

Spatial Clustering for Generation of Routes Adjusted to the Vehicle Fleet in Spatial Databases

Alvaro Ortiz and Luz Angela Rocha (Colombia)

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SUMMARY

A new clustering algorithm is proposed, this algorithm adjusts to logistical problems of optimal routes in cases where there is an already established fleet of vehicles, joined with a cloud of points that must be visited with the fleet of vehicles available over a road network in a spatial database. The algorithm developed was implemented in a spatial database (PostgreSQL-PostGIS) and determines the groups that each vehicle must go through, taking into account the particular capacity of each vehicle, as well as the order of the places the route should have. It makes use of Dijkstra's algorithm to determine the optimal route between every two consecutive places on the tracks registered in the database. The number of groups generated corresponds to the number of vehicles available, or until the company no longer has more places to visit, whichever comes first.

The algorithm is tested with a practical case on the roads of the city of Bogotá (Colombia) to determine the routes that the buses of a school must travel to pick up and drop off students on their journey from home to school and vice versa. It should be noted that all vehicle information, including student capacity, student information, which includes their residence address, is stored in the spatial database. The database is complemented with information on roads (polylines), home plates (points) and blocks (polygons). The school case demonstrates that the algorithm is functional and is adjustable to the number of groups and quantity of capacity measurement for each vehicle, in addition to the order of travel for each route, which allows us to conclude that it is a very practical algorithm, adjustable and applicable in many environments of logistics solutions with only the use of spatial databases and a geographic information system that serves as a graphic viewer of the routes established on the roads of the spatial work environment.

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