Spatial Analysis of A Mountain Profile using Unmanned Aerial Vehicle (UAV) imagery – A Case Study for Ski Resort Development and Planning

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Abstract

With the rapid growing of ski resorts in British Columbia, it is critical to develop an accurate, effective and low cost approach for the future planning and development. In this study, we proposed an unmanned aerial vehicle (UAV) based spatial analysis of the mountain profile for our partner, Red Mountain Resort (Rossland, British Columbia), which is seeking for expansion with million dollars’ worth of new investment (Ecosign Mountain Resort Planners Ltd 2016). The spatial analysis requires high precision digital elevation model (DEM). From the DEM, we can develop more details of the mountain profiles such as slope, aspect, elevation and more. These profiles allow for optimal placement of infrastructure when planning and developing on Grey Mountain, and provide an innovative method towards accurate, fast, and effective terrain data for future development. However, traditional survey or photogrammetry methodologies are not feasible and expensive for small scale projects and the accuracy is not enough for the need of detail planning. We propose a new integrated approach using UAV and real-time kinematic satellite survey (RTK) using high accuracy global positioning systems (GPS) device (Dobre, Robert 2011). We establish a baseline and some control points and used a 3D Solo drone to collect aerial imagery covering Red and Grey Mountain area, which can deliver a high accuracy DEM (average 3 cm resolution). Using the elevation difference detection approach, we remove the vegetation and obtain the true DEM. Given development criteria from Red Resort, we apply spatial analysis of mountain profiles to highlight the suitable development area. The preliminary result is promising and currently under the reviewing of our partner.

