

Object Classification and Segmentation Based on Deep Learning Using Underwater Mapping Data

Hiroshi Okawa^{1*}, Shigeyuki Omoto², Shota Yagi³, Takashi Miyamoto⁴
and Kazuo Kashiwama⁵

¹ EJ Innovation Technology Center, Eight-Japan Engineering Consultants Inc.
5-33-11 Honcho, Nakano-ku, Tokyo 164-8601, Japan
ookawa-hi@ej-hds.co.jp,

² EJ Innovation Technology Center, Eight-Japan Engineering Consultants Inc.
3-1-21 Tsushima-Kyomachi, Kita-ku, Okayama, Okayama 700-8617, Japan
oomoto-shi@ej-hds.co.jp,

³ Graduate School of Civil, Human and Environmental Engineering, Chuo University
1-13-27 Kasuga, Bunkyo-ku, Tokyo 112-8521, JAPAN
a16.365j@g.chuo-u.ac.jp

⁴ Department of Civil and Environmental Engineering, University of Yamanashi
4-3-11 Takeda, Kofu, Yamanashi 400-8511, JAPAN
tmiyamoto@yamanashi.ac.jp

⁵ Department of Civil and Environmental Engineering, Chuo University
1-13-27 Kasuga, Bunkyo-ku, Tokyo 112-8521, JAPAN
kaz@civil.chuo-u.ac.jp

Key Words: *Underwater Mapping Data, AUV, ASV, Deep Learning, CNN, PointNet*

The recent development of underwater robots and measurement equipment, it has become possible to achieve high-quality underwater mapping using acoustic survey equipment with high resolution. The underwater mapping data obtained by these methods are expressed by the intensity of sound reflection and do not have color information. As a result, object identification from the acquired data depends on discrimination by professional engineer, and it is not only difficult to identify objects automatically and quickly, but also involves human error due to differences in the experience of the engineer and routine tasks.

In this presentation, a fast and accurate classification method for underwater objects using underwater mapping data obtained by a small Autonomous Underwater Vehicle (AUV) and autonomous surface vehicle (ASV) is presented. For the mapping data, in addition to underwater acoustic reflection intensity images, water depth data, point cloud data and backscattering reflection intensity data are employed. We propose the automatic classification and semantic segmentation method on deep learning using a convolutional neural network (CNN) and PointNet. In order to verify the effectiveness of the present method, we applied it to the measured several underwater mapping data.