Combining WEB - GEO Services for Mobility Smart Applications

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Abstract
The ever increasing penetration rates of geospatial web services and location-based services in smart applications generates research interests in studying the potential influence of Geoinformatics technologies in users daily mobility needs. A smart application exploiting and combining different web services is developed to demonstrate the above relationship. As a demo case the concept of Geo-fencing is employed to highlight the Mobility as a Service model.

Keywords: Smart Mobility and Applications, Geo-fencing, Location-based Services, Geo-services, Mobility as a Service

Rationale
Smart devices is emerging as the main technology platform in the mobile marketplace. Recent studies show that 35% of smartphone users in the five largest European economies access maps on their device while at the same time map usage via smartphone is growing seven times faster than via the classic web. Other market research shows that 40% of European mobile subscribers make frequent use of at least one location-based service. The same percentage is estimated up to 50% for North America due to higher adoption of smartphones and GPS-enabled handsets. Having said all that, it is worth focusing on the potential influence of smart applications that employ map and location-based technologies, in the transportation mobility needs of people daily activities.

Various types of traffic data are transferred through custom web services deployed under transportation infrastructures in order to satisfy specific functional requirements. For example, video detectors in an intelligent transport system (ITS) infrastructure providing real time travel times are mainly used to feed a traffic management system (TMS) in order to inform drivers via VMS messages. Information regarding traffic incidents occurring in a transport network may also be provided through appropriate web services to a traveler information system (ATIS). However, such a valuable information may be multiply exploited if it is possible to be served to multiple directions like for example for the purposes of a routing software, or to alert mobile application users reaching to a congested area of the road network. Most of the aforementioned information usually maintains also the geospatial dimension of the involved entities, i.e. the coordinates of road segment endpoints or the measurement values (mile markers) in case of a route. Concerning spatial data sharing and exchange the dominant standards utilized are the geospatial web services (GWS) introduced by the Open Geospatial Consortium (OGC) during last decade. In this respect, numerous research projects and business solutions rely on Web Map Service (WMS) for map visualizations or on Web Processing Service (WPS) for data processing purposes. Furthermore, in case the involved hardware includes also a positioning component (GPS) and the involved software includes the user location parameter, the respected GWS are also called location-based services (LBS).

The present work makes an attempt to combine all of the above mentioned standards towards the development of a demonstrative smart application satisfying user mobility needs. For example, by merging a freely available OGC WMS map service and combining with it a web service providing congested road segments it is possible to create an end user web interface presenting a real -time traffic congestion map. Furthermore, by putting together incidents provided by a third party web service provider and also combining the user location parameter, it is possible to create a geofencing-based smart application notifying the user with valuable traffic-related information. Specifically, a cross-platform Javascript/HTML application has been developed alerting for bad traffic conditions nearby user's current location.

Development

The application has been developed in Javascript and is based on Geo-fencing. The geofence is practically the geographic area defined by a radius around the user's current location. A simple trigger sends messages/alerts to the user whenever geofence surrounds/intersects congested travel paths.

The application makes use of the user's current location and three web services, two offered by a transport-related organization and one public web map service. The user is alerted whenever he reaches near congested road segments.

1. Two web service were employed, both offered by Hellenic Institute of Transport (HIT) of the Centre for Research and Technology Hellas (CERTH). One static web service provides travel paths and the other frequently updated web service provide real time traffic conditions. In detail:
    - *itravel-paths* containing the WGS84 coordinate values of 218 travel paths of Thessaloniki urban road network
    - *itravel-traveltimes* containing current travel times for the above paths
2. BING Maps is the web map service (WMS) employed to provide the texture of the area.
3. User location is retrieved through device's GPS
4. Communication is achieved through ISP
5. For demonstration purposes a simple Geofencing condition was set:

    > *Find road segments of low levels of service (low travel times) intersected by a buffer zone around the current user's location*

Conclusions

The presented work is targeted to policy makers, researchers, academics aiming to exploit contemporary web technologies to support the Mobility as a Service (MaaS) model, as well as smartphone users, trip makers and everybody having mobility needs to cover daily activities.

The combination of different web services deployed for the purposes of transportation projects and infrastructures and also of other available geospatial web services with the aim to build smart applications for covering transportation mobility needs is the main outcome of the presented work. Therefore the presented work rather focuses on the utilization of geoservices than on the complexity and the validity of the involved data and algorithm.

To conclude, geospatial web services, location-based services, smart applications and state of the art technologies such as geofencing may be employed to exploit traffic data and enhance mobility. Web services are out there and ready to satisfy people mobility needs.