SHIGEMICHI MATSUZAKI

I am a Ph.D. student at Toyohashi University of Technology, Japan, majoring in computer science, especially robotics. My research interests include deep learning in robot perception, mobile robots in unstructured environments, and mobile service robots.

CONTACT

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https://shigemichimatsuzaki.github.io/

SKILLS

C++

Python

ROS (Robot Operating System)

PyTorch

PCL (Point Cloud Library)

LANGUAGES

Japanese (Native)

English (Business level fluency)

Chinese (Conversational level)

CERTIFICATIONS

TOEIC IP - 985 / 990

EDUCATION

Toyohashi University of Technology

Doctoral course in Engineering (2020-present)

Toyohashi University of Technology

Master of Engineering: MEng, Computer Science (2018-2020)

Toyohashi University of Technology

Bachelor of Engineering: BE, Computer Science (2016-2018)

National Institute of Technology, Kumamoto College

Associate degree of Engineering (2010-2016)

EXPERIENCE

Intern

INTEL Microelectronics (M) Sdn. Bhd - Penang, Malaysia
January 2018 - February 2018

- Automating visualization of utilities of the devices in the factories
- Development of notification system
  - Requirements definition through communication with local employees in English

Research Assistant

Toyohashi University of Technology
October 2018 - present

- Joint research with SINFONIA TECHNOLOGY Co., Ltd.
- In charge of the development of autonomous navigation of an agricultural mobile robot

RESEARCH INTERESTS

Traversability estimation for navigation in plant-rich environments

- My main research topic is **scene recognition considering traversable plant parts** for robot navigation in plant-rich environments such as greenhouses, forests, etc.
- Conventional mobile robots with range sensors do not take the presence of traversable objects covering the paths into account and thus **cannot traverse those paths, recognizing them as obstacles**.
- Our method **explicitly estimates the object classes and traversability** and enables navigation through the traversable plants.
- Our method can **broaden the applicable environments** of autonomous mobile robots to unstructured and complex environments with plants.

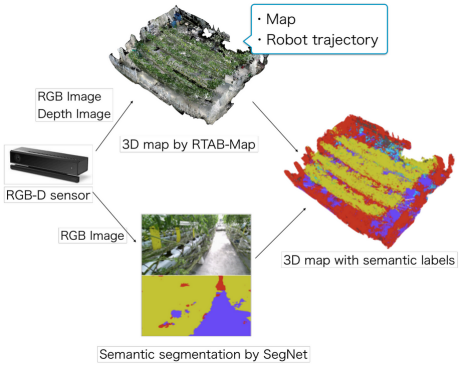
Deep learning

- In the traversability estimation, we adopt deep learning on images for the recognition of object classes and traversability.
- For practical situations with a few or no labeled training data available, I have studied and applied techniques such as **domain adaptation**, **un/semi-supervised learning**, **few-shot learning**, etc.

Home service robots

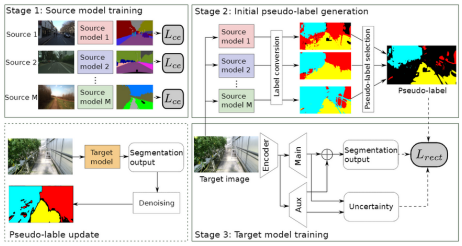
- Besides my main research, I also worked on software development for robot competitions such as **World Robot Summit (WRS)** and **RoboCup@Home**.
- As a team leader, I worked on the **project management** of the entire development, **system integration**, and **coding** of some functions, as well as some paperwork tasks.
- In WRS 2018, our team won **3rd place** out of 14 teams and was awarded the **Japanese Society for Artificial Intelligence Award**

RESEARCH THEMES



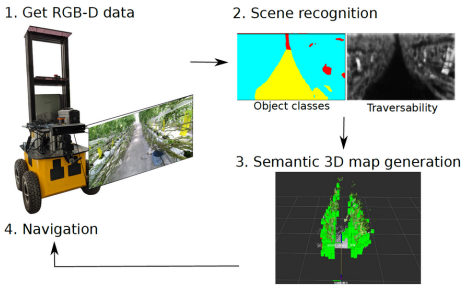
3D semantic maping with experience-based label refinement

- Generating 3D voxel map with object class information for path planning considering traversable plants.
- Integrating an existing 3D SLAM method (RTAB-Map) with image-based semantic segmentation (SegNet).
- **Bayesian label refinement** utilizing information of the robot's traversals based on prior knowledge that plants are more likely to be traversed by the robot.



Multi-source pseudo-label learning for semantic segmentation

- Training of a semantic segmentation model for greenhouse images **utilizing multiple publicly available datasets** of outdoor scenes.
- Generating pseudo-labels by integrating outputs from the source models trained with each outdoor dataset.
- Deep learning-based recognition **without any dedicated image datasets with manual annotation**, which is hard to achieve.



Object traversability estimation w/o manual annotation

- Scene recognition for robot navigation **considering traversable plants covering the paths**, which may otherwise be recognized as obstacles.
- A novel architecture for estimating both object classes and traversability, and a **manual annotation-free training method** for the model.

PUBLICATIONS

Journals

1. S. Matsuzaki, H. Masuzawa, J. Miura, “**Image-based scene recognition for robot navigation considering traversable plants and its manual annotation-free training**”, IEEE Access, vol. 10, pp. 5115-5128, 2022, doi: 10.1109/ACCESS.2022.3141594.
2. S. Matsuzaki, J. Miura, H. Masuzawa, “**Multi-source Pseudo-label Learning of Semantic Segmentation for the Scene Recognition of Agricultural Mobile Robots**”, Advanced Robotics, 2022 (to appear)

International conferences

1. S. Matsuzaki, H. Masuzawa, J. Miura, “**Online refinement of a scene recognition model for mobile robots by observing human's interaction with environments**”, Proc. IEEE Int. Conf. on Systems, Man, and Cybernetics (SMC), 2022
2. Y. Uzawa, S. Matsuzaki, H. Masuzawa, J. Miura, "**End-to-end path estimation and automatic dataset generation for robot navigation in plant-rich environments**", International Conference on Autonomous Systems, 2022
3. S. Matsuzaki, J. Miura, H. Masuzawa, "**Semantic-aware plant traversability estimation in plant-rich environments for agricultural mobile robots**", European Conference on Mobile Robots (ECMR) Workshop on Agricultural Robotics and Automation, 2021
4. S. Matsuzaki, H. Masuzawa, J. Miura, S. Oishi, “**3D Semantic Mapping in Greenhouses for Agricultural Mobile Robots with Robust Object Recognition Using Robots' Trajectory**”, Proc. IEEE Int. Conf. on Systems, Man, and Cybernetics (SMC), pp.357-362, 2018

Domestic conferences (in Japanese)

1. 松崎成道, 三浦純, 増沢広朗, "**教師なしドメイン適応に基づく農業用自律移動ロボットの環境認識のためのセマンティックセグメンテーションの学習**", 第27回ロボティクスシンポジア, 2022
2. 松崎成道, 三浦　純, 増沢広朗, "**植物繁茂環境における自律移動: ロボットの通過経験に基づく通過可能植物の認識**", 第39回日本ロボット学会学術講演会, 2021
3. 鵜沢祥亘, 松崎成道, 三浦純, 増沢広朗, "**植物繁茂環境における自律移動 -画像を用いた経路方向推定とデータセット生成-**", 第39回日本ロボット学会学術講演会, 2021
4. 鵜沢祥亘, 松崎成道, 増沢広朗, 三浦純, "屋外ナビゲーションのための画像を用いた進行方向の直接推定", ロボティクス・メカトロニクス講演会, 2021
5. 松崎成道, 増沢広朗, 三浦純, "**通過可能植物を考慮した環境認識による移動可能領域検出**", ロボティクス・メカトロニクス講演会, 2020
6. 松崎成道, 三明優介, 劉玉宝, 眞野千輝, Liliana Villamar Gomez, 中野中央, 石原啓志 ,三浦純, “**RoboCup Japan Open 2019@Home DSPLにおけるチームAISL-TUTの取り組み**”,第37回日本ロボット学会学術講演会, 2019
7. 松崎成道, 増沢広朗, 三浦純, 大石修士, “**施設園芸用移動ロボットのための意味情報付き3次元地図の生成**”, ロボティクス・メカトロニクス講演会, 2018

MEMBERSHIPS/AFFILIATIONS

- IEEE, Robotics and Automation Society (RAS)
- The Robotics Society of Japan (RSJ)