Event: Symbiotic Society Seminar
Date: December 14, 2025
Location: Kanagawa Prefectural Government Headquarter Building

ともに生きる社会
かながわ憲章
KANAGAWA CHARTER for an Inclusive Society

Robotic Systems for Creating a Symbiotic Society

- Thinking from Users' Perspectives -



Kanagawa Institute of Technology
Human-Machine Symbiosis Laboratory (SybLab)

Scan the QR code to get the slides.

- Presentation Materials Page (Please access via the QR code)
  - Japanese Version
  - English Version
  - Hiragana Version (Easy Japanese)



https://www.syblab.org/laboratory/tomoiki/index_jp.html

SybLab Human-Machine Symbiosis Laboratory



Research Objectives

Symbiosis of Humans and Machines

Exploring Ecosystems for Humans and Robots to Grow Together.

Research Fields

- Machine Learning Theories
- Cognitive Developmental Robotics
- Nursing/Medical/Welfare Supports



Toward Realizing a Symbiotic Society

- **Mission:** SybLab aims in studies on “Human-Machine Symbiosis” and demonstrates the development of supporting devices focusing on nursing, medical, and welfare fields.
- **Philosophy:** We are targeting on “thinking about the relationship between humans and machines from users’ perspectives”.
- **Goal:** We are trying to increase what we can do through technology especially for whom social participation is limited due to disabilities, aging, disease and etc.

Creating an environment where everyone can participate in societies through technology.

What is "User's Perspective" in Disability Welfare?

In the Kanagawa Prefecture Disability Welfare Ordinance:

- Everyone involved with persons with disabilities should think from their perspective.
- Value the person's own wishes and desires.
- Create a society where persons with disabilities can live according to their own feelings and thoughts with receiving necessary supports.

Developing user-friendly systems from users' perspectives

Reference: Readable for Everyone: Kanagawa Prefecture Ordinance for Promoting Disability Welfare from the Perspective of Persons with Disabilities

Field Testing Overview

Date August 25 (Mon) – September 1 (Mon), 2025

Place Social Welfare Corporation Tenryu Koseikai (Hamamatsu City)

Content

- Behavior Measurement Tests
- Rehabilitation Tests

Thinking about Human-Machine Symbiosis from Users' Perspectives.

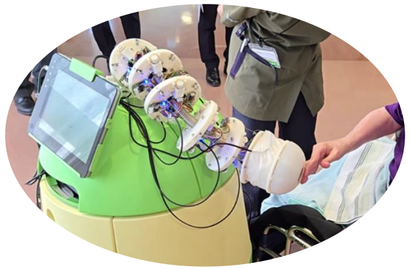
Robot Systems Verified in Field Tests



Finger rehabilitation using image recognition and sound generation
Presenter: Yudai Aikawa
Theme: Finger Rehabilitation



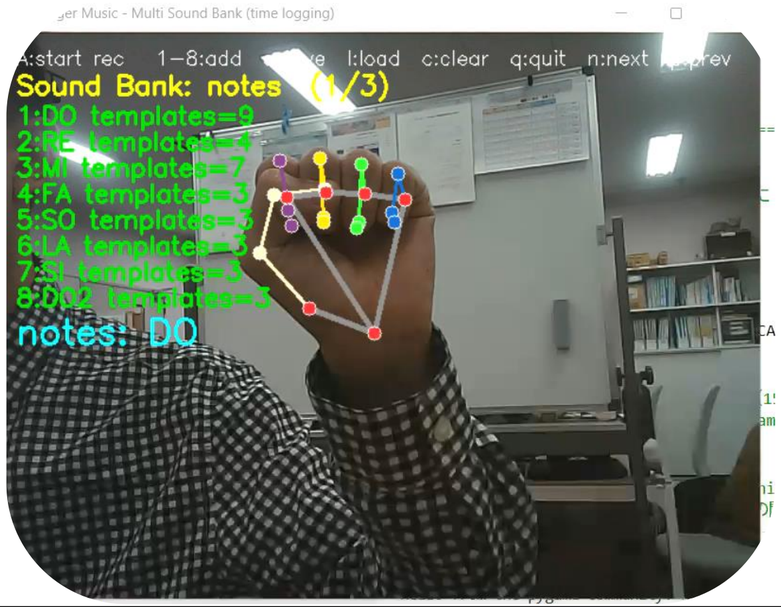
Speaking meal monitor by Image recognition to prevent aspiration
Presenter: Shunsuke Igarashi, Min Pyae Hein
Theme: Meal Monitoring



Robot interaction for sleep detection and arousal control
Presenter: Ren Harima, Teng Xin Ying
Theme: Sleep Improvement

01/Finger Rehabilitation

Background: Diseases or injuries reduce finger join movement.
Purpose: Make rehab easy and accessible for everyone.
Method: Play music with finger gestures. Use sound to perceive motion range.
Features: Play with slight movements. Fun and engaging for beginners.



Playing tulips with finger movements



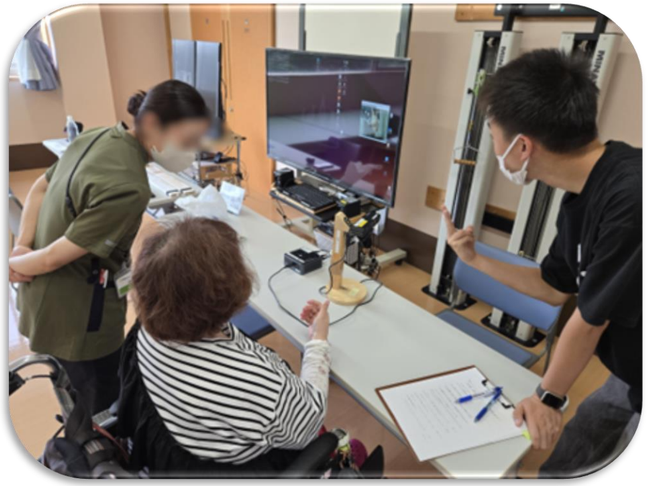
Easy to play and fun

01/Finger Rehabilitation

Demonstration test results

- In rehabilitation, it is important to motivate people to "have fun and want to try". It meets the needs of the rehabilitation field.
- Because the finger gestures were set for able-bodied people, there were times when it was difficult to produce sound as expected.
- It is difficult to remember the correspondence between finger gestures and sounds. I would like you to present a table of correspondence between scales and finger gestures.





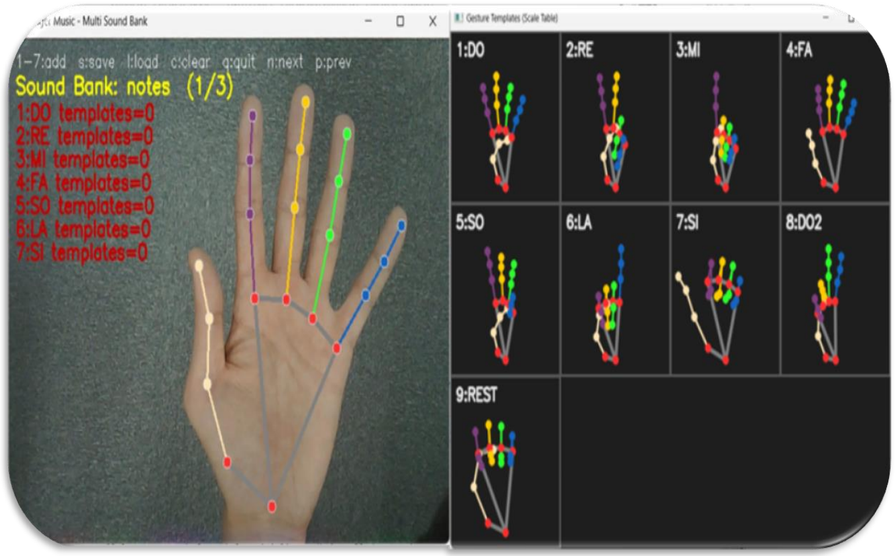
01/Finger Rehabilitation

Improvement after demonstration testing

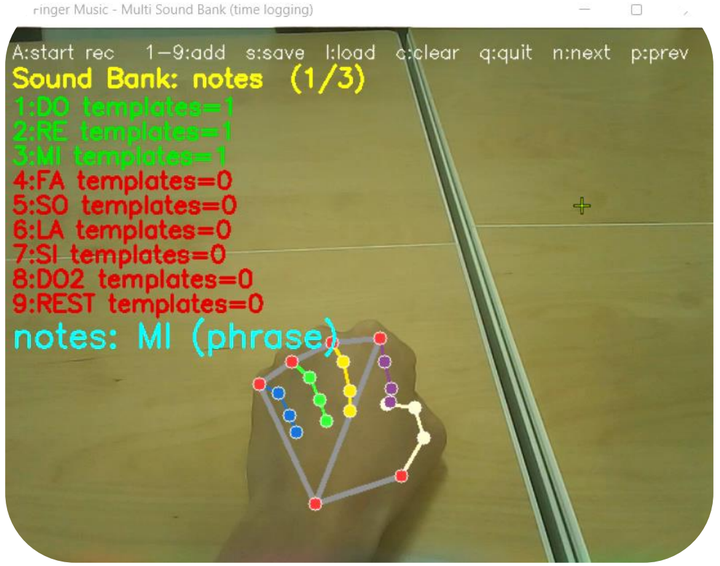
■It has been improved so that it can be played even with few moving fingers.

■Improved to be able to register gestures with your finger.

■Made it possible to display registered finger gestures.



Scale table with registered gestures



Playing with few fingers

01/Finger Rehabilitation

Conference Presentation (December 01, 2025)

■When I presented my research at the 29th Accessibility Workshop of Information Processing Society of Japan, I received the Student Encouragement Award.



Conclusion

■We proposed a system that converts finger bending and stretching into sound and can continue finger rehabilitation in a fun way.

■I realized the importance of building a system from the perspective of the person concerned, such as setting finger gestures.



Future prospects

■I want to increase the variety of sounds that sound when playing.

■I want to be able to rehabilitate with sound games.



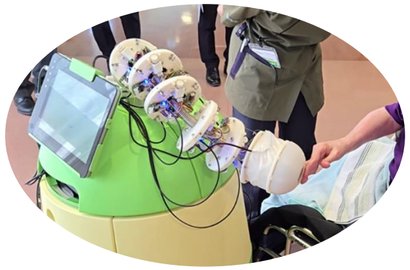
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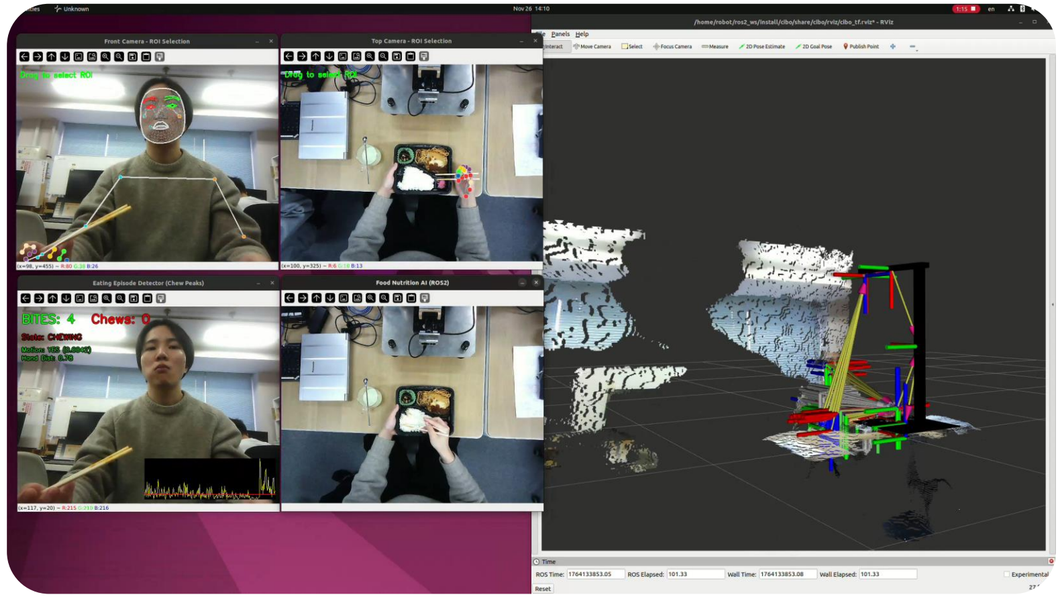
Robot interaction for sleep detection and arousal control
Presenter: Ren Harima, Teng Xin Ying
Theme: Sleep Improvement

02/Meal Monitoring

Background: Swallowing disorders cause aspiration and choking accidents.
Goal: Identify a method to prevent aspiration and increase food intake.
Method: Eating behaviors are recognized, and chewing & posture are guided.
Features: Food transportations to the mouth and chewing are counted.



Recognizing eating behavior of the elderly



3D analysis of eating behavior by the system

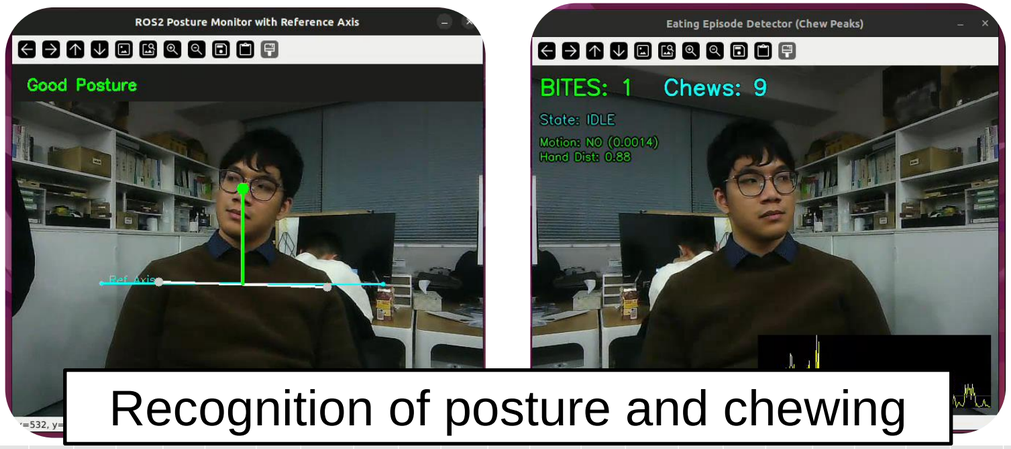
02/Meal Monitoring

Feedback Comments:

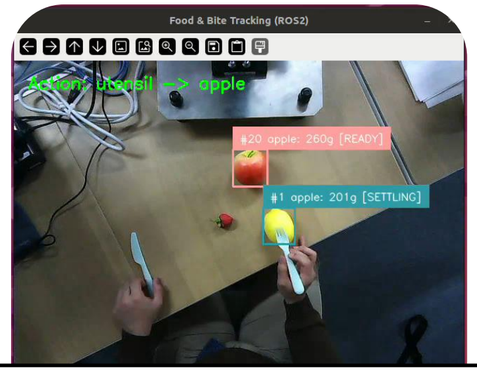
- **Insight:** Good posture and more chewing reduce the risk of aspiration.
- **Request A:** Meal delivery errors lead to accidents. It's helpful if food type is verified.
- **Request B:** Lower voice pitch is preferred. High-pitched sounds gets harder to hear.

Improvements:

- **New Metrics:** Posture angle, bite motion, chew count of a person are measured.
- **New Detection:** Estimates types, volumes and calories of foods are estimated.



Recognition of posture and chewing



Estimation of food type, volume and calories

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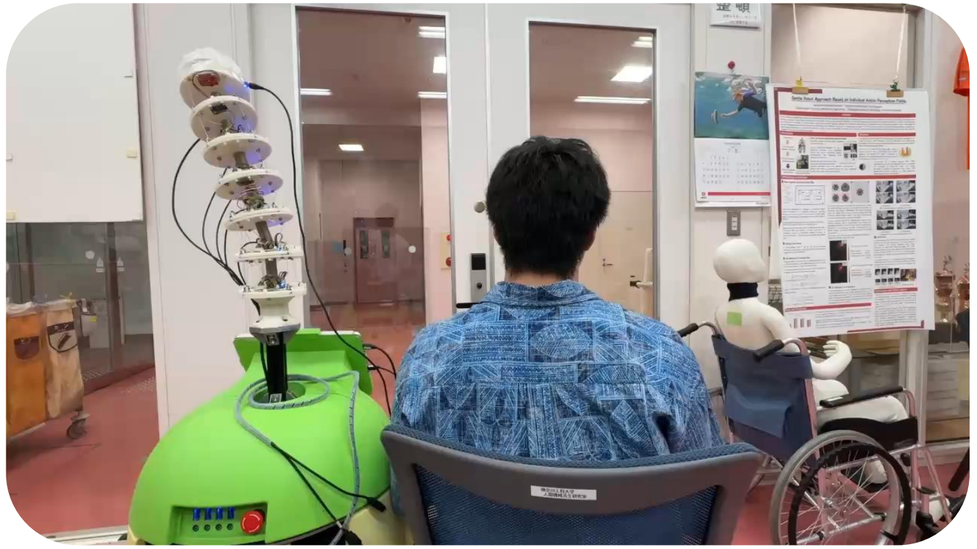
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03/Sleep Improvement

Background: Daytime sleep reduces the quality and quantity of night sleep.
Objective: Identify how to disrupt sleep and increase daytime activity levels.
Method: Robot detects sleep and prompts awakening verbally and physically.
Features: A robot stimulates sense of touch and pressure, when dozing off.



Approaching a person who is taking a nap in bed



Shaking shoulder to wake up a person

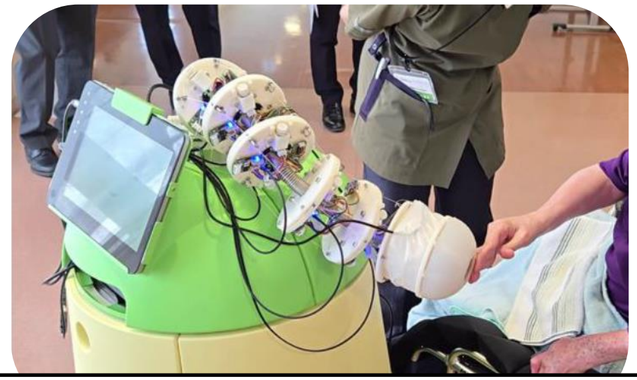
03/Sleep Improvement

Feedback Comments:

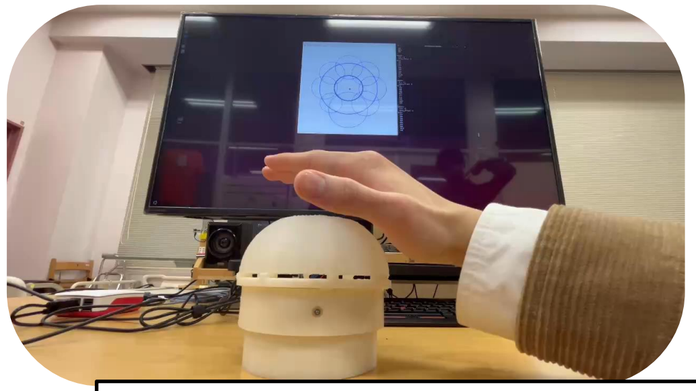
- Acceptance: Staff members are preferred to wake me up, but robot is acceptable.
- Touch: Begin touched by a robot was not unpleasant, but it felt “hard” to the touch.
- Safety: Gradually encourage awaking, considering individuals with heart conditions.

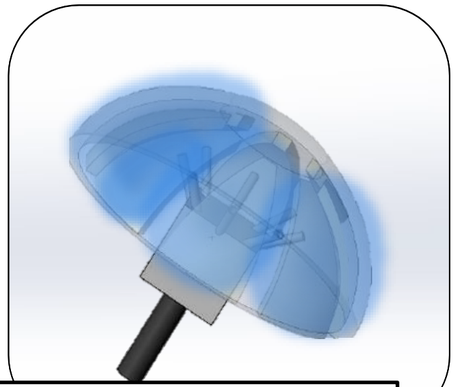
Improvements:

- New Skin: We introduced hemispherical contact detection to a silicone artificial skin.
- Hygiene: We are examining improvements in hygiene through self-disinfection.



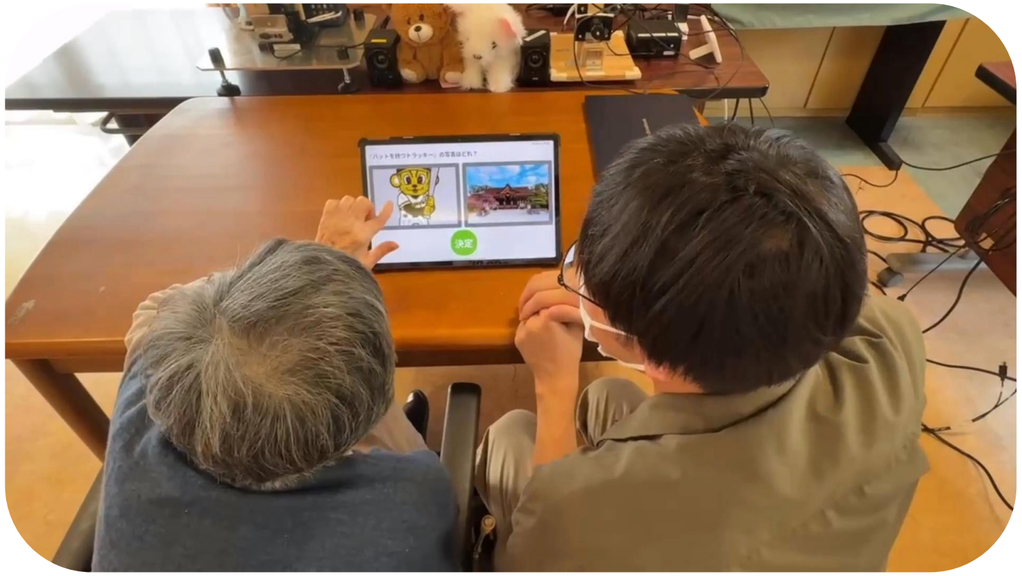
Touching artificial skin





Addign contact detection and self-disinfection

04/Related Research Topics



Recall training with a memory app

Recall and retain fun memories and new memories with the app

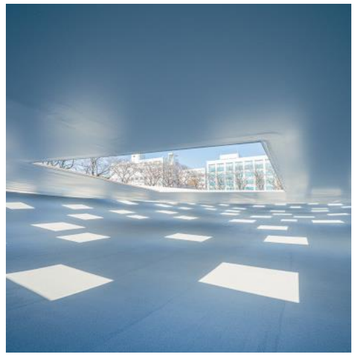


Oral interface for visualization of tongue movements

You can operate life support equipments while rehabilitating your tongue.

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Thank you for your attention.

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