A Study on AI-Based Agricultural Land and Drainage Detection Using Drone Image

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Abstract

According to a recent survey, domestic farmers' strong will to introduce digital technology-based autonomous agricultural machinery is being emphasized. 87.1% of young farmers and 77.1% of ordinary farmers expressed interest in using these technologies. In addition, in a survey related to the introduction of agricultural technology (2021 by the Ministry of Agriculture, Food and Rural Affairs), 24.3% of the respondents expressed their intention to introduce autonomous agricultural machinery, and 16.2% preferred advanced tractors. (KREI in 2021) Domestic agricultural machinery manufacturers such as Daedong, TYM, and LS Mtron are conducting research and development on level 3 autonomous tractors. However, in order to maximize the agricultural work performance and agricultural efficiency of autonomous agricultural machinery, it is necessary to secure precise agricultural land spatial information first. Therefore, in this study, an algorithm for detecting agricultural land and drainage channels based on AI was studied by using drone images. The vertex image of each agricultural land was acquired by using drones and RGB cameras. In order to utilize the AI-based Semantic Segmentation model, a dataset was constructed and agricultural land and drainage channels were divided. An agricultural land search was conducted by classifying the acquired data into Tranin, Validation, and test. The model was advanced by adding attention elements, etc., to the existing CNN-based U-Net. Drone images were acquired, geometric transformation was performed using GPS and IMU data, and ground sampling points were calculated.The vertex of the target agricultural land was photographed and the drainage was detected with geotagging in the Direct Georeferencing-based vertex image with an Ai-based semantic segmentation model. A skeleton-based centerline was generated, and two-end points were acquired from the centerline and vectors were generated. Agricultural land boundaries were adopted by selecting directional vectors similar to drainage vectors. Finally, it was possible to detect the boundary line corresponding to the location of the apex and drainage of the agricultural land. It is judged that the agricultural effect will be maximized if it is used for field farming such as Flowing Into ridges, tillage, and sowing based on autonomous agricultural machinery through precise agricultural land boundaries and drainage location information.

Keywords: AI, Drone Image, Detection Agricultural Land