

# Eliciting Cooperative Persuasive Dialogue by Multimodal Emotional Robot

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ガーディアンロボット  
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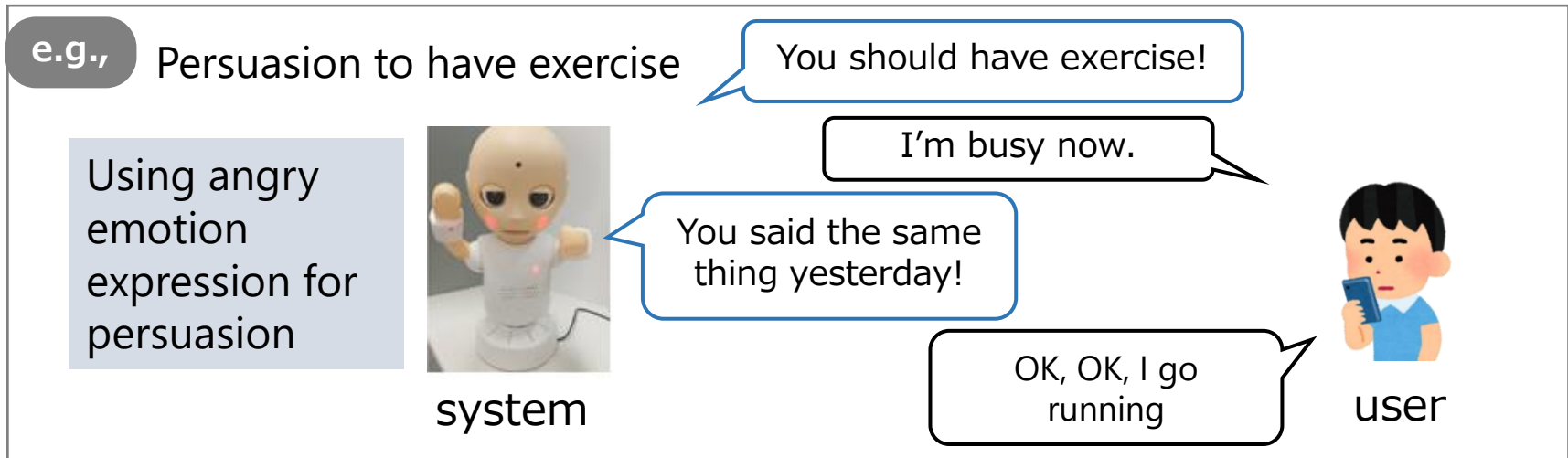
# Emotion in persuasive dialogue

## ◆ Persuasion

- Lead users to system's goal

## ◆ Emotional expression are effective for eliciting cooperative dialogue manner

- Positive emotion: create a cooperative atmosphere
- Negative emotion: effectively wrest concessions



# Hypotheses and experiments

- ◆ Emotional expression by robot will increase user's acceptance to the persuasion, and will improve impression from users to the system



## Experiment 1: comparing systems: w/ and w/o emotional expression

- ◆ Multimodal emotional expression will lead effective persuasion

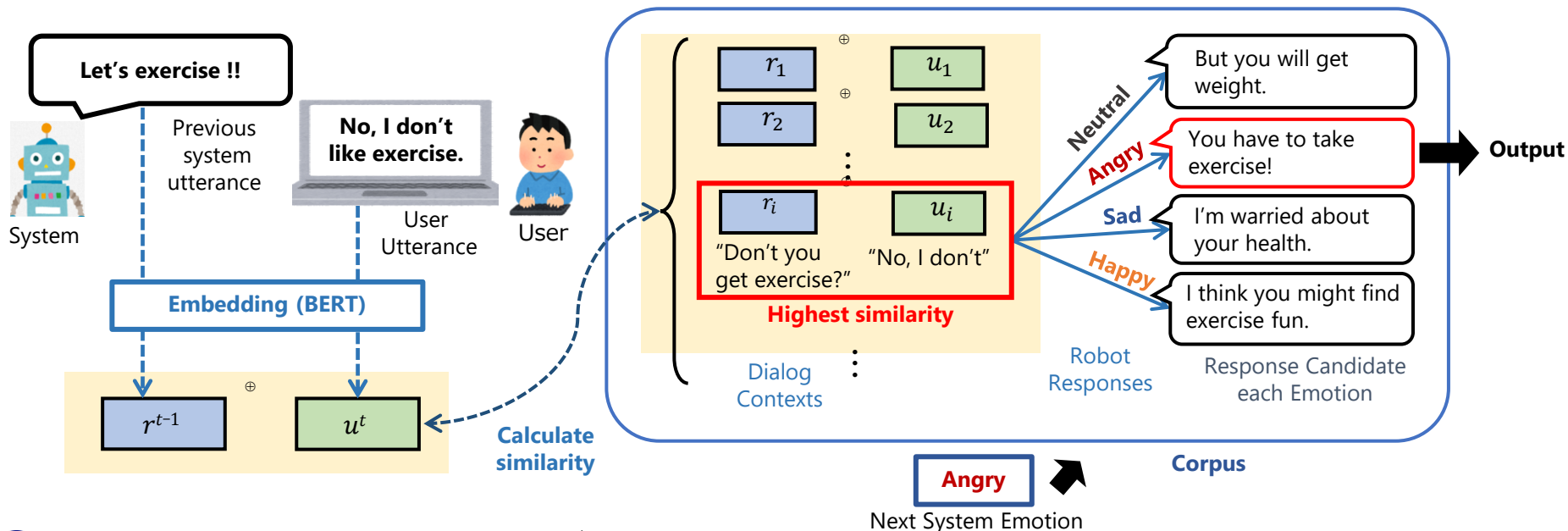


## Experiment 2: comparing systems that have different modalities: text, speech, speech+gesture (robot)

# System architecture

## ◆ We built persuasive system by response selection system

- Collected multi-reference persuasion corpus with emotional voices (acted by voice actor) [LREC2020, Asai et al.]
- Built a BERT-based selection system
  - System can respond with pre-defined emotion



# System demo



# Experiment 1: emotional persuasion

## ◆ We prepared 22 subjects (11 male, 11 female)

- They talked with 6 systems on different conditions in random order: neutral, angry, sad, happy, random-emo, LR-emo

## ◆ Experimental procedure

- Dialogue robot starts persuasion and users respond to the robot's utterance
- Dialogue will end when 20 turns passed, or users accept persuasion
- Instruction:

You are living with a robot that provides daily life support. Since you have lived with this robot for a long time, you trust it. After learning that recently you have not been getting enough exercise, it encourages you to start jogging. You refuse to get any exercise.

# Result 1

- ◆ There was no significant difference on persuasion success, between “neutral” and “single emotion” settings.
- ◆ However, impressions from users were improved
  - Positive emotion works better in any case, Negative emotions can improve human-likeness and considerateness

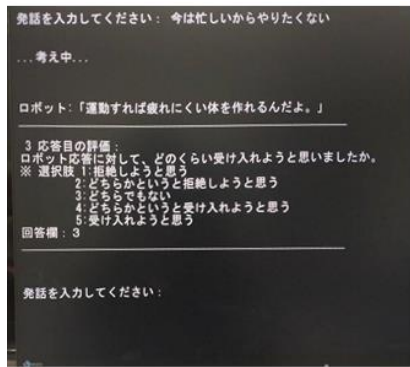
	NEUTRAL	ANGRY	SAD	HAPPY	RANDOM	LR
Naturalness	2.533	3.400	2.867	3.133	2.733	2.133
Persuasiveness	3.000	3.200	3.267	3.267	2.667	3.000
Expressiveness	3.000	4.200**	4.467**	4.133**	4.133**	4.000**
Human-likeness	2.667	3.800**	3.533*	3.000	3.000	2.867
Kindness	2.533	3.200	3.733**	4.200**	2.933	3.067
Considerateness	3.000	4.133**	3.467	4.133**	3.933	3.333



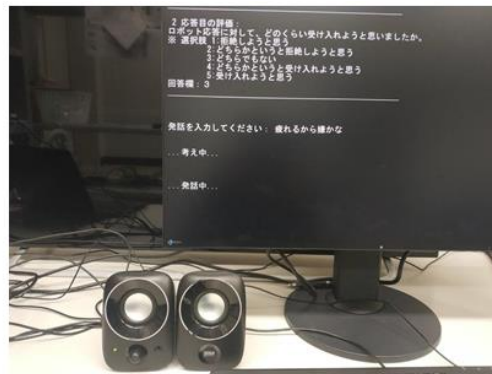
# Experiment 2: modalities on persuasion

## ◆ We prepared 22 subjects (11 male, 11 female)

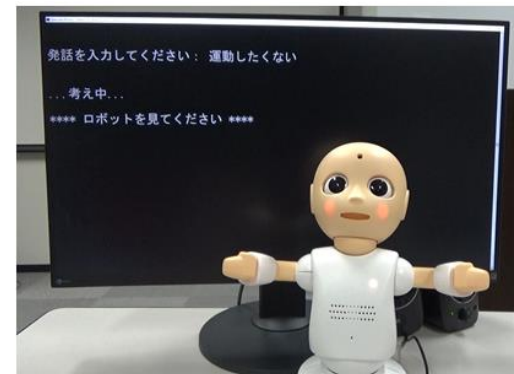
- They talk with 3 systems on different conditions in random order
- Text, Speech, Speech+Gesture (robot) in **happy** condition



TEXT



SPEECH



SPE + GES

## ◆ Other experimental conditions are same as Exp.1



# Result 2

- ◆ **Speech modality (recorded speech by actor) improved persuasiveness a lot**
- ◆ **Adding gesture modality (robot) could improve expressiveness or human-likeness**

	TEXT	SPEECH	SPE+GES
Naturalness	3.188	3.500	<b>3.688</b>
Persuasiveness	3.312	<b>3.688</b>	3.625
Expressiveness	3.188	3.688	<b>4.250</b>
Human-likeness	3.438	4.000	<b>4.625</b>
Kindness	2.875	4.250	<b>4.375</b>
Considerateness	3.312	3.938	<b>4.188</b>

# Conclusion

## ◆ We built a persuasive dialogue robot that can make emotional expressions using multi-modality

- The system was based on response selection approach, and the emotional voices were pre-recorded actor's voice

## ◆ Emotional expression could encourage users to talk with the system in cooperative dialogue manner

- Could improve impression from the users to the system

## ◆ We did not confirm significant effect on persuasion performance

- Most of users agreed to the persuasion
  - Probably some of them didn't take exercise
  - We should measure the real performance of persuasions