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

Here begins our new MIRAI

MOONSHOT RESEARCH & DEVELOPMENT PROGRAM

R&D Theme

Functions of *Jizai Hon-yaku-ki*

Progress until FY2022

1. Outline of the project

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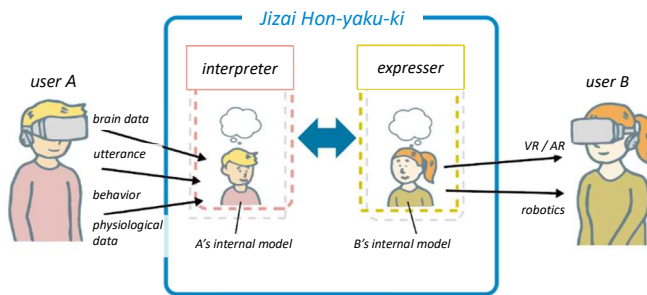

Illustation of *Jizai Hon-yaku-ki* (when A speaks to B)

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 Theme 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. *Succeeded in estimating a caregiver's stress level from the caregiver's and her child's pulse rates;*
2. *Developed a warmth-presenting display that is non-*

contact and highly responsive;
3. *Developed a floor interface to record room-scale human behavior;*
4. *Analyzed quantitatively the context-dependent features of our utterances.*

Outcome 1: We utilized the electrocardiogram (ECG) of 51 caregivers and their 3-t+o-4-year-old children. We found that one can estimate a caregiver's stress level from the caregiver's and her child's ECG. Interestingly, the physiological data from someone (a child) can improve the estimation of the mental state of another (a caregiver).
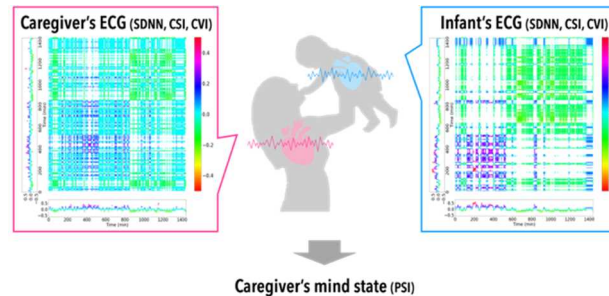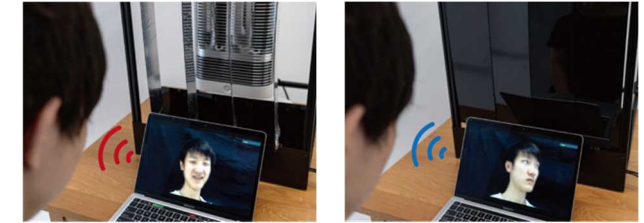

Outcome 1 — illustrative summary
Figures by Professor Yukie Nagai (UTokyo)

Outcome 2: We developed a visual display equipped with non-contact, high-responsive thermal feedback by swift control of infrared radiation. It enables one to "perceive" the interlocuter's mental state and behavior, assisting our situation-driven communication.

Outcome 3: We developed a tile-shaped interface placed on the floor with force sensors. It measures position,

Outcome 2 — illustrative summary
An agent (left) feel warm when he is catching the interlocuter's eye on the display.
Source: https://doi.org/10.1145/3532721.3535569

posture, and movement without each user wearing a device. This module helps to estimate human behaviors and related intentions that are difficult to record visually.

Outcome 4: We used amplitude modulation (temporal variation in the intensity of the sound signal) to analyze phonetic changes in our utterances depending on the situations and contexts. This finding helps to develop voice outputs that reflect the user's intention and are easily understood by others.

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 Themes.
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