

## **5. Volume Estimation Method for Respective Types of Disaster Debris - In Situ Experiments with UAV and Image Analysis -**

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Severe disasters have afflicted Japan one after another, such as The 2011 off the Pacific coast of Tohoku Earthquake, the Kinu River flood (2015), and The 2016 Kumamoto Earthquake. In such cases, massive amounts of debris are created, which hinders restoration of damaged areas.

In this research, the authors developed a new method for estimating the volume of disaster debris for the respective types of debris. The idea derived from the notion that conventional techniques were unable to produce accurate estimates, nor discriminate between the types concerned. The objectives of this research are: 1) to estimate the volume of debris quickly and accurately, and 2) to break down the estimate per respective types of debris. For such purposes, the authors used an unmanned aerial vehicle (UAV) for Objective 1), and image analysis with a hue index for Objective 2).

As a result of this research, a new method was developed that can promptly conduct surveys and discriminate between the types of debris involved.

**Key words:** disaster debris, UAV (unmanned aerial vehicle), image analysis, hue