmade and since it is what is depended on advanced traditional technology, long years are needed for the acquisition to obtain the technique.

(2) Change of a lifestyle, the demand of traditional handicrafts articles has showed low transition, causing difficulties of training successors which has become a big subject of the whole industry.



Oldest FUDE exists  
(made 1185 )

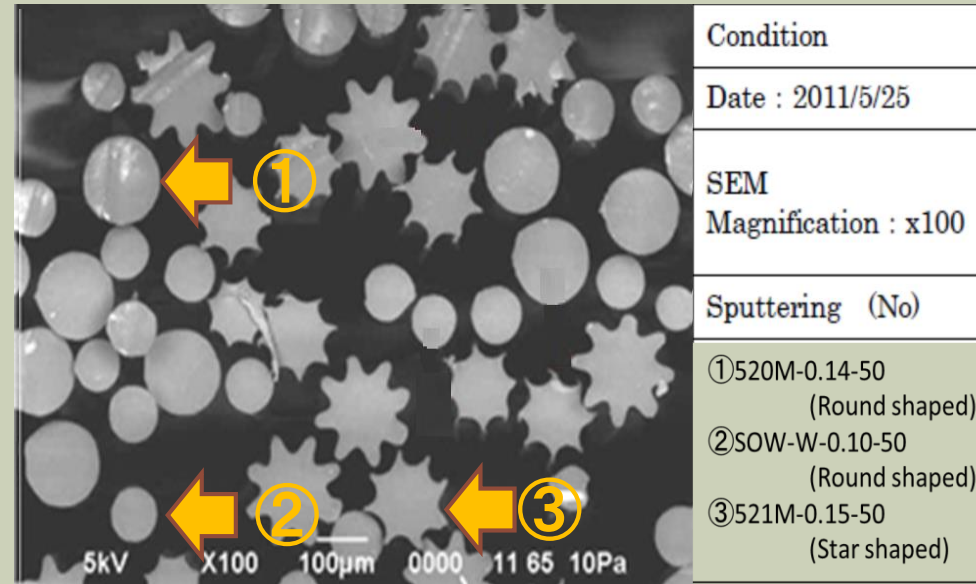
It is not an exception in the traditional “FUDE” (Japanese calligraphy brush) industry of Nara prefecture in Japan.



# THREE TYPES OF PBT FILAMENTS



Bundle of fiber materials



Cross section observation by SEM

(1) 0.14 Round shaped (TORAY MONOFILAMENT CO.,LTD.)

(2) 0.10 Round shaped (Suminoe Textile Co.,Ltd)

(3) 0.15 Star shaped (TORAY MONOFILAMENT CO.,LTD.)

# ANALYSIS OF “KEMOMI” PROCESS

High performance brush can be obtained by **blending many kinds of materials** with different characteristics. This stage is called KEGUMI.

Filaments are not to be able to demonstrate the performance only by mixing the filaments, synergy of high performance only begins to appear when **filaments are uniformly distributed**. This process is called KEMOMI.

“KEMOMI” is the work to even up the humidity mixing ratio in all the parts of the filaments bunch. It is often said as the most important process during brush manufacturing



KEMOMI Sceanery

# PROGRESS DEGREE OF KEMOMI

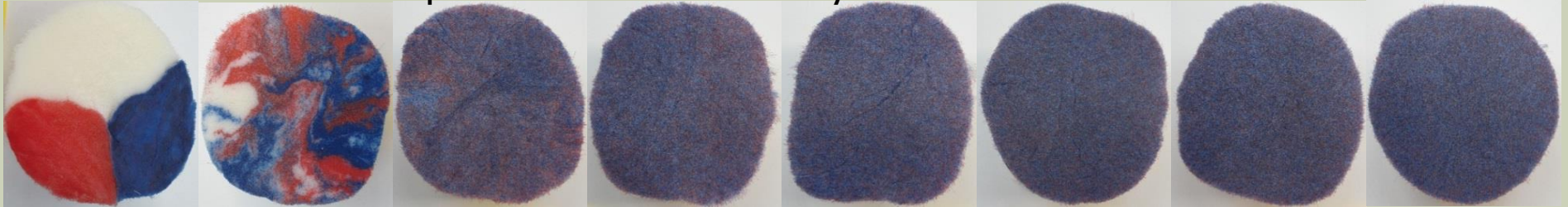
Master craft's man

experience of KEMOMI 17 years



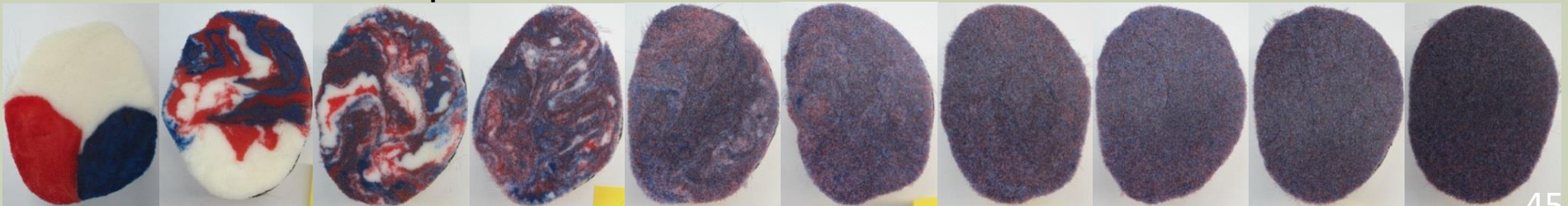
Intermediate worker

experience of KEMOMI 8 years

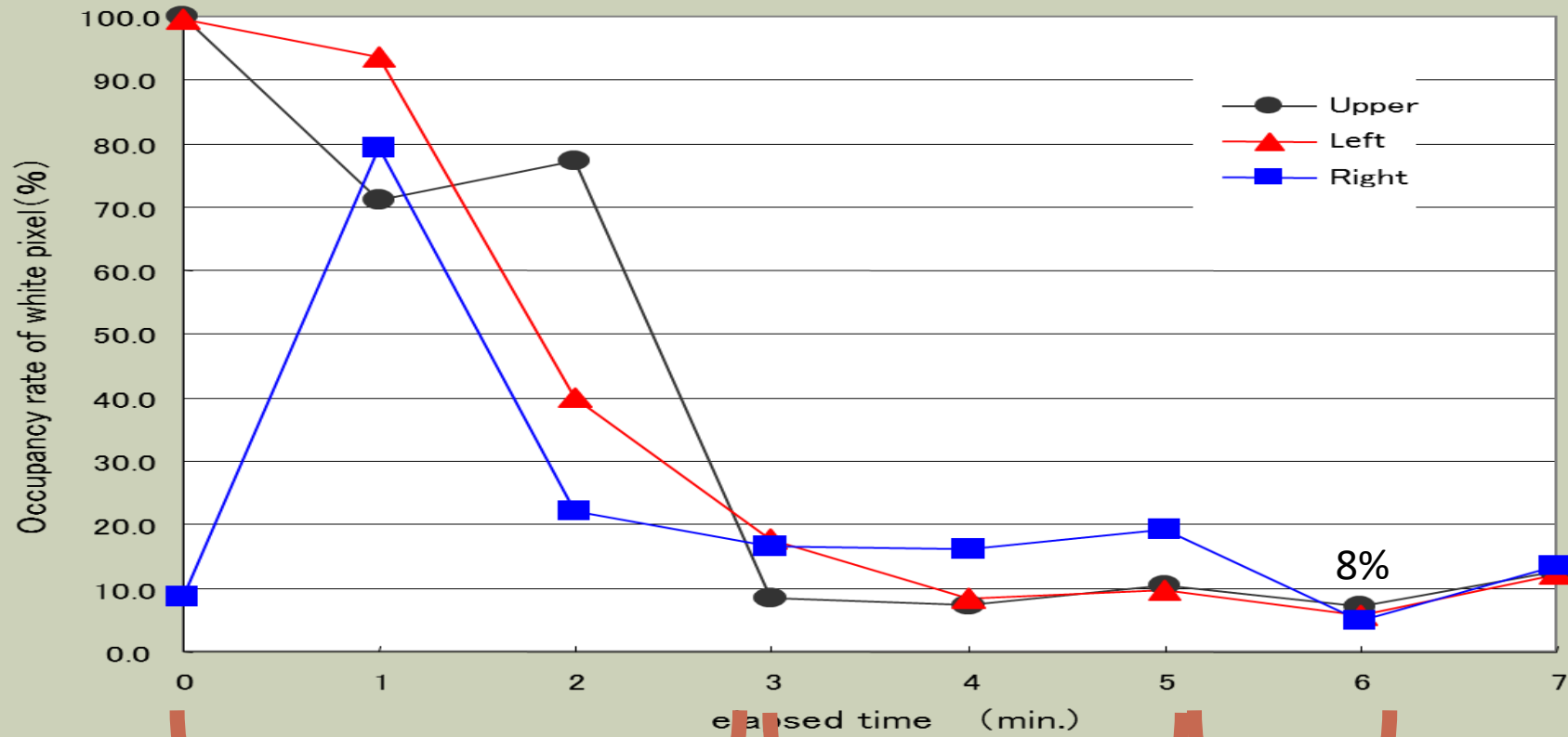


Unskilled worker

experience of KEMOMI 8 month



# The occupancy rate of the white pixel during every elapsed time



The rapid mixing stage

Adjusting stage

Finishing stage