

Automatic detection of plant objects considering environmental noise

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◆ Background

In plants or disaster sites, there are many dangerous places.
→ High demand for **automatic inspection** by robots

In some robotics competitions such as WRS^[1], the task execution in the sites is important,



Uneven ground course in WRS

◆ Research Purpose

In plants or disaster sites:
→ Valve or lever operation is required.
→ This operation can be applied to other tasks.

However, object detection of valves or levers is needed to automatic operation with robots.

Previous work on valve detection :
- Detection by Color-based Segmentation ^[2]
→ However, the result is easily affected by **environmental noises** such as light reflection.

On the other hand, deep learning was very effective to object detection.

However, previous studies^{[3][4]}:
- only considered a single object.
→ Necessary to deal with **multiple object recognition** such as valves and levers.



Original valve image



Valve image with light reflection

◆ Research Goal

Based on YoLo and conventional study^[4], constructing **deep learning model for automatic multiple detection** such as valves and levers considering environment noise and verify its effectiveness.

◆ Research Plan & Approach

I. Constructing learning model.

1. Taking pictures of valves and levers from the front.
2. Adjusting daylight or color and creating a large amount of test data for training by image processing.
3. Constructing a model and verifying its effectiveness.

II. Improve the model.

1. Taking more photos by changing the angle of view or the color of background and creating test data for training by image processing.
2. Constructing its improve model and verifying its effectiveness.

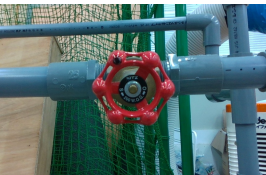


Image from front



Image from right side



Image from left side

◆ Tentative schedule

	Oct.	Nov.	Dec.	Jan.	Feb.
Constructing learning model					
Improve the model					
Thesis writing					

◆ Reference

[1] <https://wrs.nedo.go.jp/wrs2020>

[2] Shishiki Keito, "Object Recognition and Pose Estimation from RGB-D Data Using Active Sensing", Graduation research of University of Aizu, 2021.

[3] V. B. S. Mahalleh. et al. "YOLO-Based Valve Type Recognition and Localization," *2019 IEEE 6th International Conference on Industrial Engineering and Applications (ICIEA)*, 2019, pp. 37-40.

[4] Funayama, Y. *et al.* Automatic analog meter reading for plant inspection using a deep neural network. *Artif Life Robotics* **26**, 176–186 (2021).