Automated psychophysical personality data acquisition system for human-robot interaction

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  - ✓ Personality and Big-5 personality model
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- Conclusion

Introduction

Motivation of personality recognition.

Hi, Who are you?

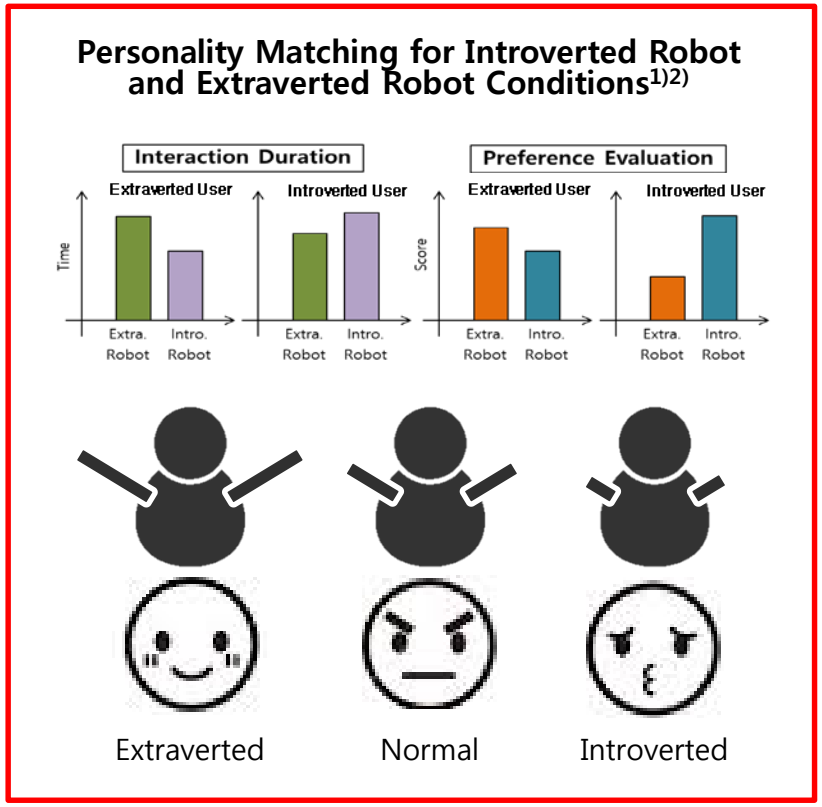
Hi, I'm robot for you

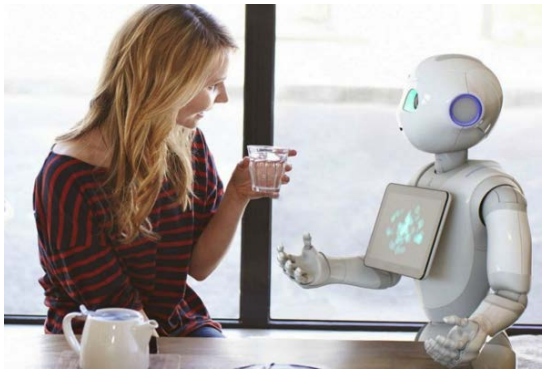
How is the weather today?

Today's weather is sunny.

Rule-based response of robot

Motivation of personality recognition.





Hi, Who are you?

Hi, I'm robot for you

(This person's personality looks extraverted, so I have to act more actively.)

Today's weather is sunny, How about going for a walk?

That's a good idea.

Socially adaptive response of robot

Personality Recognition could be important to build more natural human-robot interactions.

1) A. Aly et al., "A Model for Synthesizing a Combined Verbal and NonVerbal Behavior Based on Personality Traits in Human-Robot Interaction"

2) Tapus, A., "User-robot personality matching and assistive robot behavior adaptation for post-stroke rehabilitation therapy. *Intelligent Service Robotics*,"

Personality and Big-5 Personality Model

Personality : An image of a person formed in a social environment.

Character : A stable characteristic structure inherent in nature, reflects less on social and cultural characteristics.

Temperament : Characteristics affected by biological factors.[1)]

- Personality Theory

Freud : Psychological sexual theory

Erickson : Psychological social theory

Jung : Analytical psychology theory

⋮

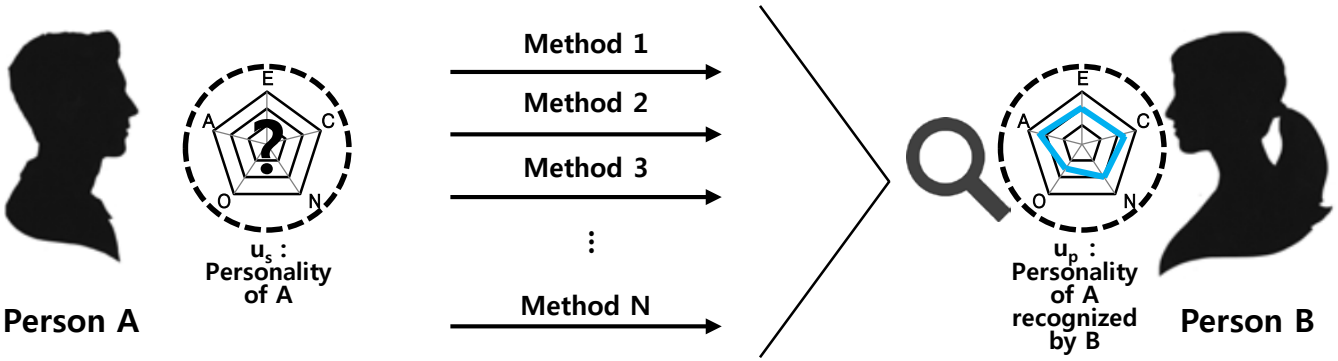
McCrae, R. R.
Costa, P. T.[2)]

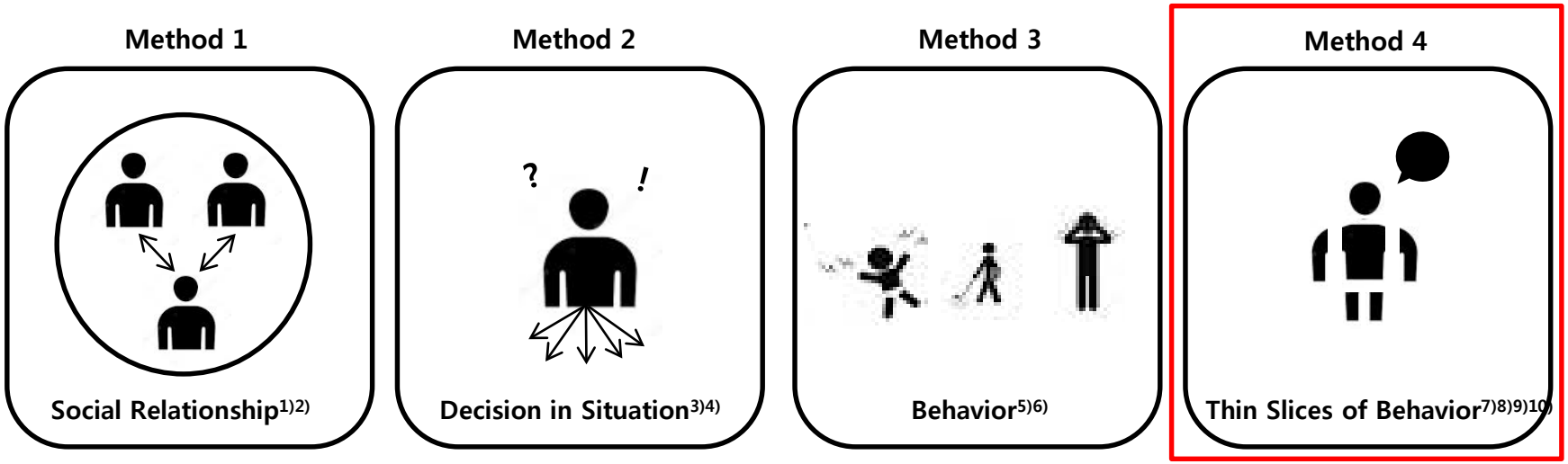
Big-5 Personality Model

1), Strelau, J. (1983). *Temperament- Personality - Activity*, Academic Press, London.2)

2), McCrae, R. R. & Costa, P. T. (May 1997). “Personality trait structure as a human universal.”.《American Psychologist》``

Previous Researches of Personality Recognition





1), Colvin, C. R.,&Funder, Predicting personality and behavior: A boundary on the acquaintanceship effect

2), Kenny, D. A., A social relations analysis. New York: Guilford Press.

3), Blackman, M. C., & Funder, The effect of information on consensus and accuracy in personality judgment.

4), Use of categorical and individuating information in making inferences about personality.

5), Funder, D. C., & Colvin, C. R. Explorations in behavioral consis- tency: Properties of persons, situations, and behaviors.

6), Gosling, S. D., Ko, S. J., Mannarelli, T., & Morris, A room with a cue: Personality judgments based on offices and bedrooms.

7), J. Biel, "The YouTube Lens : Crowdsourced Personality Impressions and Audiovisual Analysis of Vlogs"

8), L. M. Batrinca, "Please, tell me about yourself"

9), F. Pianesi, "Multimodal recognition of personality traits in social interactions"

10), A. V. Ivanov, "Space Speaks – Towards Socially and Personality Aware Visual Surveillance"

11), K. Audhkhasi, A. "Personality Classification from Robot-mediated Communication Cues"

Behavior VS thin-slices of behavior

Behavior

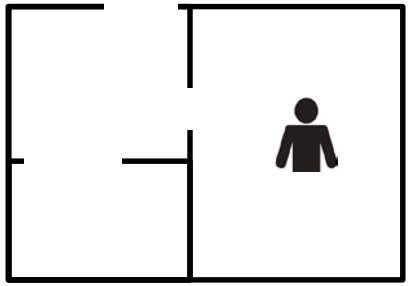
Two people shake hands.

Thin Slices of Behavior

Speech

Physiological Information

Face expression



Location,
Movement route

Gesture & Behavior

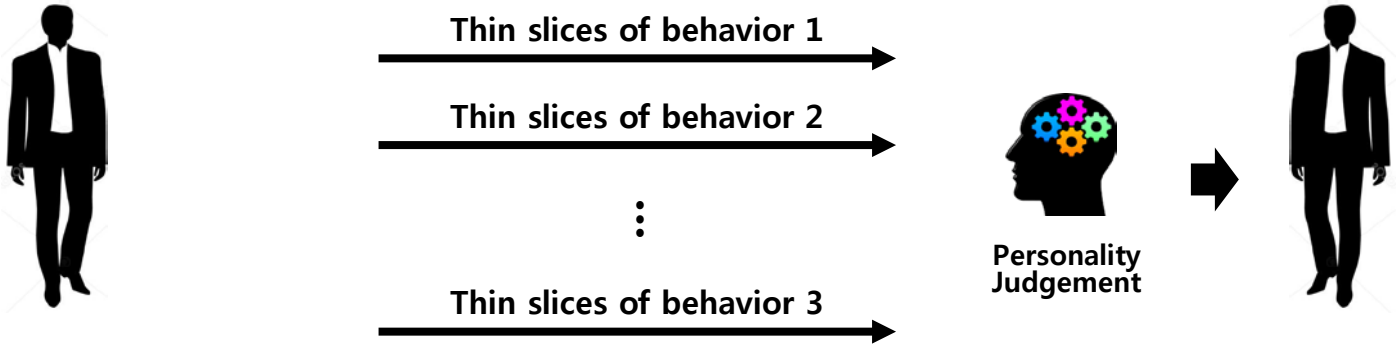
- Human behavior can be divided into several thin slices of behavior.
- Thin-slices of behavior are speech, face expression, body gestures and so on.
- Conventional sensing devices (camera, microphones) can be used to extract the thin-slices of human behaviors.

P. Borkenau, N. Mauer, R. Riemann, F. M. Spinath, and A. Angleitner, “Thin slices of behavior as cues of personality and intelligence.,” J. Pers. Soc. Psychol., vol. 86, no. 4, pp. 599–614, 2004.

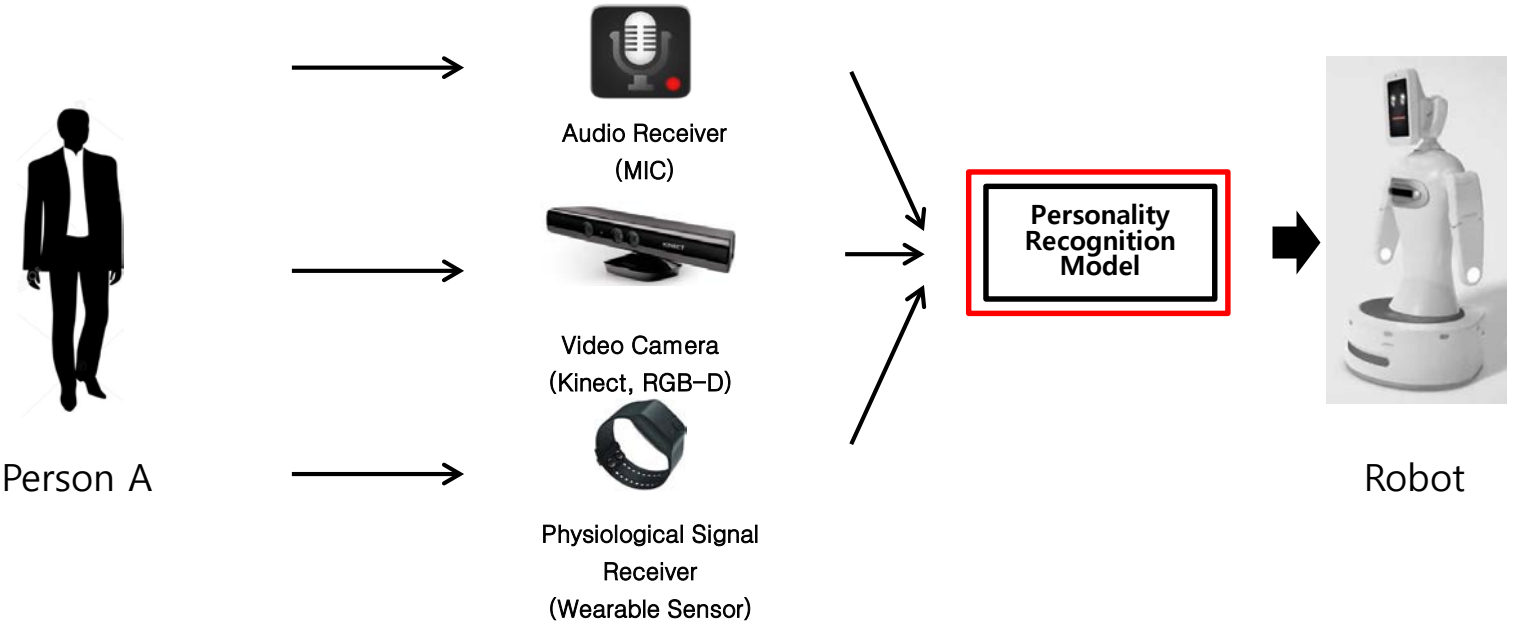
System and Method

Thin slices of behavior-based personality recognition

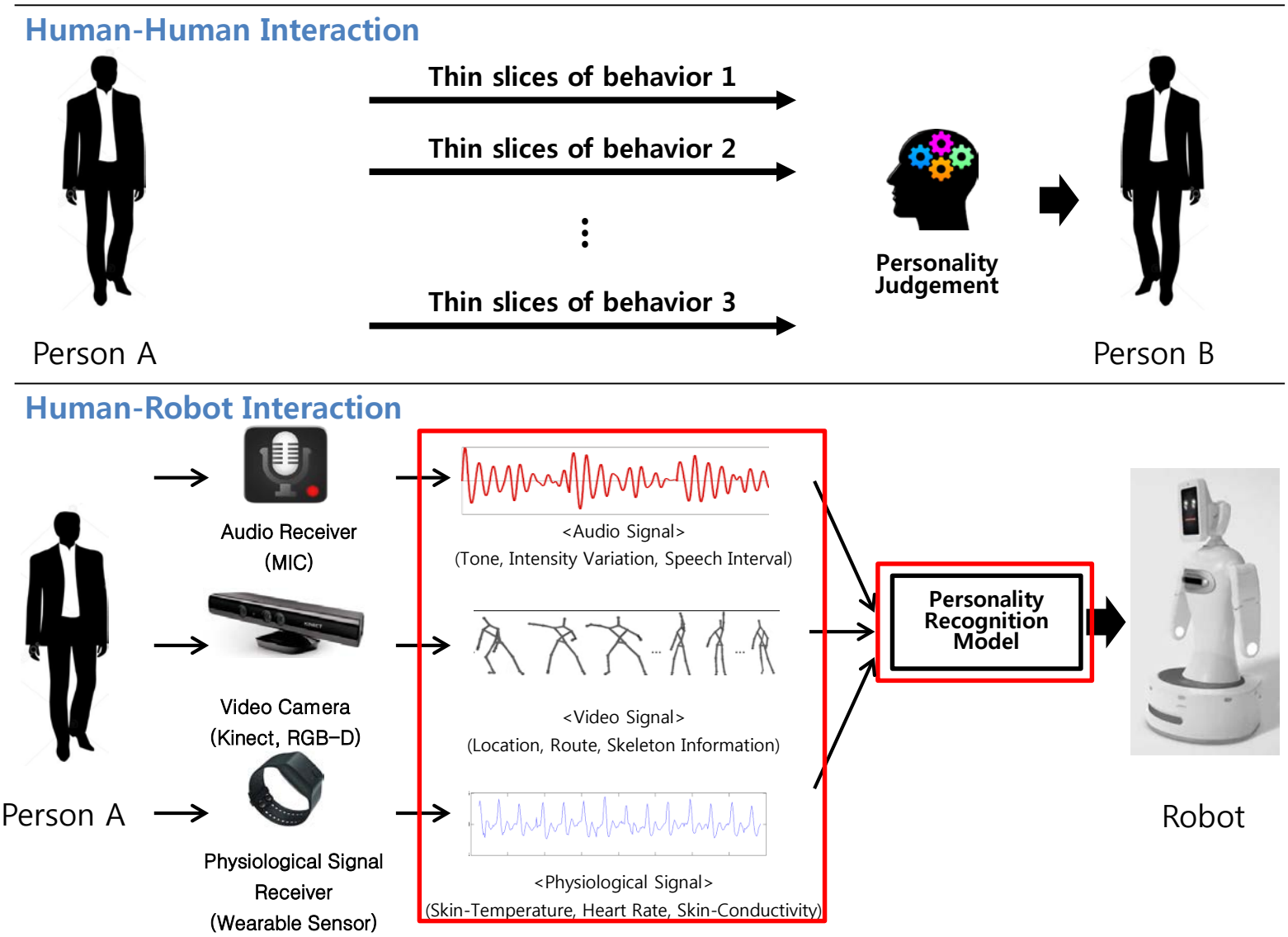
Human-Human Interaction



Human-Robot Interaction

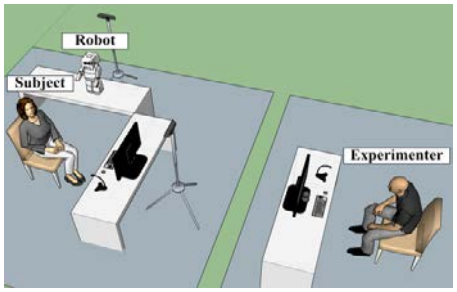


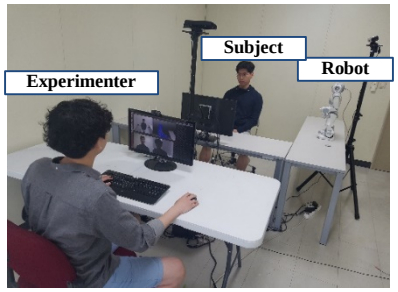
Thin slices of behavior-based personality recognition



Overview of proposed system

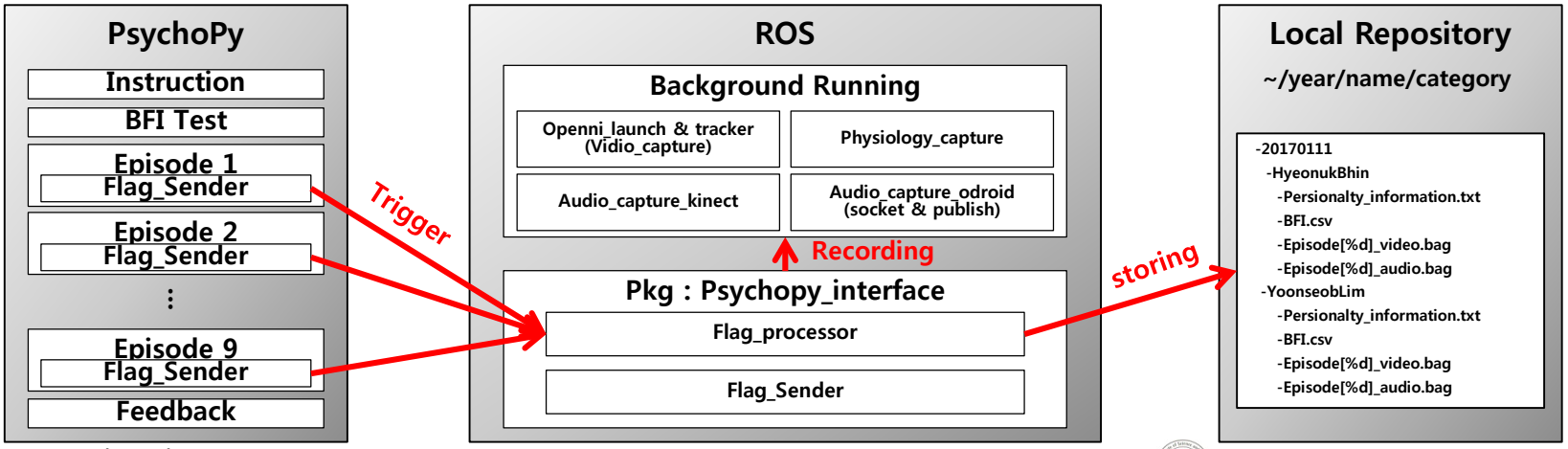
- **Title : Automated psychophysical personality data acquisition system**
  - ✓ **Object : Data acquisition for personality recognition model**
  - ✓ **Importance**
    - Psychophysical platform (PsychoPy) + Robot Operating System platform (ROS)
    - Composed of various interaction scenarios (Monolog, Conversation(Human to Human, Human to Robot)
  - ✓ **H/W Architecture of proposed system**



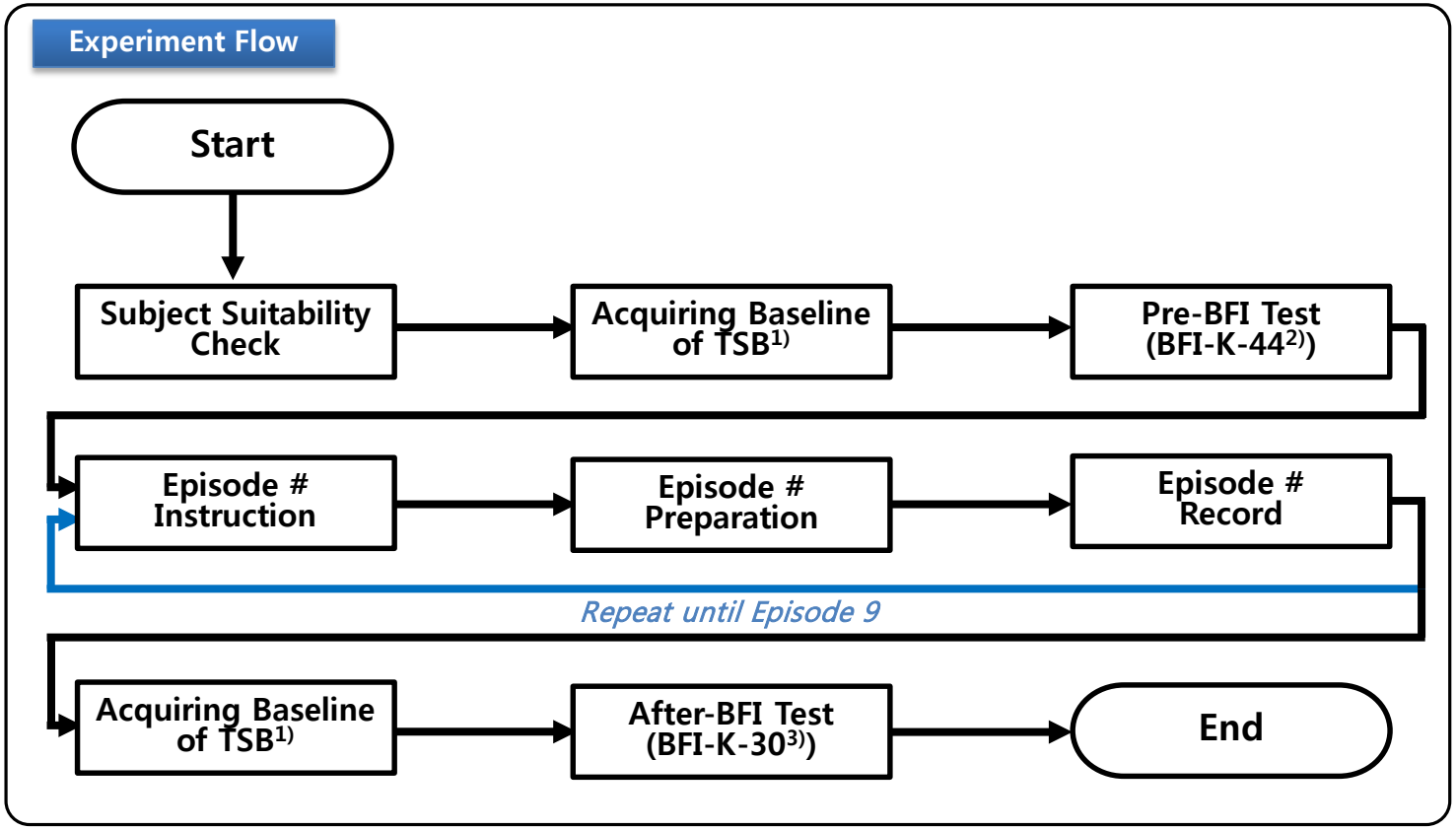


- **Sensor List :**
  - Camera - 4 EA(Depth Cam:2)
  - MIC - 3 EA
  - Wearable Band - 1EA
- **Role :**
  - Subject(user)
  - Experimenter(Acquaintance 1)
  - Robot(Acquaintance 2)

  - ✓ **S/W Architecture of proposed system**

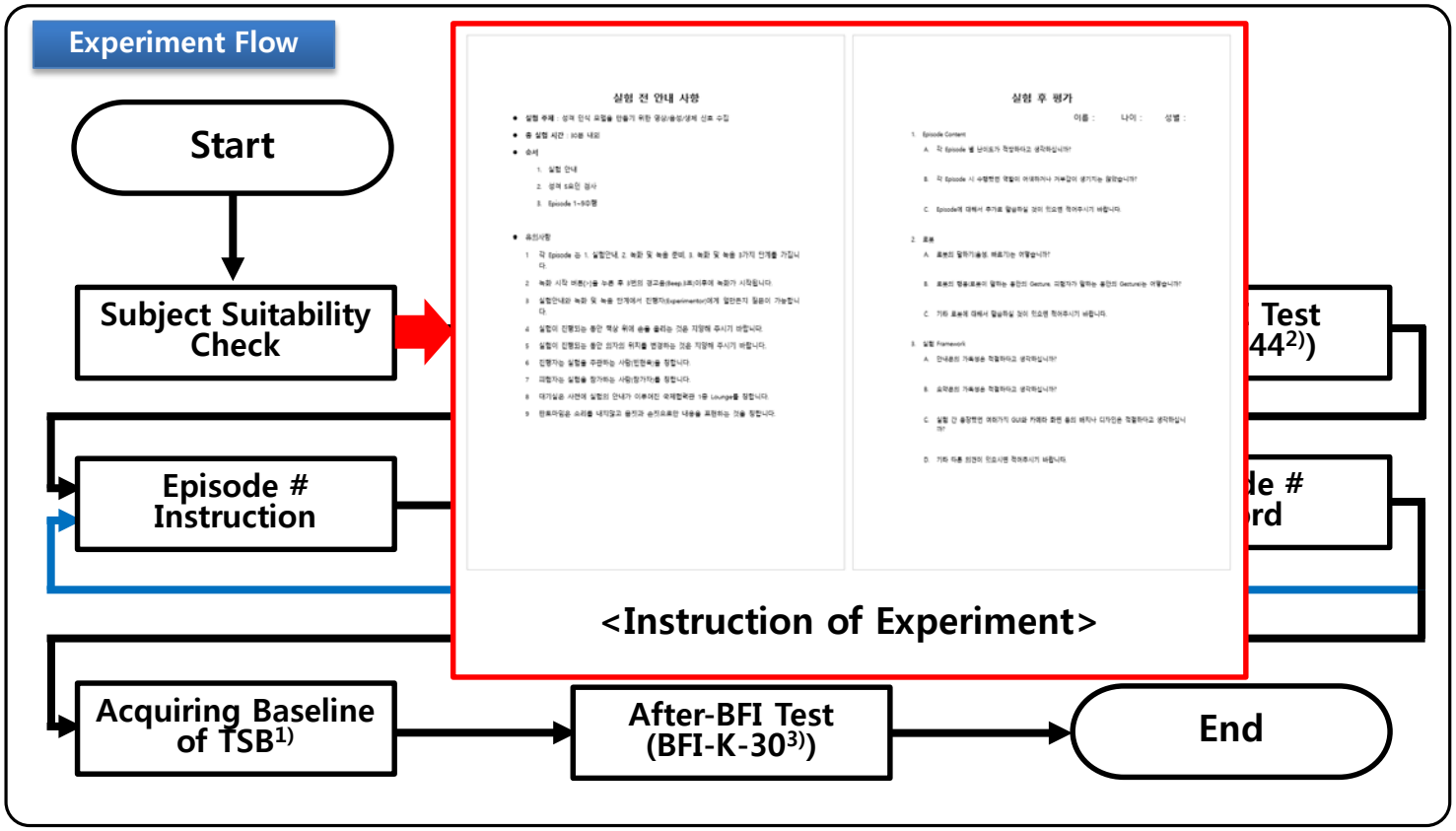


Procedure of the experiment



1) Thin-Slices of Behavior
2) Big-5 Personality 44 Test Inventory for Korean Adulthood
3) Big-5 Personality 30 Test Inventory for Korean Adulthood

Procedure of the experiment



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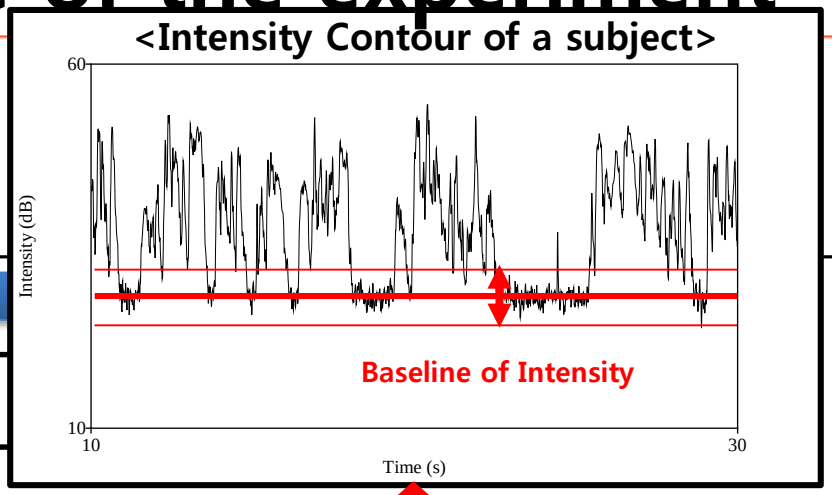
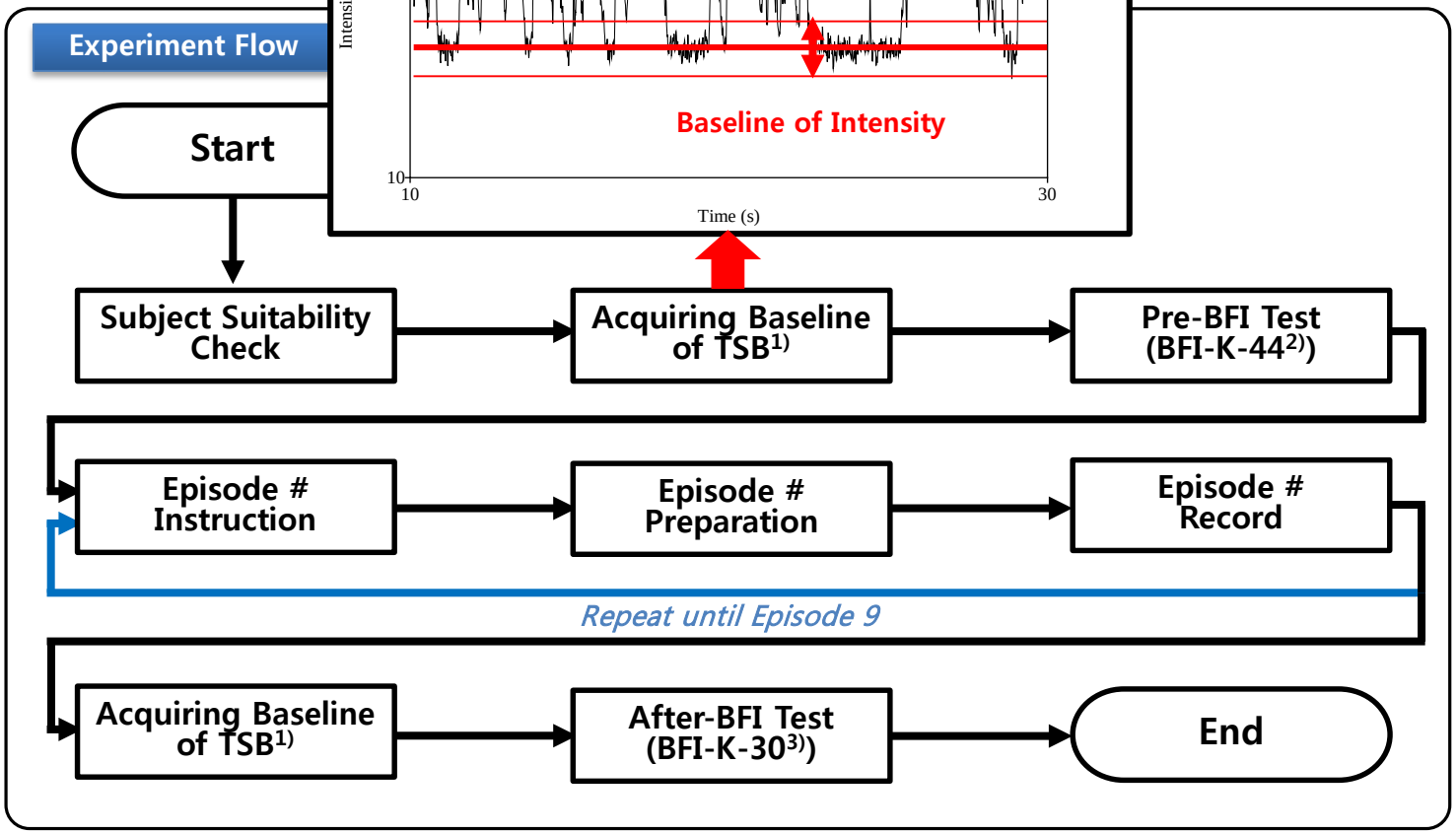
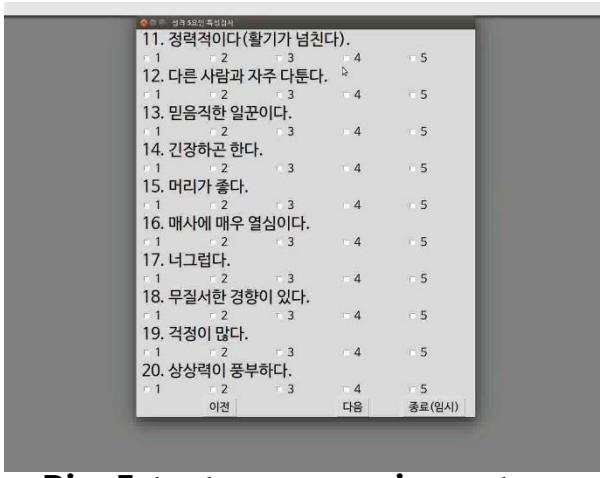




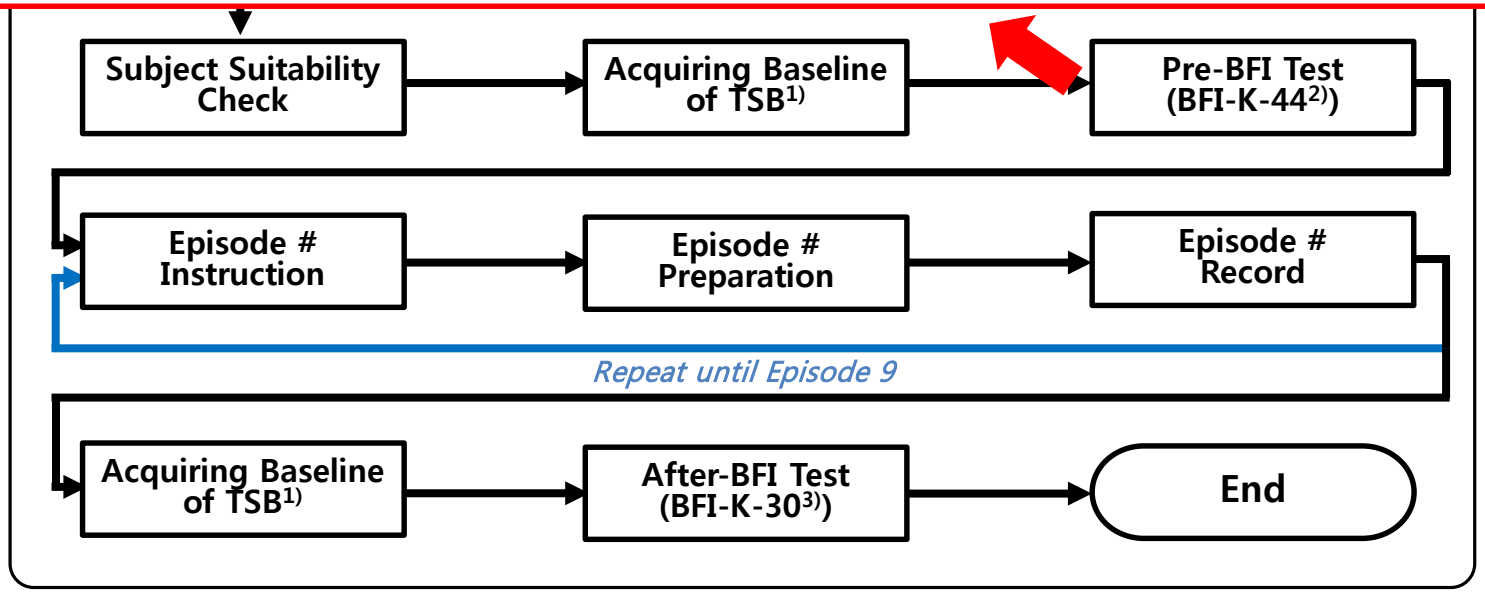
1) Thin-Slices of Behavior
2) Big-5 Personality 44 Test Inventory for Korean Adulthood
3) Big-5 Personality 30 Test Inventory for Korean Adulthood

ID	Question	Trait
1	I am reserved	Ext
2	I am generally trusting	Agr
3	I tend to be lazy	Con
4	I am relaxed, handle stress well	Neu
5	I have few artistic interests	Ope
6	I am outgoing, sociable	Ext
7	I tend to find fault with others	Agr
8	I do a thorough job	Con
9	I get nervous easily	Neu
10	I have an active imagination	Ope

<Questions of the Big-Five Inventory>



<Big-5 test program in system>



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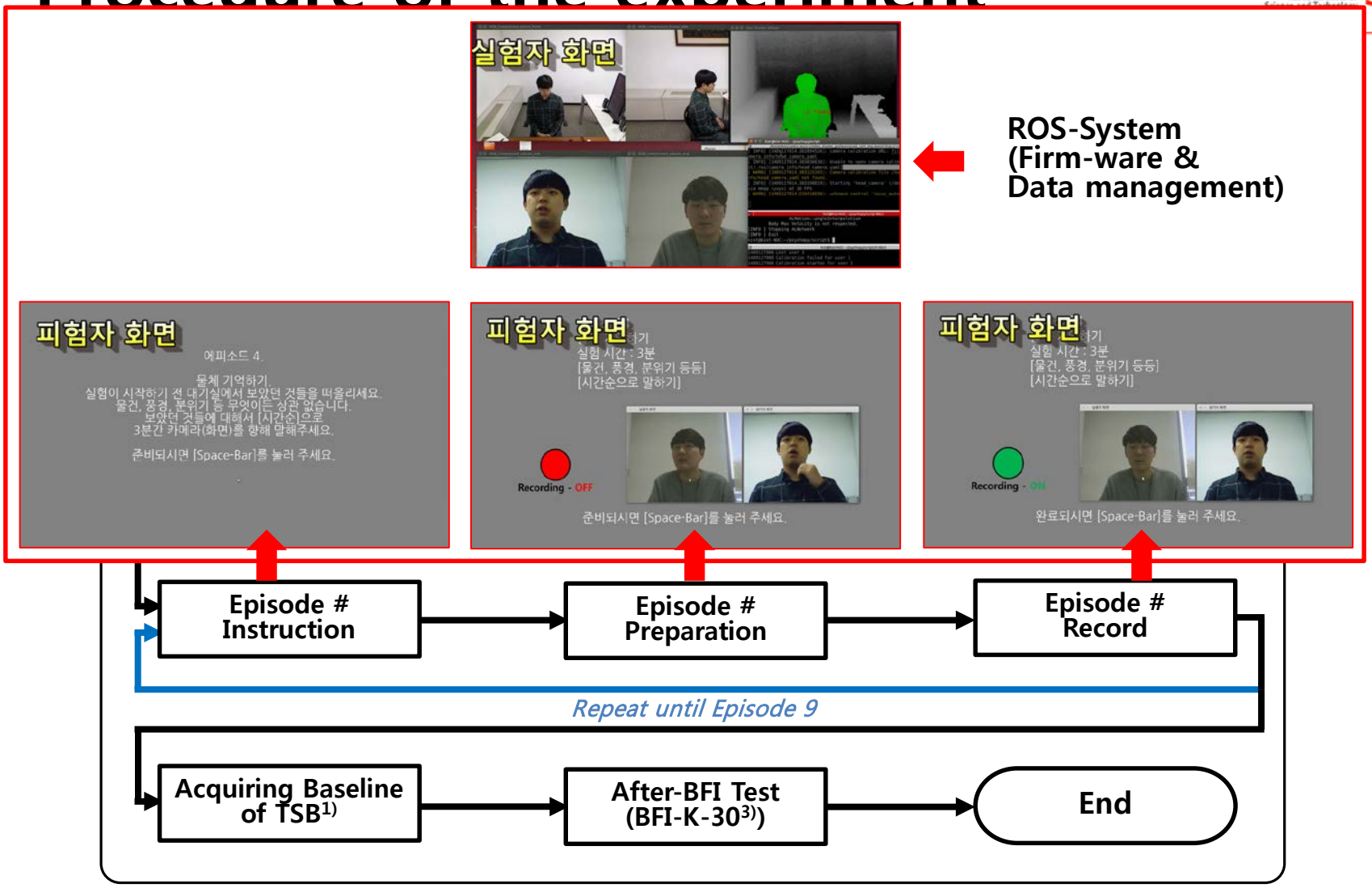

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Scenario description of episodes

- Consider situation during human-robot interaction (Alone, Human to Human, Human to Robot)

Num.	Scenario	Duration (minute)
1	Introduce yourself	1.5
2	Introduce yourself to the robot after listening to self-introduction of the robot.	3
3	Tell the fun experience to the robot after listening to the story of the robot.	3
4	Describe the objects you saw in the waiting room.	5
5	Introduce the robot to the experimenter.	5
6	Speak the answer by solving any one of the three logical problems.	5 (limited)
7	Read and speak 12 newspaper headlines.	2
8	Describe any one of the three situations using pantomime.	5
9	Sing a song you chose	1.5

P. Borkenau, N. Mauer, R. Riemann, F. M. Spinath, and A. Angleitner, “Thin slices of behavior as cues of personality and intelligence”

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5	Introduce the robot to the experimenter.	5
6	Speak the answer by solving any one of the three logical problems.	5 (limited)
7	Read and speak 12 newspaper headlines.	2
8	Describe any one of the three situations using pantomime.	5
9	Sing a song you chose	1.5

Situation : Alone

- Monolog
- Solving Problems
- Singing Alone

P. Borkenau, N. Mauer, R. Riemann, F. M. Spinath, and A. Angleitner, “Thin slices of behavior as cues of personality and intelligence”

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Situation :

Human-Human Interaction

- Conversation
- Explain
- Pantomime

P. Borkenau, N. Mauer, R. Riemann, F. M. Spinath, and A. Angleitner, “Thin slices of behavior as cues of personality and intelligence”

Scenario description of episodes

- Consider situation during human-robot interaction (Alone, Human to Human, Human to Robot)

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4	Describe the objects you saw in the waiting room.	5
5	Introduce the robot to the experimenter.	5
6	Speak the answer by solving any one of the three logical problems.	5 (limited)
7	Read and speak 12 newspaper headlines.	2
8	Describe any one of the three situations using pantomime.	5
9	Sing a song you chose	1.5

Situation :

Human-Robot Interaction

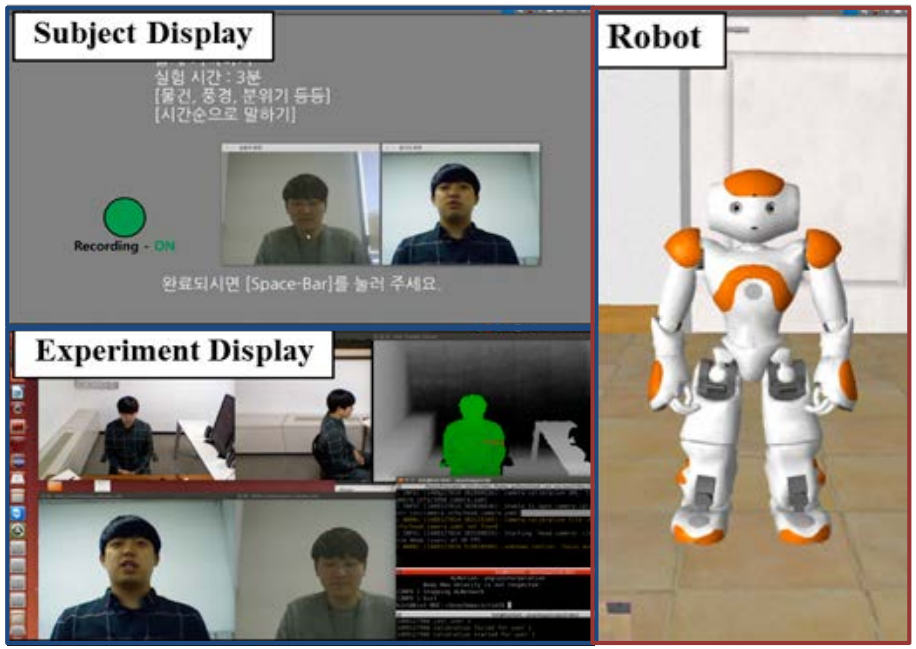
- Conversation

P. Borkenau, N. Mauer, R. Riemann, F. M. Spinath, and A. Angleitner, “Thin slices of behavior as cues of personality and intelligence”

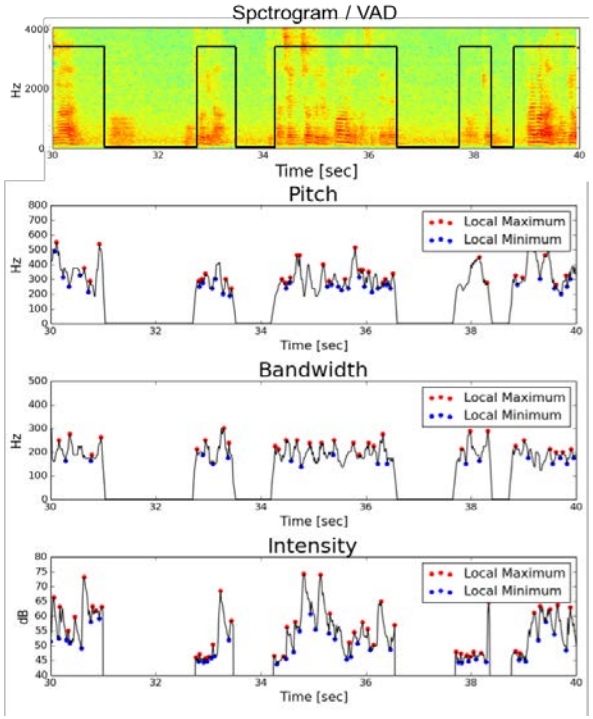
Result(Ongoing)

System operation screen & acquired data example

Example view of thin slice behavior data acquisition experiment



Acquired Audio Data

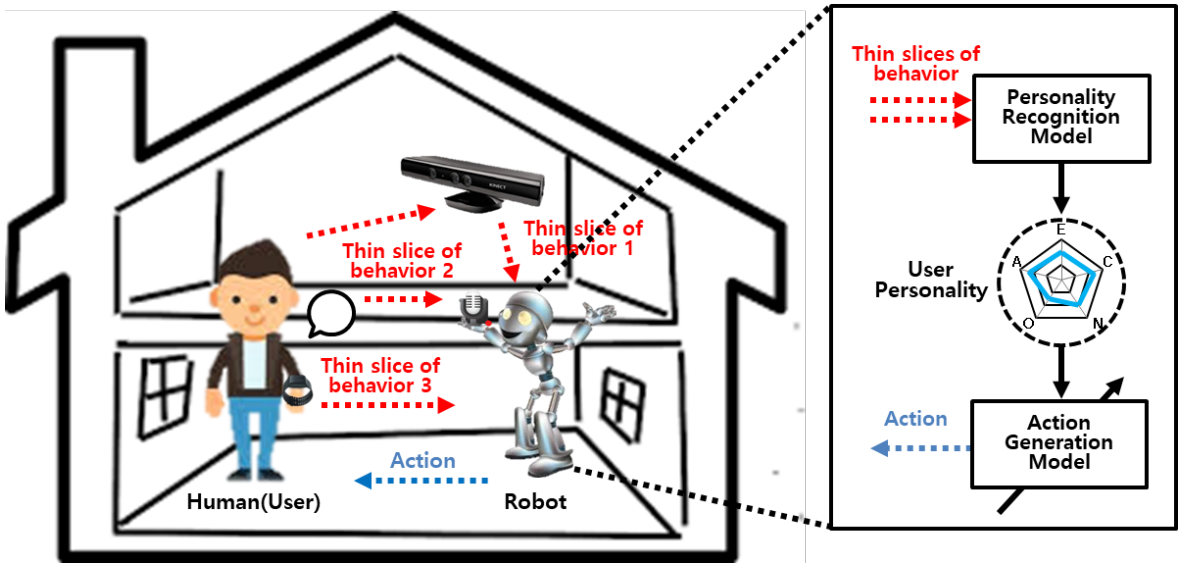


- 13 Subjects have been participated.
- We are currently analyzing the possible correlation between the obtained human behavior and personality using statistical/machine learning methods.

Conclusion

Conclusion

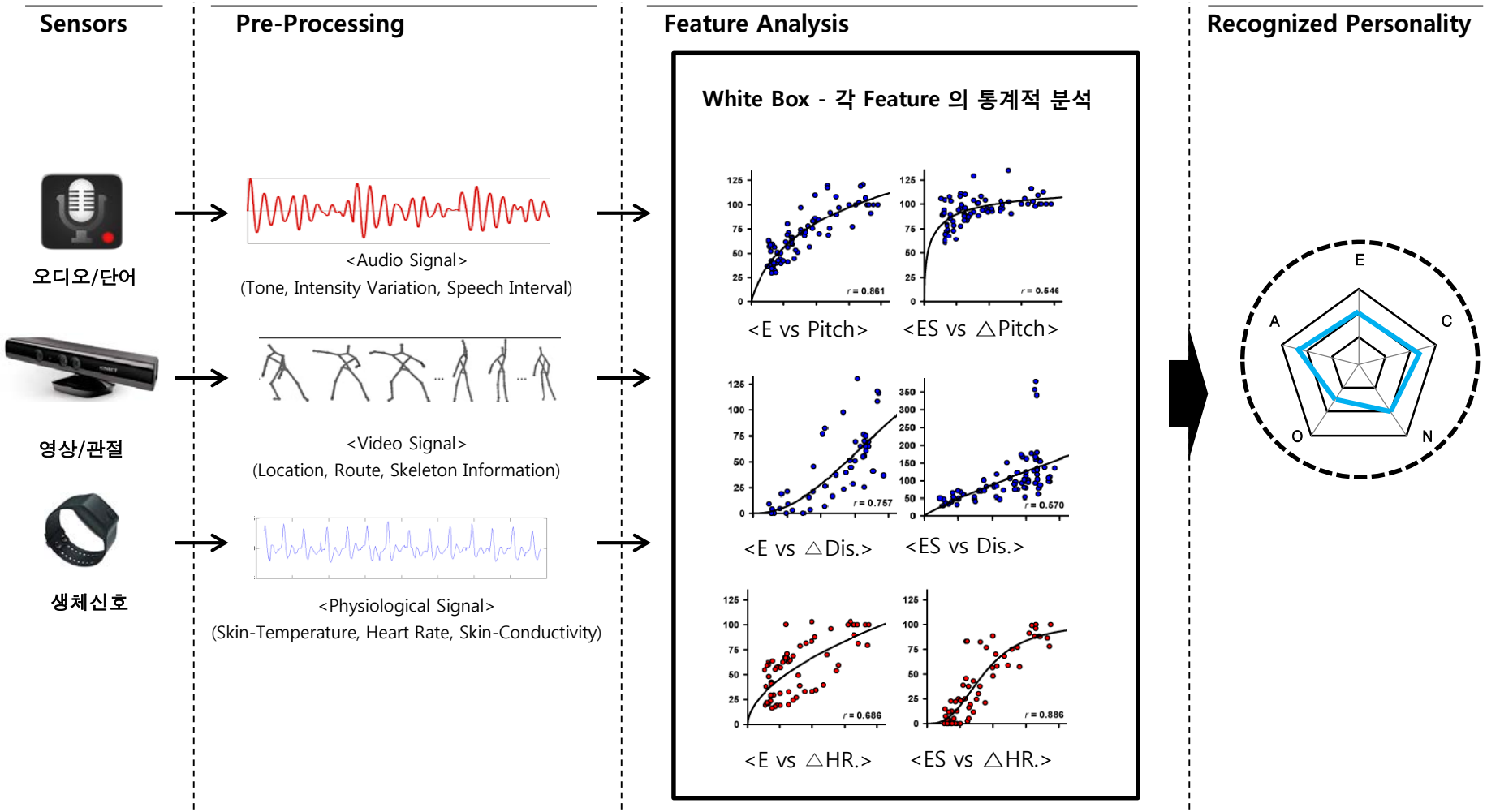
- ✓ We have constructed the automated human behavior data acquisition system for personality recognition.
- ✓ We are going to analyze correlation between thin-slice of behavioral cues acquired our system and human's personality.
- ✓ We plan to build the online personality recognition model and apply it to human-robot interaction scenarios.



Thank you

System and Method

- 통계 분석을 이용한 성격 인식 방법(Thin-slices of behavior-Based)



System and Method

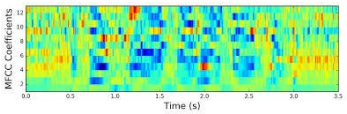
- **DNN-Based End to End 성격 인식**

Sensors

오디오/단어

영상

Pre-Processing



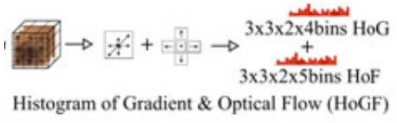
<MFCC + Voice Energy>

Sppech2Text

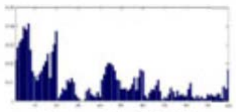
<HoBoW>

Spatial Configuration Time Trajectories

<얼굴요소(눈, 코, 입) 머리 움직임 Traj.>



<얼굴 영상 HoGF>

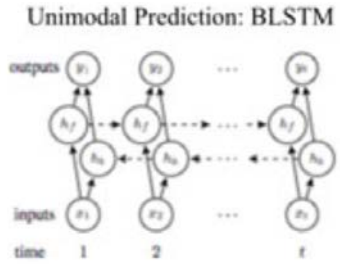


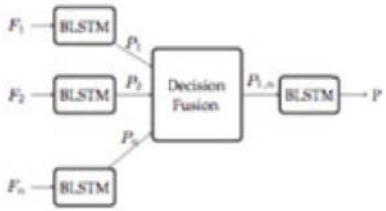
Pyramid of HoG

<몸 영상 PHoG>

Feature Analysis

Black Box – Bidirectional-LSTM





Recognized Personality

u_p : Personality of A recognized by B