Generating 3D Surfaces from Low Altitude, Unmanned Aerial Vehicle Imagery

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Terrain modeling and three dimensional spatial analyses are rapidly growing fields within remote sensing. Softcopy photogrammetry has opened many doors since its development, from historical analyses of three dimensional surfaces to generating high resolution DEMs (Digital Elevation Models) from overlapping satellite and aerial photography. Most of these DEMs are derived from satellite imagery using digital photogrammetry, but at coarse resolutions. Aerial LiDAR (Light Detection and Ranging) allows for highly accurate terrain and elevation modeling at higher resolutions, but at significant cost. New developments in technology are creating interesting opportunities: generating DEMs from low altitude aerial imagery using semi- and fully-automated digital photogrammetric techniques.

Digital photogrammetry for aerial imagery has become more accessible in recent years. Additionally, the use of remotely piloted small aircraft for multispectral remote sensing has increased. Combining digital photogrammetry with UAV (Unmanned Aerial Vehicle) imagery has the potential to provide an efficient and inexpensive alternative to terrain mapping with LiDAR. This study utilizes dense, low altitude imagery acquired with the LOUIS imaging platform from TerraPan Labs in conjunction with the LPS Terrain Extraction module in ERDAS and Bloodhound by Pix4UAV to generate high resolution three dimensional surface models from test sites in San Diego (USA) and Carinthia (Austria). These surfaces are compared against LiDAR to determine their accuracy.

Utilizing UAVs and photogrammetry to perform three dimensional spatial analyses can create myriad new opportunities in remote sensing, especially at the local level. Projects with the need for three dimensional data on a micro scale, but without the funds for aerial LiDAR imaging will have a manageable alternative. This could include a number of applications such as monitoring coastal erosion, infrastructure development, and disaster (earthquake, landslide, etc.) response and analysis.

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