A Cloud Computing-based Micro-Unmanned Aerial Vehicle System for Geological Disaster Surveys

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In recent years, Unmanned aerial vehicle (UAV) tilt photography, InSAR, LiDAR and other technologies have been used in the field of geological disaster surveys and research to varying degrees, with traditional field survey methods being unable to meet the requirements of rapid and subtilized geological surveys nowadays. Thanks to the rapid development of UAV tilt photogrammetry technology, UAVs have played an important role in geological disaster emergency investigations and geological surveys. However, there are still some problems with the application of UAVs: 1. Geological disaster investigators who commonly hold degrees in geology find it difficult to learn how to operate UAVs; 2. professional UAV pilot training involves high costs and long training cycles, and meanwhile, UAV platforms and their loaded multi-lens tilt cameras are of high value, which render UAVs impossible to use as a standard accessory for geological disaster investigation teams; and 3. professional 3D modelling software is expensive and requires highly configured computer hardware, and in field scenarios, it usually has poor timeliness in terms of data processing. A micro-UAV system, mainly consisting of a UAV flight path control app (supporting Android/IOS) and a web-based data processing cloud platform, has been developed to solve the problems emerging in UAV-based geological disaster surveys, such as the difficult data collection, slow data processing, and high human involvement. The system integrates existing consumer-grade micro-UAV hardware and our newly designed UAV path planning and photogrammetry modes applicable in geological disaster surveys to achieve the fast acquisition of images, DOM, DSM, 3D models and point cloud data for geological disaster survey areas, based on high-speed processing and multi-node distributed GPU cluster technology. The main goal of this micro-UAV geological disaster surveying system is to rapidly acquire, transmit, process and distribute large-scale three-dimensional geographic information for small areas. The UAV flight path control app features one-click take-off and automatic landing, and the web data-processing cloud platform can realize one-click automatic data processing. The system has good application prospects due to its low cost and easy operation, and the fact that it can be widely used as a
standard accessory by teams in various geological disaster investigations.

**Keywords:** micro-UAV system, cloud computing, geological disaster survey, rapid and subtilized survey