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## Integration of High Resolution Satellite Imagery and LiDAR Data for Forest Damage Detection

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**Abstract**

Fallen (i.e. snow damage and wind thrown) and withering (i.e. disease and insects) of trees in abandoned forests are one of the major problems in forestry. However the current investigation method relies on a ground survey, which is difficult to grasp the conditions extensively. Recently, usage of high spatial resolution satellite imagery and LiDAR (Light Detection And Ranging) data are anticipated as an effective solution for the forest monitoring. High resolution satellite imagery is effective for detecting withered and fallen damage, although this data has a difficulty in distinguishing between withered and fallen damage. Digital Surface Model (DSM) and Digital Elevation Model (DEM) which are made from LiDAR data are effective for detecting fallen damage, although this data has a difficulty in detecting withered damage. In the developing method, integration of high resolution satellite imagery and LiDAR data were utilized to detect two types of damage separately at same time. Multinomial Logit Model (MLM) was utilized for integrated processing. Red, NIR channel and gap areas detected by DSM and DEM were dependent variables for MLM. This method was examined on the IKONOS Multispectral Imagery and LiDAR data in the test area. Accuracy assessments were conducted from the aspect of omission (User's accuracy) and commission (Producer's accuracy). In withered damage detection, 78% and 74% of pixels were correctly detected, respectively. In fallen damage detection, 82% and 84% of pixels were correctly detected, respectively. From these results, this method was demonstrated that integration of two data can detect fallen and

withering damage in high accuracy.

Keywords: high resolution satellite imagery, LiDAR data, fallen damage, withered tree, integration

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