USE CASE
Powerlines

« YellowScan UAV LiDARs enable the quick and easy collection of detailed data about the powerline and its environment. »

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Business need

Mapping the vegetation around powerlines is a major issue for most energy companies around the world. The goal is to detect offending vegetation around powerlines in order to efficiently organize targeted pruning. Another expressed need is the mapping of the powerline itself to detect any problems (loose or ripped cable, object falls…).

The mapping is currently done on foot or with a LiDAR on a helicopter. The issues encountered whilst walking are hard to access areas as well as a visual evaluation that can lack precision. For the helicopter there are high costs and a low reactivity due to fully booked service providers. Being able to map small areas of interest to complete the helicopter's annual work would greatly improve the pruning process, therefore reducing mobilization costs for both mapping and pruning.

Customer Profile

Company: **Enedis**
Industry: **Powerlines Maintenance**
Country: **France**

Solution

YellowScan lightweight UAV LiDARs enable the quick and easy collection of detailed data about the powerline and its environment, which is not possible through the use of remote sensing imagery or Radar, takes longer with on foot methods and costs more with classical airborne LiDARs. The generated point cloud leads to 3D maps of the powerline and surrounding vegetation, and further key metrics can be calculated, such as detection of offending vegetation.

Mission parameters

- Client: Enedis
- Partners: Product'air, E-Copter, Dielmo3D
- Location : France
- Flight speed : 5 m/s
- Flight altitude : 30 m
- Equipment : DJI S1000 Octocopter and YellowScan Surveyor

Benefits

- High density LiDAR data
- Small dataset size
- Date on powerline
- Vegetation data under powerline
- Adapted to small area surveys
- Rapid deployment
- Low disturbance
- Low costs
- Access to difficult areas

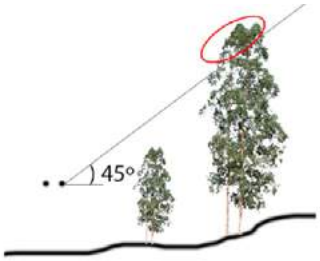
YellowScan

Data post-processing by Dielmo3D

The LiDAR is provided in the open-source LAS point cloud format, which is the industry standard. Here are the steps followed by Dielmo to extract the essential information and provide it to Enedis :

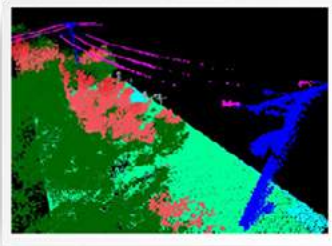
1. Vectorization of each voltage line, with auto snapping.

2. Using Dielmo Open LiDAR, an automated classification is run using a subsample of the LAS files that are contained in a buffer around the powerlines' poles and conductors. It is then verified and edited manually as the powerline structure is considered vegetation. Once the classification ends, profiles are extracted.



Tree fall logic

3. Vegetation encroachment detection in the network: the goal is to detect, analyze and evaluate the risk of potential forest fires at different levels from it. The buffers are based on the voltage, conductor type, span length and position of the vegetation along the span. For each voltage, a vector layer of polygons showing the classified OV and the minimum 3D distance inside the polygon are generated. Vegetation that is encroaching over the conductors is also identified as an overhang.



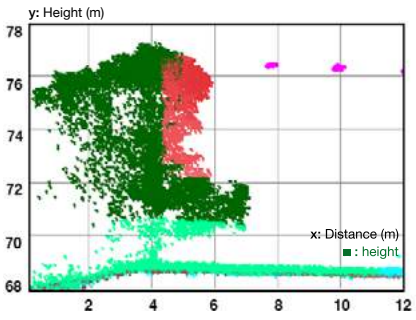
Example of dangerous vegetation

4. Tree fall risk: an algorithm checks each pixel of the Digital Surface Model (DSM) and assesses if the height of the vegetation stands above an imaginary line at 45° from the nearest powerline : the vegetation over this line might hit it. As a result, a vector layer of polygons with the delimitation of the regions with tree fall potential helps them prioritize the risk.

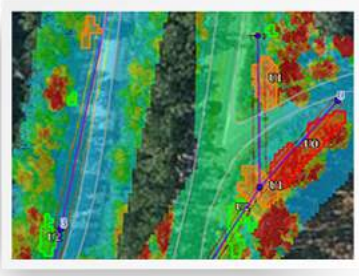
5. Ground clearance: This measurement is done directly on the LiDAR point cloud. Dielmo's own algorithms are used for this step to measure the minimum distance to the ground for each point of the wire. The result is an Excel spreadsheet to find violations of the regulations to prioritize the next actions.

Results

The Surveyor system provided approximately 20 points/m2 thanks to its 2 echoes per shot, allowing information on the powerline and surrounding vegetation to be extracted. The raw point cloud was classified to identify offending vegetation and produce the expected output (excel file indicating key areas and maps).



Cross section of mapped hazards



Hazard mapping on an orthophoto