Alps

This month we present a Product Survey on Airborne Lidar Processing Software (ALPS), see page 14, so I shall here touch briefly on operations typically performed on Lidar data. Basically, all Lidar scanners measure range and intensity of terrain points hit by the laser pulse, and corresponding platform positional and orientation parameters. The first task is to convert the raw data into positions - three coordinates for each point - in a geodetic reference system. The resulting point-cloud is the basis for further processing, including filtering, visualisation, classification and analysis, or other manipulation.

Filtering is the removal of unnecessary points, e.g. those reflected from vegetation when creating a 3D city model, or from vegetation and buildings when creating a bare ground digital elevation model (DEM). DEMs belong to the main category of Lidar products, and ALPS routines may enable generation of contour lines and cross-sections, and detection of break lines, usually based on a Triangulated Irregular Network (TIN) earlier created from the point-cloud. ALPS may contain refined DEM modules such as calculation of lines of sight, slopes, volumes, and simulation of floods or other hazards. ALPS may also allow automatic classification of groups of points into buildings, roads, trees or power-lines.

Onscreen zoom and rotation of the point-cloud, and navigating through it, are crucial for assessing data quality, planning and control of subsequent steps in processing, and editing for manual selection of individual points. Basically, points may be represented as white dots on a dark background, but usually they are coloured according to intensity or textured using co-registered imagery. Presentation of results may require facilities such as hillshading, diffuse lightening, multi-layering, altitude colouration or automatic draping of aerospace imagery over the point-cloud. Good visualisation is also necessary for fitting through a group of selected points features such as lines, circles, planes, spheres, cylinders and cones. Selection facilities enable measurement of the distances and angles of lines connecting points. Some ALPS support point-cloud viewing in stereo using graphics hardware.

Lidar scanning, due to characteristics of its acquisition, generates irregularly distributed points. The implementation of many mathematical operations, such as area and volume computations, requires data arranged on a grid of square cells. Gridding demands interpolation; common are nearest-neighbour, inverse distance weighting, Kriging and polynomial fitting. Once processed, the ALPS output will often be imported into other software, usually a GIS. Since many data formats exist it is important that any ALPS supports a wide variety of import and export formats, both for importing data into the ALPS itself and for importing the output into other systems.