



Concrete use cases of GNSS & GALILEO performance in micromobility

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11th December 2020

Who are we?



Reby is a Spanish company that designs, manufactures and distributes shared electric vehicles, offering a practical and sustainable solution to move around cities.



Reby e-Moped



Reby e-Scooter



Reby e-Bike



We're a team of 100 people.



We operate in Barcelona, Zaragoza, Gijón and Terrassa in Spain. In Italy we operate in Lecce, Bergamo, Napoli, and soon in Florencia, Taranto and Caserta.



306.500 register users



With its own fleet and franchises 6.000 e-Scooters, 2000 bicycles and 3000 e-Moped



Which has ride 2.339.807.000 Kms



Saving 284,052,685 tons of CO₂

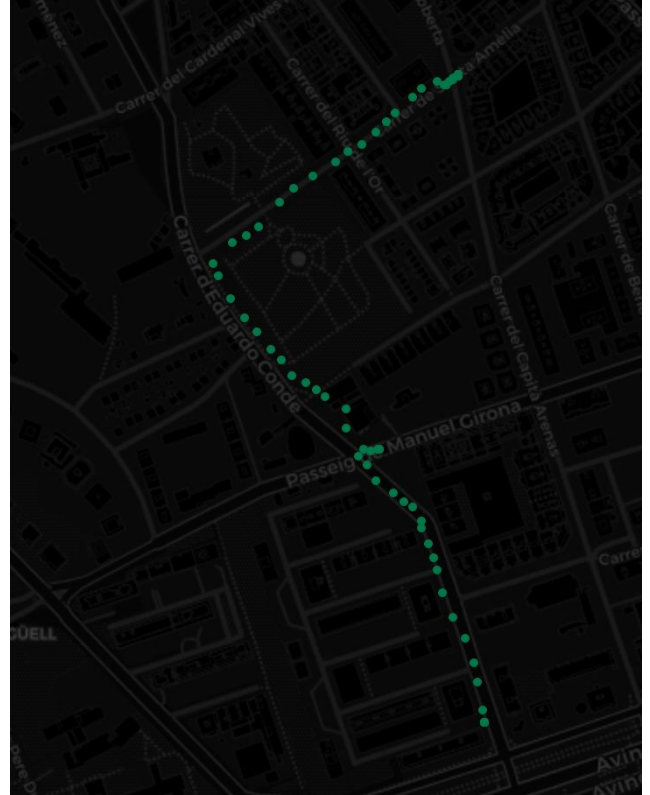
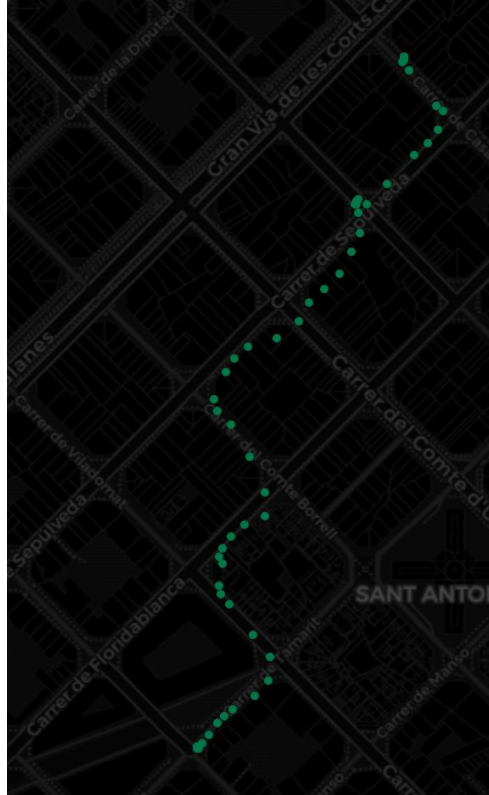
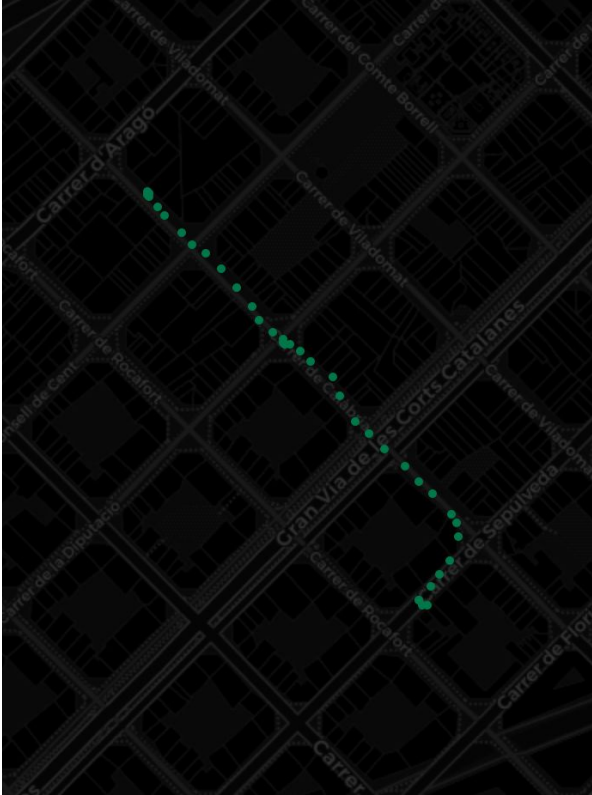




Why Reby has invested in an GPS GNASS module

- High competitive industry that pushes us to keep improving the service.
 - Offer a safe ride
 - Complementary services: sensors, etc.
- Public Space is limited and local regulations are strict and getting stricter on parking and driving issues
 - Restrictive streets or areas
 - Limited speed in specific areas
 - Etc.
- Having a positive impact in the communities that we operate

Geolocation data tends to be “messy”





Micromobility is challenging

- Everything, every data point in our business comes geolocalized. It's the only way to have things under control (e.g. maintenance, end-of-ride, deployments)
- "Normal" road networks don't apply
- Operationally stressed (battery swaps, deployments, maintenance)
- Occupies public space and needs to enforce local regulations
- Data-stressed (needs lots of reliable data to make decisions, e.g coverage)
- Forced to innovate rapidly to remain relevant

Unprecise geolocation hurt the business

User

User can't find a vehicle or can't park:

- Unhappy
- Less loyal
- Unlikely to recommend

Operations

When operators don't find vehicles or spend too much time looking for them:

- Waste of time thus money
- Loss of vehicles
- Additional obstacle to their duties

Business

With unprecise geolocation:

- Considerable economic impact
- Alarm system is also unprecise
- Fleet uncertainty
- Harder to meet local regulations
- Requires background fixing

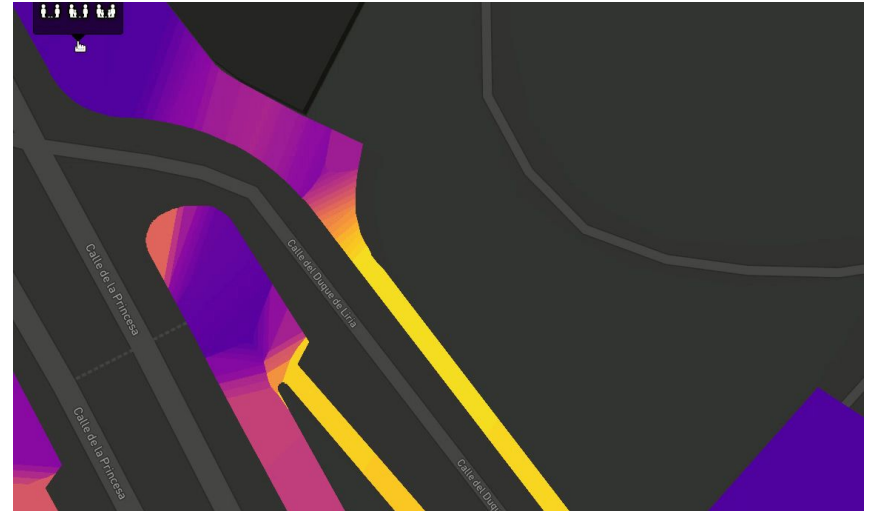
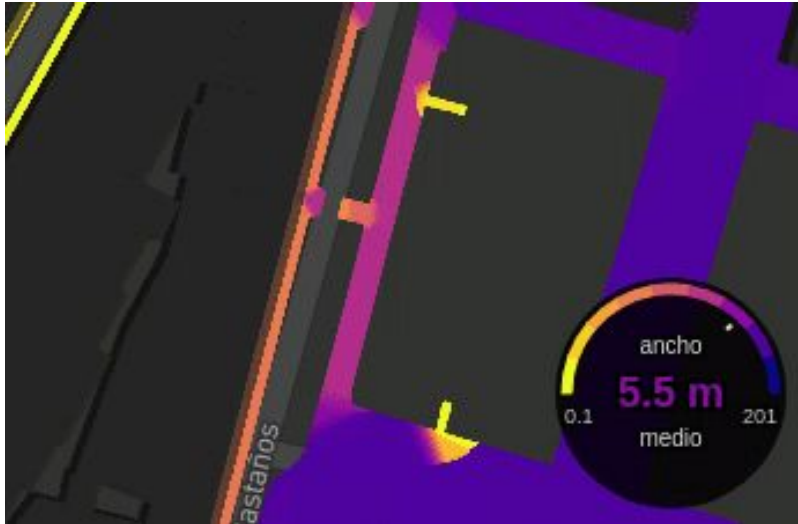
More restrictions require better data

Designated parking areas



More restrictions require better data

Designated parking areas



More restrictions require better data

Use of designated lanes



More restrictions require better data

Enforce local regulation



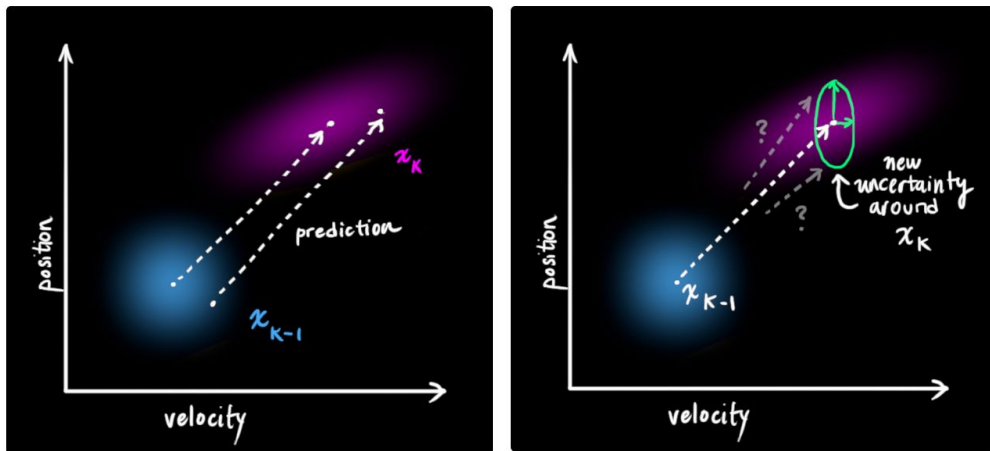
More restrictions require better data

Enforce good behaviour

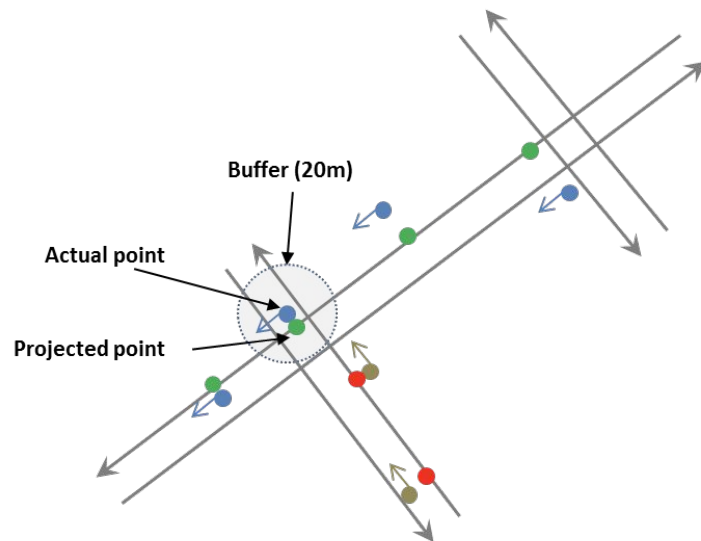


We can approximate, but no ideal

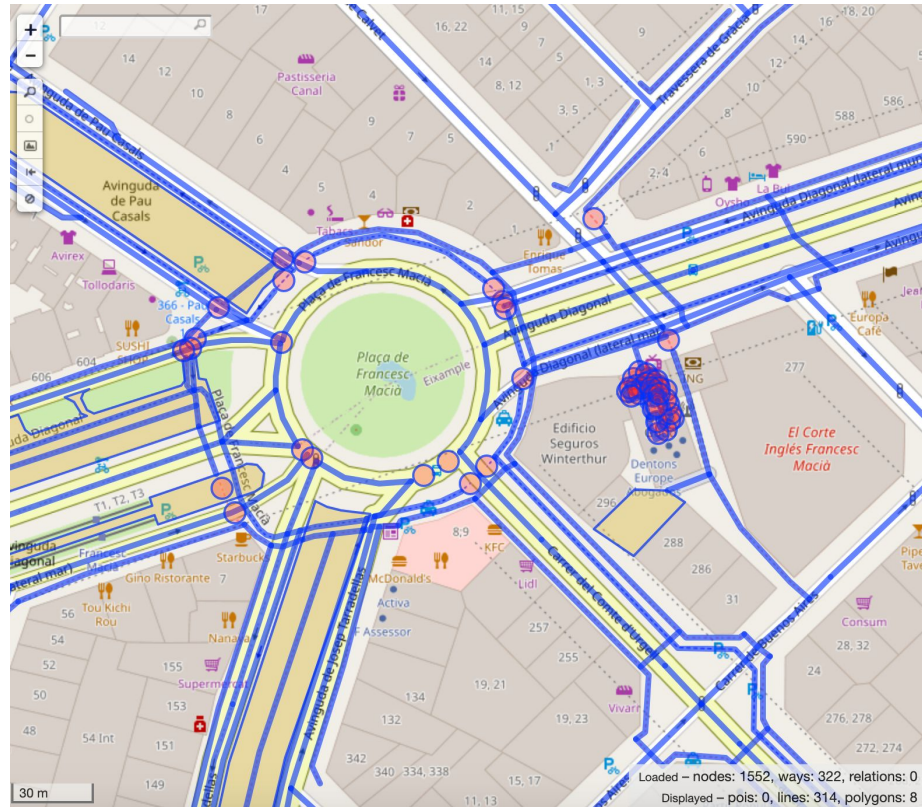
Kalman or particle filters



Map-matching



We can approximate, but no ideal





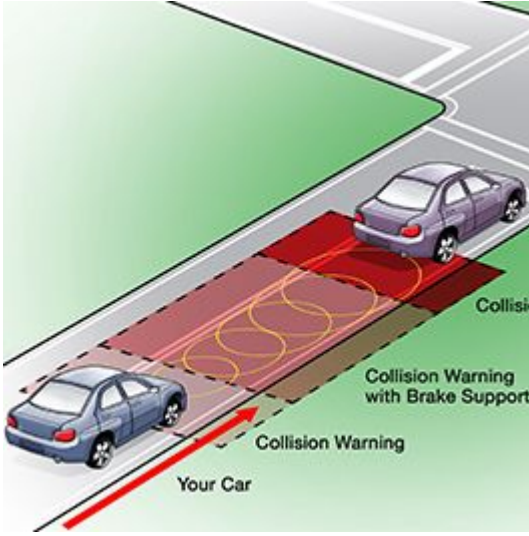
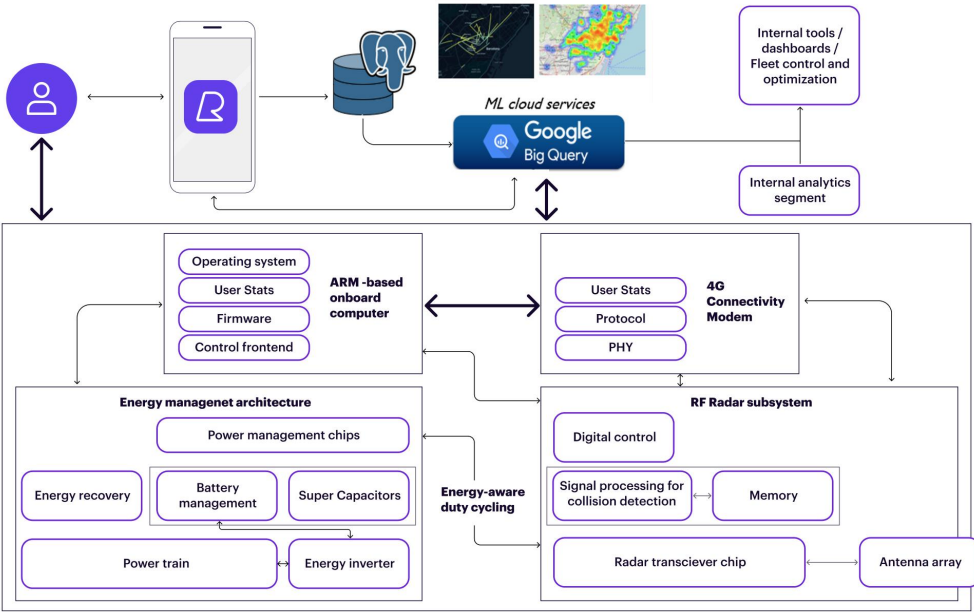
This presents different challenges

- It's not as precise as necessary in most cases (bicycle lane besides or near a main street)
- When filtering under too many conditions, it's computationally challenging to do it real-time (batch-processing or post-processing ok)
- Vehicles need to be equipped with more sensors (barometers, gyroscope, accelerometer) for filtering, especially when GPS signal is lost.

In some use cases, filters or approximations don't make the cut

Certain innovations require no mistakes

Collision avoidance



Earth Observation

