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Mobile application for 3D real-time visualization for Outdoor sports competitions (LIS3D)

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Abstract

Introduction - State of the Art

An innovative solution of connected bibs is available to the organizers of outdoors sports events. It allows to follow in live the participants and secure the tracks. The innovation is based on Global Positioning System (GPS) tracking, two-dimensional (2D) and three-dimensional (3D) real-time visualization. This solution [1] allows the public to follow in live or in a delayed time all participants (500 and more) or a particular participant.

Portable GPS tracking in sport events has been around for a decade, but has been used only on a small scale (less than fifty participants are usually tracked) due to inadequate standard network coverage of operators. The generalization of the mobile networks roaming has allowed the development of specialized companies in the management of multi-operator standard networks at competitive costs. [2,3]

Finally, the virtual 3D visualization with dynamic real-time tracking of outdoor sport event seems to be under-covered by the industry or even nonexistent.

Objectives, materials and methods

Through our sport competition data collection carried out in 2016, we intend to build an unique 3D visual replay rendering for building a mobile application where the user could benefit from a virtual 3D immersion of the real-time sport event similar to the real one of the "Tour de France".

First of all, the connected bib consists of an electronic device integrated in the sport participant's bib. The electronic device including a GPS chip and a Subscriber Identity Module (SIM) card transmits electronically over the Internet (TCP / IP) at the frequencies between 30s and 60s. Overall, the system autonomy varies from 10 to 20 hours. In addition, we have developed several 2D visualization modes: using the Google Maps API [4], (Fig. 1), or using the proprietary 2D projections, (Fig. 2), all obtained from the real-time network

frames containing timed GPS coordinates of the sport participants during the event.

A 3D model restricted to the bounds of the sport competition track was realized. We used an open source software environment such as QGIS [5] and the Qgis2threejs plugin [6] built on top of ThreeJS library [7] (Fig. 3). Thanks to these tools, we have combined geographic information layers, coming from the large scale referential (RGE®) databases of IGN comprising digital elevation models (DEM) and high resolution Orthophotography layers (BD ALTI®) through "geo-services" Web Map Services (WMS). [8,9]

Results and Demonstration

In this context of sport competition, we propose you a descriptive analysis and a 3D visualization demonstration of real-time sport event managed in 2016 among which a TRAIL (53km), a SWIM & RUN (44km) and a marathon (42km) involving a number of sport participants from 100 to 500. [10]

The visual quality of the 3D blocks was obtained thanks to QGIS and QGIS2THREEjs configurations and the associated geographic data layers. The overall obtained result (3D block with dynamic follow-up of the sport participants) makes possible today to simulate a moving camera at a distance of fifty meters above the sport track.

Keywords

IOT, Geolocalization, Sport, 3D, Live

Topic category

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- Training for FOSS4G
- Certification for FOSS4G

Family 5: New Trends

X IoT

- Indoor mapping
- UAV's.
- Cloud based geo-applications
- Location privacy

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Figure 1
Google Map 2D live view (Marathon du Cognac, Sources : Google, LiveInSport)

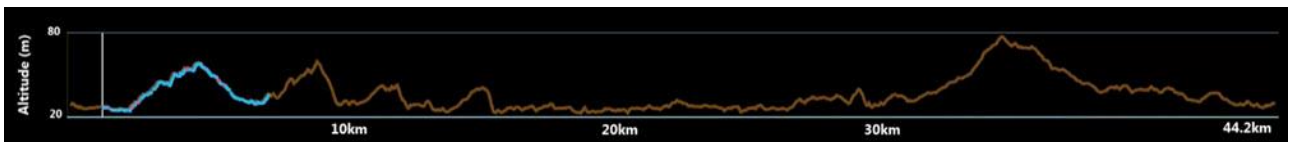


Figure 2
2D profile live view (Marathon du Cognac, Source : LiveInSport)



Figure 3

3D replay view (Swim&Run Côte Vermeille, Sources: MNT-IGN, WMS-CRAIG, Univ.Lille, CHU Lille, LiveInSport)