Goal9 Realization of a mentally healthy and dynamic society by increasing peace of mind and vitality by 2050. Development of "*Jizai Hon-yaku-ki* (At-will Translator)" connecting various minds based on brain and body functions

R&D item

3. Functions of Jizai Hon-yaku-ki

Progress until FY2023

1. Outline of the project

In R&D Item 3, we aim to develop *Jizai Hon-yaku-ki* itself and, specifically, its **key functions necessary to support our everyday interactions**.



Illustation of Jizai Hon-yaku-ki (when A speaks to B)

Jizai Hon-yaku-ki consists of two components: an **interpreter** "reads" the user's mental state and an **expresser** "conveys" it to another user.

The primary task of this R&D Item is to develop the two parts with **sensitivity to the diversity of contexts and our personalities**, so that *Jizai Hon-yaku-ki* can assist our mundane communication.

2. Outcome so far

- 1. Developed tactile feedback devices to create various textures
- 2. Developed a system to share visual perspectives with

others

- 3. Developed a computational model to infer emotional states from speech
- 4. Verified the importance of facial information from speakers for understanding unclear speech
- 5. Devised a method to evaluate the naturalness of conversations

Outcome 1: We have developed a new device that allows for the manipulation of various vibration parameters to create a sensation similar to the movement of materials felt at the fingertips. This device can serve as a foundational technology for tactile interaction with others and communication assistance. Currently, we are preparing to conduct user experience evaluations targeting individuals with developmental disabilities as part of R&D Item 4.



 $\label{eq:outcome} \begin{array}{l} \textbf{Outcome 1} - \textbf{tactaile feedback device with adjustable texture} \\ \textbf{sensation} \end{array}$

Image provided by Prof. Masahiko Inami (U Tokyo)

Outcome 2: We have developed a system using headmounted displays that enables users to experience viewing things from others' perspectives. Sharing perspectives can serve as a useful function for communication support. Currently, we are verifying when shared perspectives, such as viewing the same object as others or synchronizing with



Outcome 2 — sharing the perspective of others Image provided by Asst. Prof. Hiroto Saito (U Tokyo)

Here begins our new MIRAI

MOONSHO

heartbeats, affect the user's emotional state.

Outcome 3: We have developed a model to estimate emotions from voice and found synchronized emotional changes between infants and caregivers using their voice, aiding interpretation device development for diverse users.

Outcome 4: We have found that listening to unclear speech while observing the speaker's face allows for more accurate comprehension. This finding is valuable for developing devices aimed at better understanding others' words.

Outcom 5: We have devised a new method using largescale language models (GPT) to assess conversation continuity. This is valuable for developing interpretation devices, reflecting diverse personalities and contexts.

3. Future plans

We will continue developing an interpreter and an expresser that are sensitive to contexts and personalities.

In parallel, we attempt to develop a proof-of-concept product of *Jizai Hon-yaku-ki* by incorporating the findings from the other five R&D Items.

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