3D Modeling
State of art

Technology Overview

3D modeling is the process of creating a 3D representation of any surface or object by manipulating polygons, edges and vertices in simulated space trough the computer graphics.

The 3D model of our Network is the basis for the creation of the Network Digital Twin.
Having the 3D model of the Network improves operational efficiency because it will allow the introduction of new working methods such as "virtual inspections", "updating of cartographic and asset management systems", "the generation of plans of primary and secondary plants "," the extraction of the digital terrain model to support the planning activities ", etc.
The main critical issue detection are related to the operational and safety issue like verification of measurement of the distance between our overhead network to ground, vegetation and infrastructure such as building and houses

3D modeling is based on collecting of Cloud points of infrastructure.
A Cloud points is the representation of the real world through a huge amount of point collected using a scanner. Each point describes a precise spatial position of a part of the object that represents and can provide attributes such as the color of the object and classification data (for example the type of object or the type of anomaly associated with it).The cloud points is geolocalized and oriented in the space ; therefore the distances between the various objects inside it can be measured with extreme precision.

LiDAR (Light Detection And Ranging) is similar in principles to the RADAR but it use a Laser light to accurately measure smaller objects distances and generate a 3D Points Cloud.

LIDAR it's a technology that comes from the '60 just after the invention of the Laser; it was firstly used in meteorology to study and measure clouds it became famous in '71 when NASA exploited this technology to perform surface mapping of the moon with Apollo 15 mission. Now this technology is mature and it is widely applied in many application also outside the surveying use cases : from gaming to robots and autonomous vehicles.
The developing of Lidar applications its strictly connected to GPS and IMU technology that make LIDAR applicable on moving vehicles.
Mobile mapping devices are suitable to infrastructure mapping in town and city or in suburban / industrial area where helicopter can't fly or drones are inefficient; it is capable to collect data of infrastructure that are situated near the road.

Main application

In GI&N we have long been acquiring the point clouds of our networks; we do it for AT and MT overhead networks and we use LIDAR mounted on a helicopter; the main purpose is the management of critical issues of interference (with vegetation, with man-made buildings or works, etc.), while where the helicopter cannot fly for safety or regulation reasons (for example over a city) the use of photogrammetry by drones can be a valid alternative.

Mobile Mapping is a technology that we already use in different I&N countries for the collection of infrastructure within cities or industrial areas where other technologies would not be efficient. Mobile mapping systems are similar to Google Street View cars but in addition to spherical photos they also acquire point clouds using a LIDAR; conceptually the instruments are similar to the one in use on helicopters but mounted on the roof of a car.

To acquire the 3D models of the substations we use portable 3D scanners:
For medium voltage substations, we use structured light laser scanners.
The average acquisition time of an SS MT is about 20 minutes.
For High Voltage Substations laser scanners are used and the average time for the acquisition of internal and external is about 2-3 hours depending on its size.
e-Distribuzione is testing these technologies in a 6-month pilot test with 33 3D scanners distributed in the operating units; the technicians will bring the 3D scanner and they will also acquire the 3D model of the same during the maintenance activities at the Substations.

In 2019, were reached 345,000km of mapped airlines, corresponding to 15% of the group's total.

In particular, in Italy the scan was performed on 77 primary substation and 1000 secondary substation and on 205,000 km of overhead lines.

79,000 km of airlines have been mapped in Brazil.

So it is clear that already today we have acquired and are acquiring large amounts of data (LIDAR point clouds, photographs, videos, thermographs, etc.)
In order to make this huge amount of data (estimated at 3-6 Petabytes fully operational) available to all stakeholders, we have developed together with I&N DH a system consisting of a cloud repository and a web viewer to be able to access the point clouds in an integrated manner with the map data and with the anomalies found by the maintenance systems..

In addition, the cloud repository provides and integrates the data contained into the developing Image Recognition system .