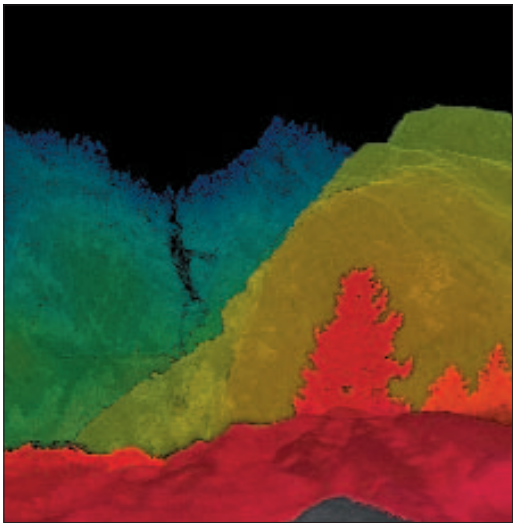
INSTITUT CARTOGRÀFIC DE CATALUNYA

VI. Photogrammetry and cartographic representation systems

Terrestrial photogrammetry. Terrestrial laser

June 2005/Version 2



Model of the gorges of Núria.

Terrestrial laser systems are based on the calculation of 3D points from the time taken for a laser beam to fly and return from an element to the capture sensor. Like airborne systems, terrestrial laser systems support the massive capture of points with great precision and high productivity, making it possible to substitute other techniques based on terrestrial photogrammetry. Moreover, in contrast with airborne systems, terrestrial laser systems can be installed very close to the element to be mapped, leading to greater precision in the capture.

The ICC has a Riegl Z-210 terrestrial laser system. This system scans the scene to be measured by means of a laser system that provides distance and reflectance measurements of the object (images 1, 2), as well as providing information about the texture of the element, since it has the capacity to observe the RGB channels (image 3).

Frequently, in order to cover a certain area, it is necessary to combine various scenes that capture a part of the area. This combination can be achieved through the identification of common points or by calculating the orientation parameters of each of the scenes. In turn, the scenes can be oriented through the identification of points with known coordinates in the images or through the direct transfer of the orientation parameters of a GPS/INS system. 3D models of buildings and other elements of interest can be generated by combining various scans (image 4).

Applications

Modelling of cities. Thanks to the RGB channel, terrestrial laser systems can be used to facilitate the creation of models of buildings and cities, as well as precise 3D virtual reality models with photographic texture.

Mine/landfill site topography. Terrestrial laser systems are highly appropriate for work in mines or landfill sites, since they take the measurements without needing to have direct access to the points. They are mainly used for volume calculations, surveying inaccessible zones and in settlement calculations.

Institut Cartogràfic de Catalunya
Parc de Montjuïc
08038 Barcelona
Tel. 34-93 567 15 00
Fax 34-93 567 15 67
www.icc.es

Generalitat de Catalunya
Institut Cartogràfic de Catalunya

Tunnel surveying. Due to their high productivity, terrestrial lasers are strongly recommended for surveying tunnels, since they minimize measurement time and, therefore, the period that the tunnel has to be inoperative.

Reverse engineering. The generation of constructive models is one of the fields in which the application of laser measurements is most widely accepted. Moreover, the comparison of the point cloud with the engineering project facilitates the quality control of the work performed.

Measurements of façades/buildings. The measurement of unusual buildings, through the use of terrestrial laser techniques, makes it possible to generate models of façades/buildings with a realistic photographic texture.

Image 1: Reflectance of object to laser pulses (intensity of returned pulse).

Image 2: Distance of object in color coding (red: near, green-blue: far).

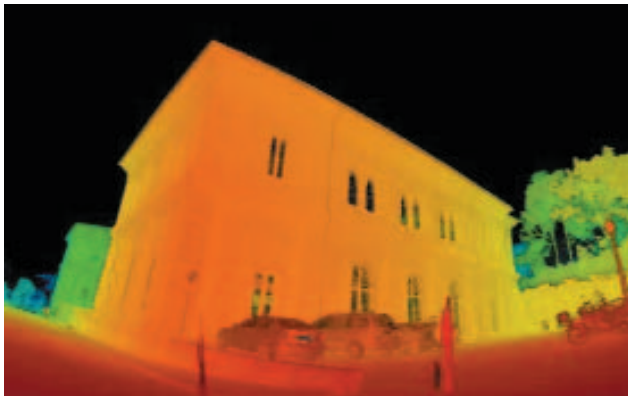


Image 3: RGB channels of object.

Image 4: 3D model of ICC building.