REAL-TIME ANALYSIS WITH GPS SENSOR DATA USING THE EXAMPLE OF THE NONSTOP BIKE RACE TORTOUR

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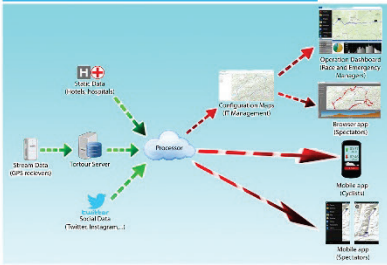
ABSTRACT

This thesis have two main objectives, by one side as it's shown in the title, the goal is studying the different analysis and statistics that can be made with real-time GNSS data, and on the other side the point is to improve the existent emergency systems on long distance sport events.
From the first part, the real-time GNSS data is an innovative technology that is starting to be used in sport events but, as I will explain later, the possibilities that this technology can offer are not really exploded nowadays. The objective of this thesis is to explode the GNSS data in order to show how many possibilities can be offered by this technology.
Today, the long distance sport events don't have an efficient emergency system. The distances between two runners in these competitions can be more than 5 km and normally there are more than 100 athletes participating. The total distance of the race is more or less 1.000 kilometres and sometimes, like in TORTOUR, the race has some parts through the mountains.
With this information is easy to imagine how difficult is to organize the emergency services by current means. If one cyclist is running alone and suffers an accident the situation can be really dangerous.
For all these reasons is very important to have a fast and efficient emergency system that can attend all the athletes during the whole race.

METHOD DESCRIPTION



The workflow starts with the GNSS receivers that send the data to TORTOUR server. They immediately process the data on this server and convert it to CSV format in order to provide the information. The data from TORTOUR server is used in ArcGIS Server, here the data is processed and filtered in order to obtain different analysis and results.
Once the data is processed in real-time, the next step is configuring the web and the mobile apps.

DATA

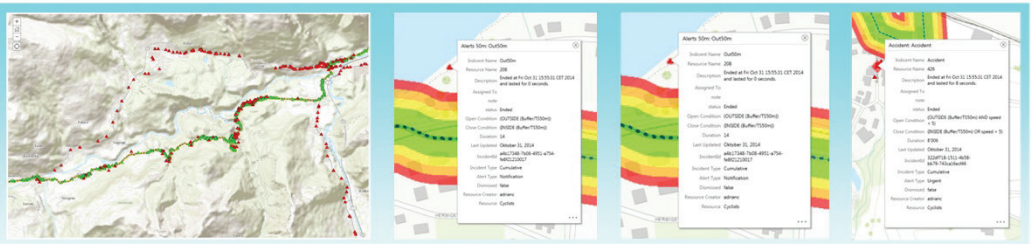
The organization provide the data in CSV format. The CSV file contains information of the GNSS receiver but also other information added by the management, resulting a file with this format:

"Data, Team Number, Team Name, Category, Latitude, Longitude, Elevation, Speed, Member1, Member2, Member3, Member4, Member5, Member6"

MODELS

With GNSS data and GeoEvent Processor different events can be identified, establishing different conditions:

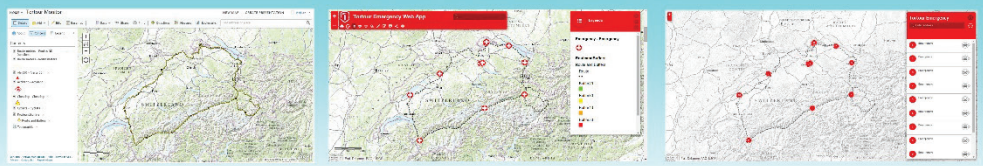
- GNSS errors
- Cheatings
- Accidents
- Signal gaps



RESULTS

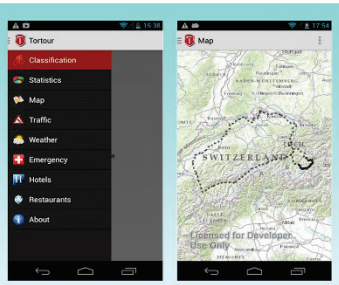
Different Web Apps for different proposals:

- Monitor Web App and Operation Dashboard for IT management, allowing editing and visualization of incidents.
- Specialized editing and navigation apps for emergency, hotels and restaurants.
- Spectators web app, for follow the race.



Android App for spectators:

- Follow the race, with a simple map
- Traffic information, with clear simbolization
- Location of hospitals
- Weather information
- Touristic information, from hotels and restaurants



Android App for cyclists:

- Distance between cyclists before and after, or choosen cyclist.
- Map for follow the race with automatic zoom
- S.O.S Button, with a simple click the app send the location and the alert to the emergency services.
- Simple, clear and without distraction during the race

CONCLUSION

The possibilities of GNSS technology are really incredible, this thesis has shown how this technology can improve the competition in different aspects. By one side, a new emergency system have been developed without expend more resources, just using the existing technology. And by the other side, diferent statistics and real time visualizations of the race can be obtained from this technology.
With the real-time classification, a lot of new possibilities for statistics appear, such as faster cyclist, average speed or how many calories can consume a cyclist in a determinate part. All of this statisctis on real-time allow the managers to improve the efficiency of the cyclists and the support systems.