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Kyushu Institute of Technology, The University of Kitakyushu, Japan
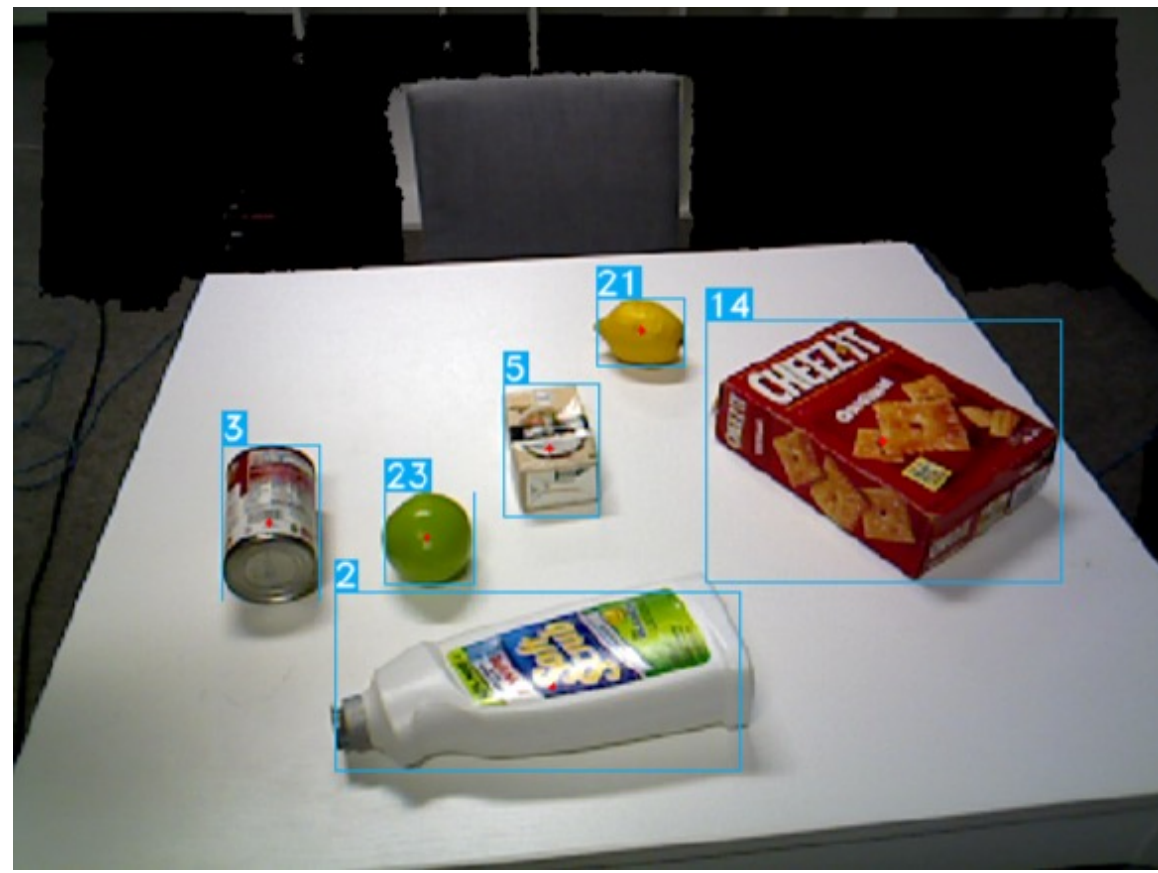
T. Shiba, T. Ono, S. Tokuno, ○A. Mizutani, Y. Yano, D. Kanaoka, Y. Fukuda, H. Amano, H. Hayashi, K. Nakahara, K. Tamai, R. Ueno, R. Takemoto, Y. Shishido, K. Murai, M. Anraku, M. Suzuka, K. Isomoto, T. Mizo, A. Suzuki, M. Shimoda, Y. Yoshimoto, Y. Tanaka, H. Tamukoh
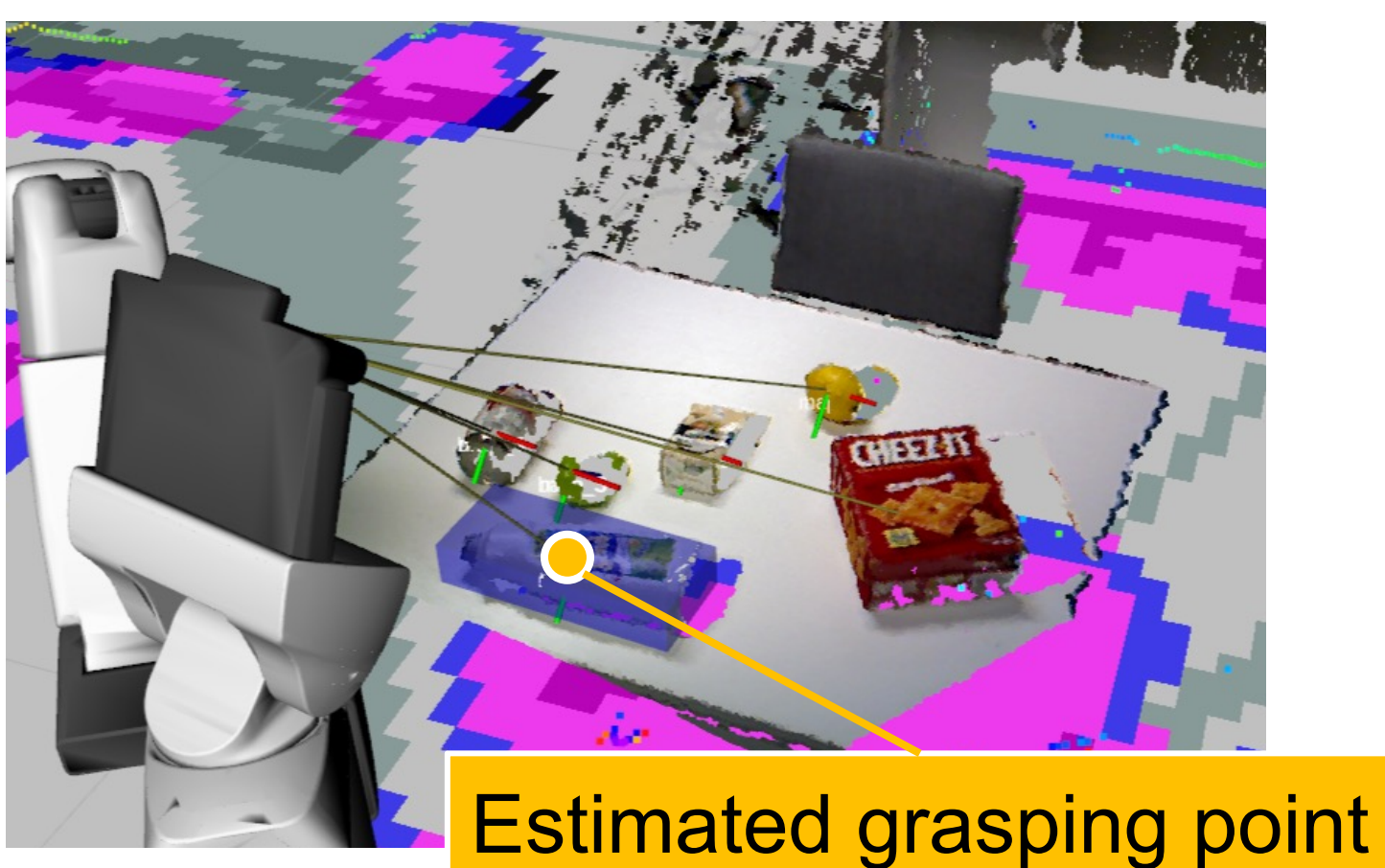
Basic Functions

Object Recognition

Object recognition YOLACT[1]
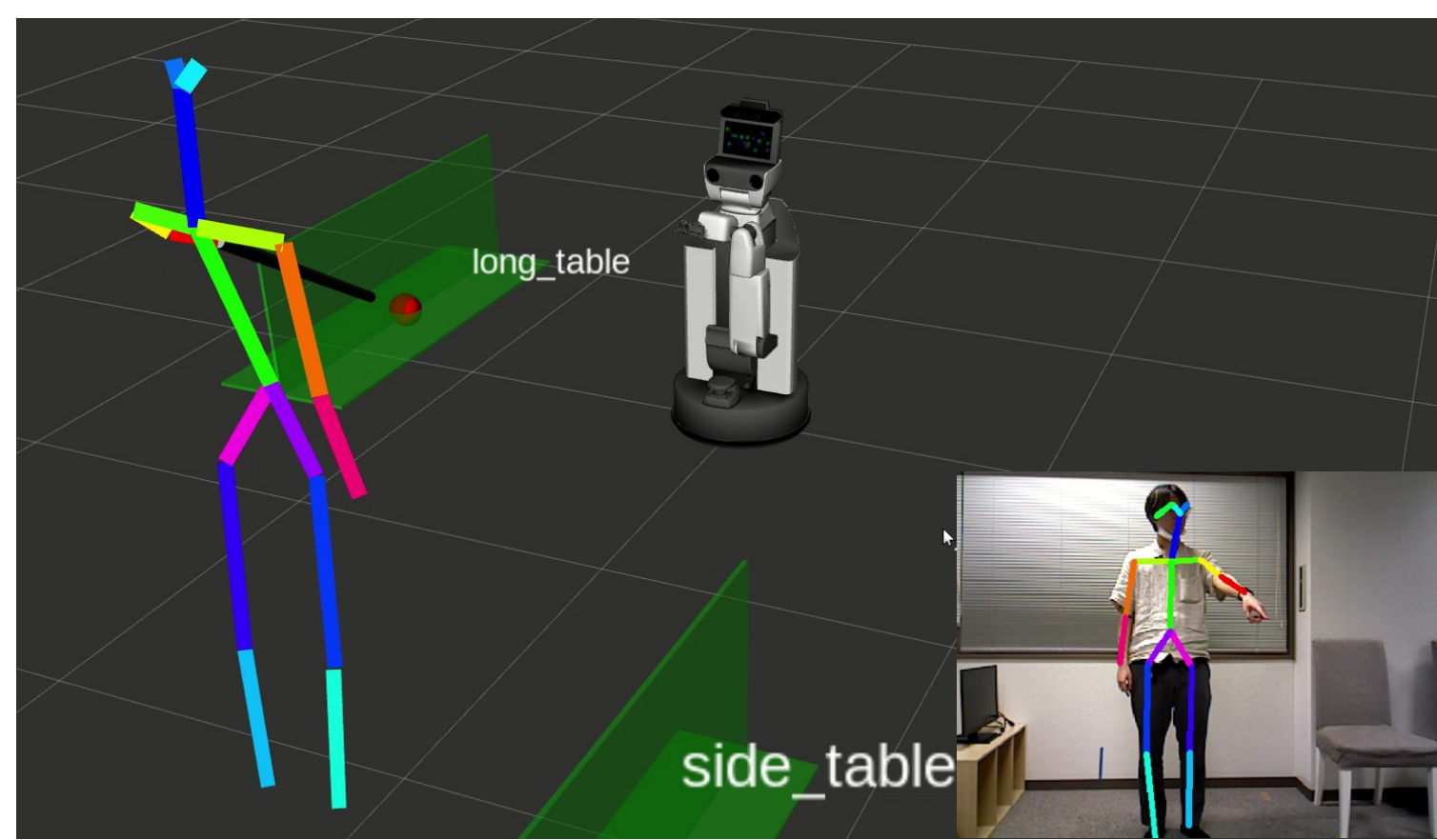

Grasping pose estimation

Estimated grasping point

Human Detection

Human attribute recognition by CSRA[2]

✓ Male
✓ Glasses
✓ Long sleeve
✓ Face mask

Pointing position estimation based on LightWeightHumanPose[3]

long_table

side_table

Voice Recognition

Speech recognition by Vosk[4]

William

Dictionary
Hunter
Max
Pikachu
William
Olivia

Noise reduction by noisereduce[5]

Env. Recognition

Placeable area recognition

: Placeable area

Travelable area recognition
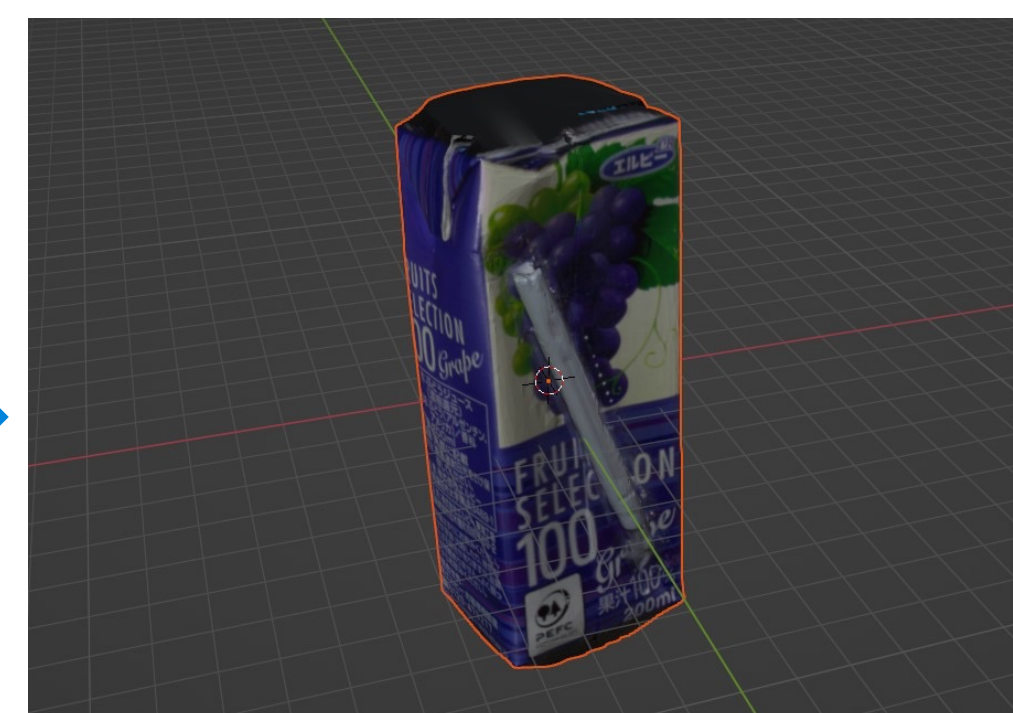

: Travelable area

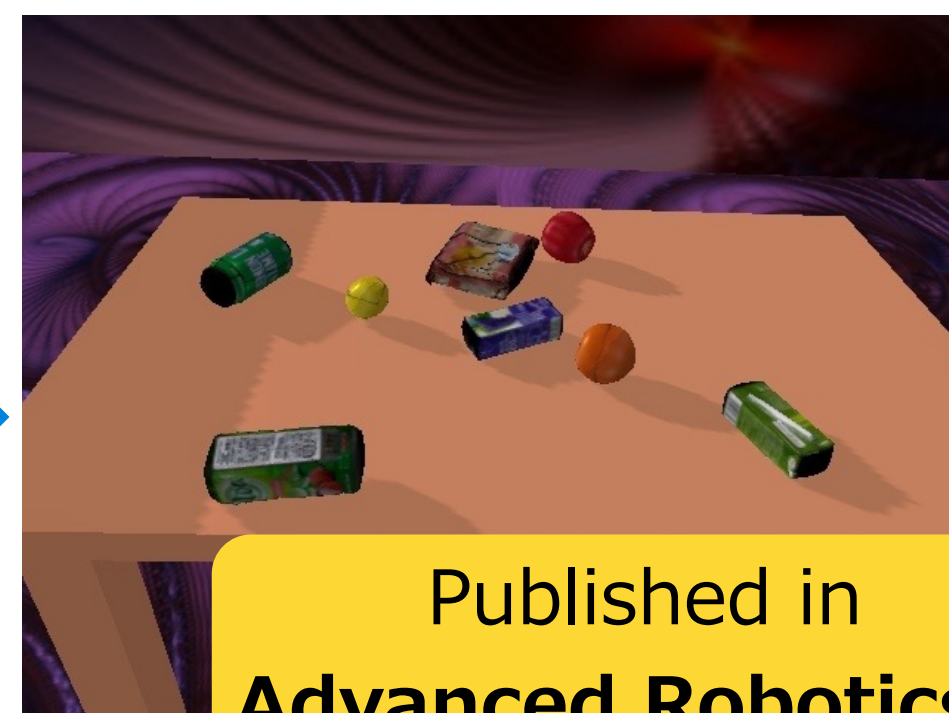## Dataset Generation and Sim2Real

3D model scanning → **Scanned 3D model** → **Domain randomization**

Published in **Advanced Robotics[6]**

1st place in WRS 2020 + RCAP 2021 + JapanOpen 2021 (Real robot's league)

Automatically generate **100,000** training data with labels and masks within **1 hr on a simulator**

Open-source Simulator

2nd place in RC2021
1st place in RCAP 2022

Our development workspace is available on GitHub:
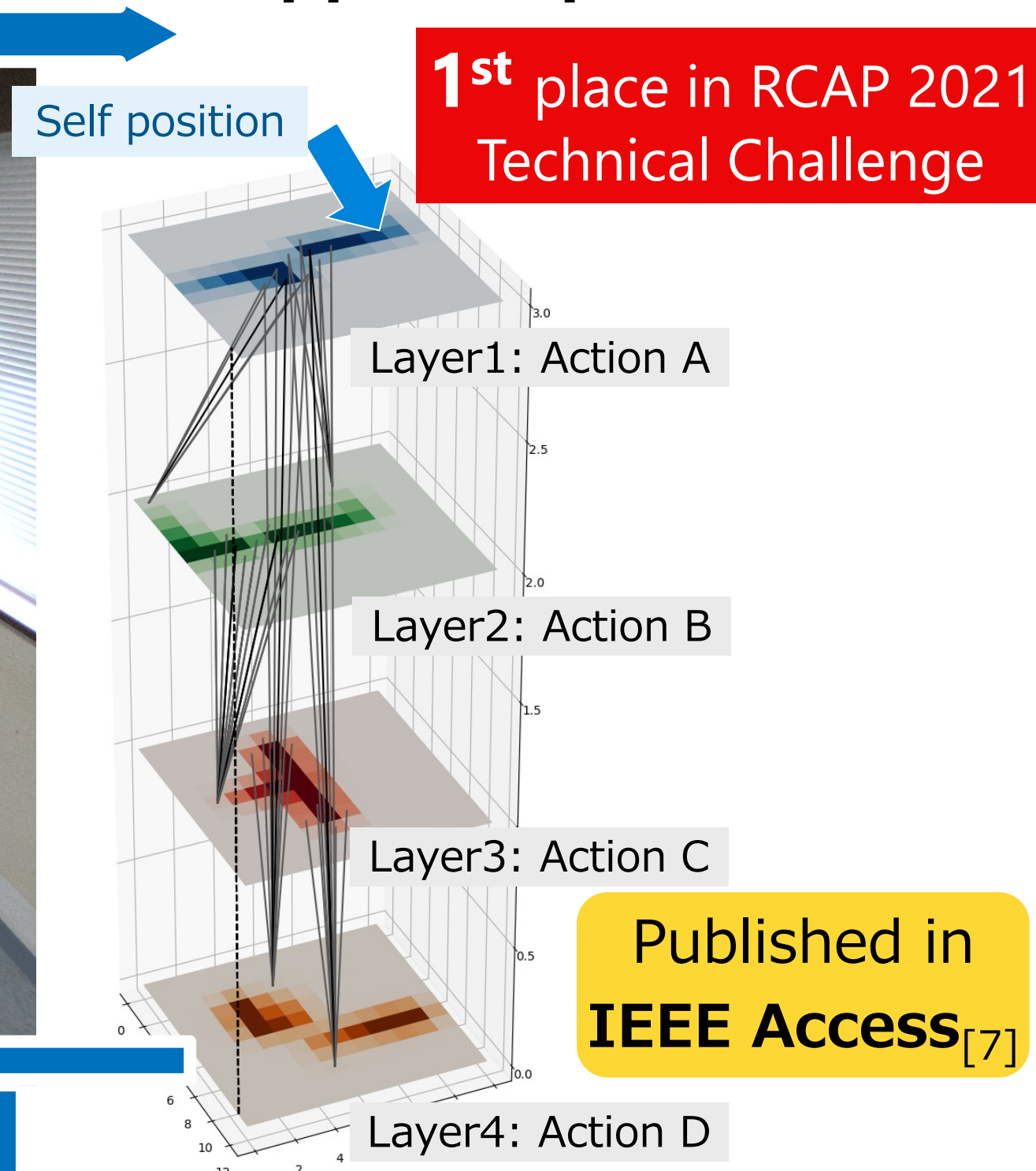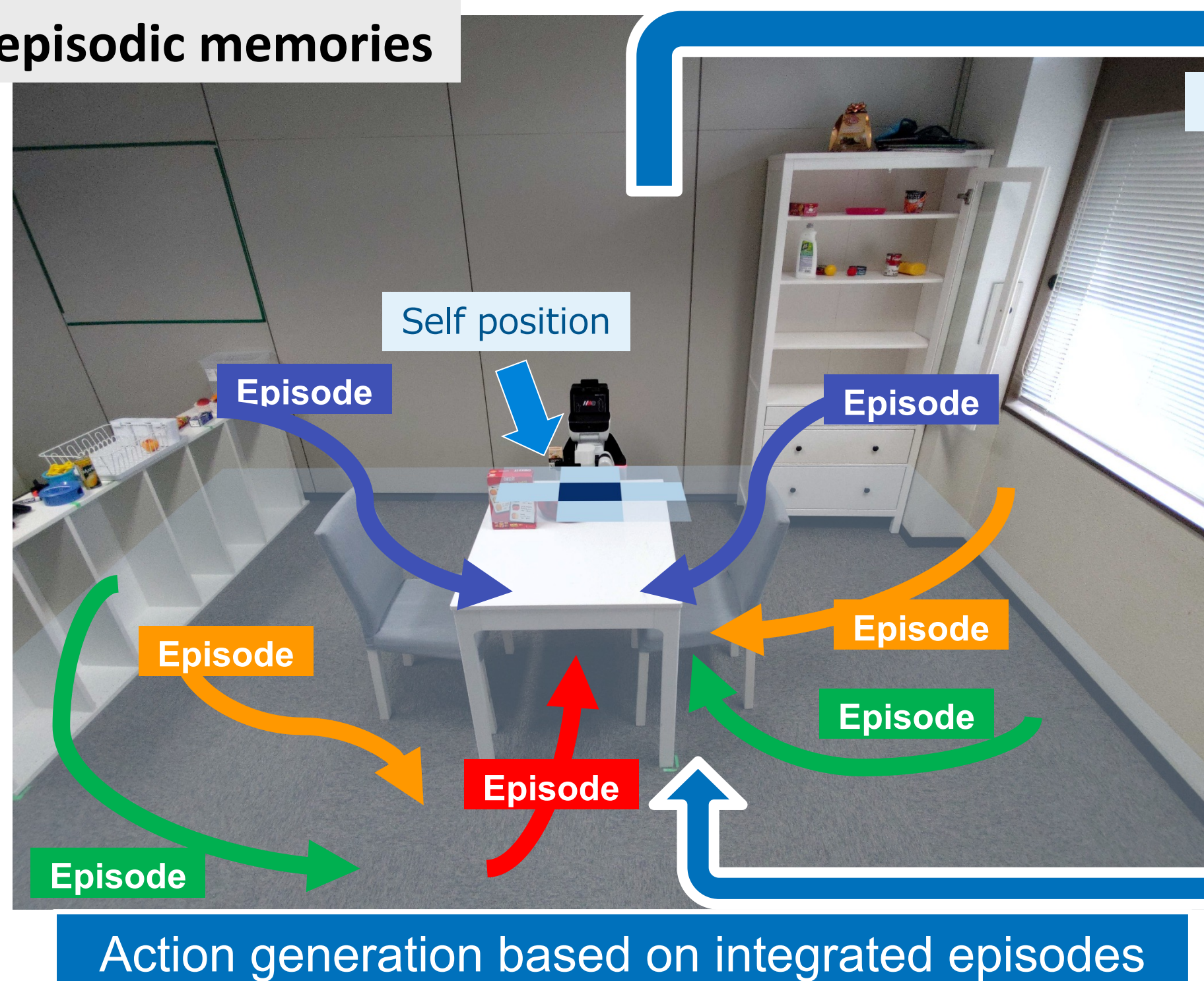https://github.com/Hibikino-Musashi-Home/hma_wrs_sim_ws

Research Activities

Brain-inspired Artificial Intelligence

Store and retrieve **episodic memories**

Episode acquisition

Self position

Episode

Action generation based on integrated episodes

Hippocampus model

1st place in RCAP 2021 Technical Challenge

Self position

Layer1: Action A
Layer2: Action B
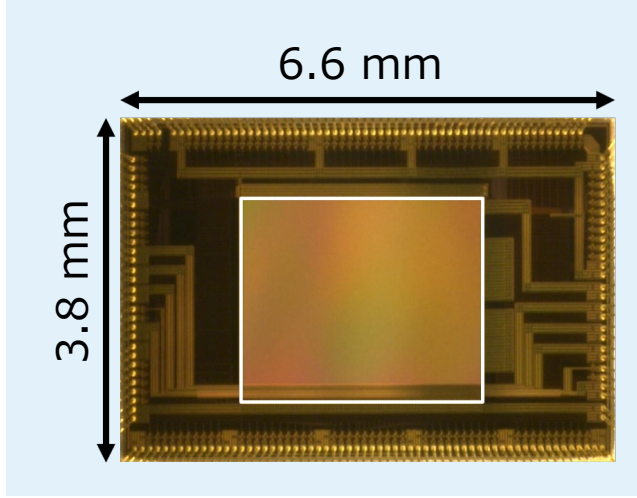Layer3: Action C
Layer4: Action D

Published in **IEEE Access[7]**

Analog Chip and Soft Hand

Efficient and fast **object classification** by a soft hand on an analog reservoir chip
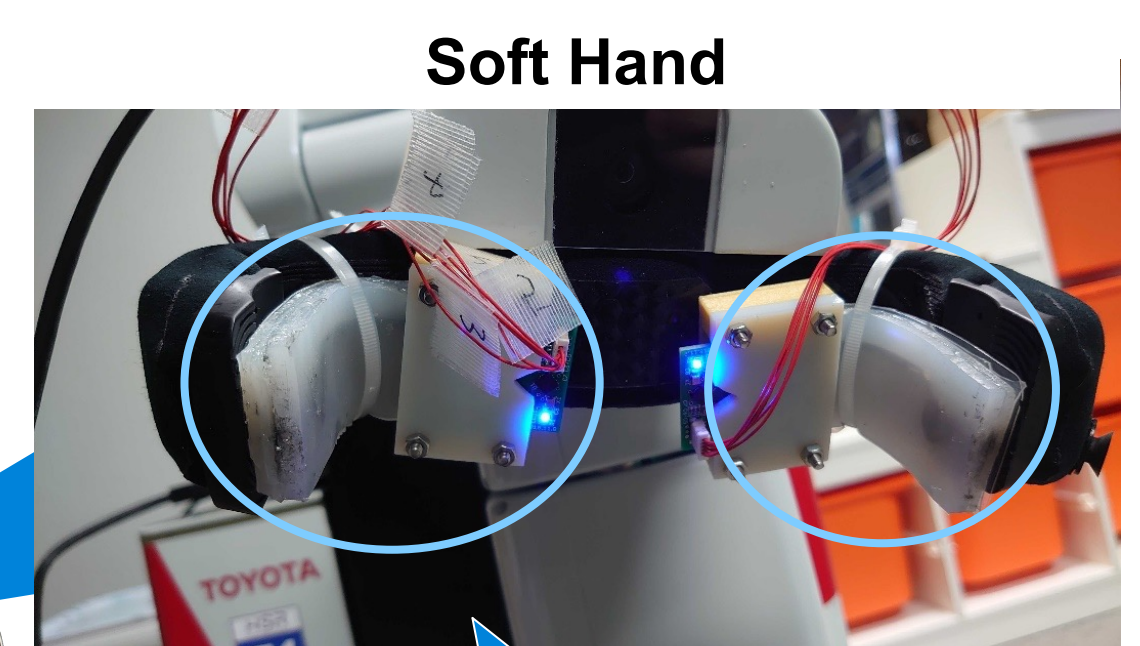
Analog Chip

6.6 mm
3.8 mm

Performance:
300 TOPS/W†
†Tera Operations Per Second per Watt

Published in **IJCNN[8]**

Connect the soft hand and analog chip using **ROS**

Soft Hand

Silicone Rubber
Liquid Metal

Open Challenge Award in RoboCup2021

Contact

HMa Official website
YouTube
GitHub
Find us on [f]
Instagram

Contact Us!

E-mail: hma@brain.kyutech.ac.jp
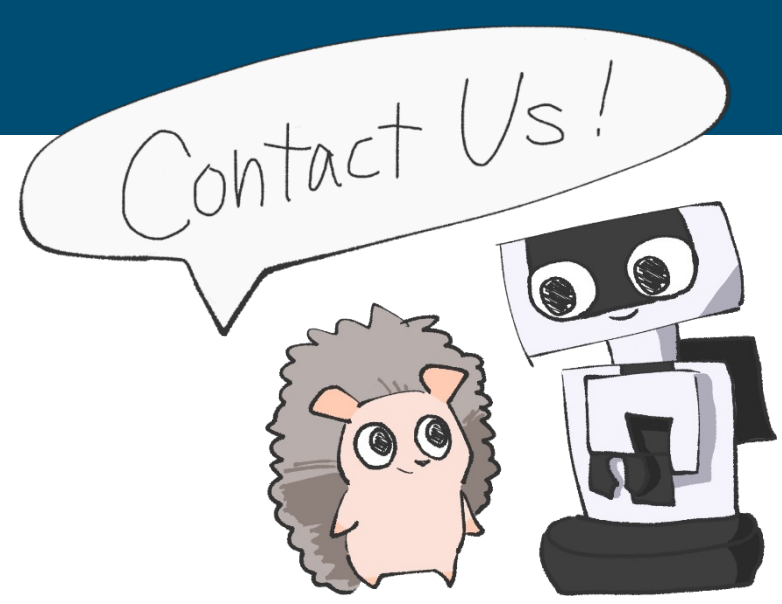
References

[1] D. Bolya et al., ICCV 2019.
[2] Z. Ke et al., ICCV 2021.
[3] D. Osokin, arXiv:1811.12004, 2018
[4] vosk-api, https://github.com/alphacep/vosk-api.
[5] T. Sainburg et al., PLoS computational biology, 2020.
[6] T. Ono et al., Advanced Robotics, 2022.
[7] H. Nakagawa et al., IEEE Access, 2022.
[8] M.Yamaguchi et al., IJCNN 2019.