

Advanced Snowplow Information System for the Catalanian DOT

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ABSTRACT

Catalonian Government has about one hundred snowplows ready to help in the cleanliness and safety of the 12.000 kilometers of roads along the territory, with over 2.500 of them around the Pyrenees area; although snowfall can reach sea level some times every year.

Each snowplow has two sensors: a GPS showing location every 90 seconds, and a Status Signal showing the vehicle state when there is any change (moving, throwing salt, shovel down, system failure, ...). This information is received in real time by a communications server and stored in a database.

The traditional fleet IS uses this information via a map application showing the last known gps position for each snowplow, a symbology for the last known state, and a dropdown with all tabular information (machine type, plate, driver, etc). Some 'advanced' systems adds spatial relational gis analysis to get the municipality or the nearest road code but... really we can't get more from the data?

The Catalanian DOT Roads Metagraph is designed at scale 1:5.000 for upscaling (planning level), roads catalogue, navigation, and dynamic segmentation; allowing these algorithms to be combined with other land variables to get a more complex scenario building. Thinking of our fleet, contains all the roads and paths where a snowplow can move, so... we can go a step further!

A new expert system for snowplow fleet management has been developed using the Metagraph. A real time database listener launches a new process every time a snowplow changes the status and execute advanced gis procedures to determine implicit information: geocode the gps coordinates, calculates the real path on the graph, intersect other geographic information, reference to the graph milestones, and store the results in a new layer on the database.

Advanced analysis were performed to obtain the spatial positions where snowplow state changed. Being time-dependent, the only way to relate over the lineal reference system was changing the routes to the temporal dimension, relating the states via temporal dynamic segmentation, and changing back the result to the spatial dimension.

Thanks to the new system we are able to generate more complex statistics:
worked kilometers, average speed, percentage of activity in each state, etc.