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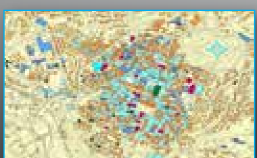
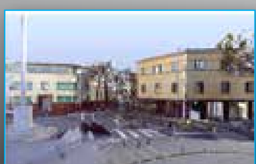
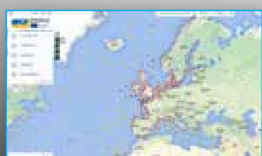


APPLYING TOPOGRAPHY TO RESCUE ACTIVITIES



TERRESTRIAL MULTI-SENSOR SURVEY



EUROPEAN MARINE OBSERVATION DATA NETWORK

EUROGI INTERVIEW ROBERTO VIOLA

TERRESTRIAL MULTI-SENSOR SURVEY: FIELD EXPERIENCES AND REMARKS

by Luigi Colombo and Barbara Marana

THE ARTICLE PROPOSES A STUDY ON SURVEY TECHNOLOGIES SUCH AS MULTI-SENSORY TERRESTRIAL LASER SCANNER, CAMERA AND GNSS. IN PARTICULAR, IT EXAMINES THE ARCHITECTURE OF THE SYSTEM SCAN-AND-GO, ITS FUNCTIONALITY AND A LAND EXPERIENCE.

Fig. 1 - Example of integration among three sensors: laser scanner, photo camera and GNSS unit.

Terrestrial surveying technologies are evolving towards highly automated multi-function sensors which can perform, during the measurement, the positioning and orientation of the collected laser-scanning points within an assigned reference system (*direct* geo-referencing). Besides, the geometric information is always integrated with photographic data, so as to offer also a semantic description of the surveyed objects (fig. 1).
These new measurement systems, traditionally operating from the ground, can be mounted on vehicles in order to perform faster and easier re-positioning on different station points; they are often equipped with electro-mechanical devices to optimize the survey geometry over objects extended in height, such as building façades and building curtains.
Recent examples of new surveying philosophy are provided both by terrestrial Multi-Station Leica Nova MS50, which combines several features in a compact measurement instrument and by spatial Scan-and-Go system (from a company headquartered in Modena-Italy), a static multi-sensor device mounted on a car, with a variable scanning geometry.
The paper describes an experiment of urban documentation performed with the Scan-and-go technology over the historic buildings of Dalmine, a town close to Bergamo (Italy), providing acquisition tests, inspections, pros and cons analyses.

Fig. 2 - Zones of undercut due to the presence of obstacles.

ARCHITECTURE OF THE SCAN-AND-GO SYSTEM

The Scan-and-go system, which is mountable over a vehicle, integrates a laser scanner, a photo-camera and two satellite receivers, along with mechanical devices for data collection optimization (bearing, verticality of the measurement and lifting of the sensors).
As known, the laser scanner allows fast metric acquisitions (object point coordinates), the photo-camera (a built-in unit, as in case of the latest Faro scanner) can generate meaningful thematic information added to geometric data (colored clouds) and then GNSS devices are suitable for fast positioning and orientation.
The system is powered electrically from the car and has an automatic levelled support for laser scanning.
So, it is allowed an improving of surveying phase thanks to the simplification of system movements, required for the different measuring sessions, and the optimization of acquisition geometry (fig.2), permitted by vertical lifting of the scan and photo sensors.
The procedural advantage also regards the reconstruction phase of the overall point model, since it becomes possible to *direct* recording the clouds, i.e. without alignment operations, in a same reference system.
Indeed, the collected points directly provide a single model, with an accuracy of a few centimeters, without further processing work over the clouds, control points (pre-signalized or natural) and adequate overlaps.
In the operational practice it is however suggested, when survey must be provided at large scale (greater than 1:50 and uncertainties less than one centimeter), a check via software of the *direct* instrumental connection among adjacent clouds, with a possible refinement using matching algorithms based on common recognizable features.
The antennas of the two satellite receivers for Scan-and-Go are mounted, respectively, on the car front-hood, through a manual leveling base which also includes an "orientation target", and over the scanner placed on the top of the tube.
The survey sensor is usually a laser scanner, but also a motorized total station, connected to the telescopic support through an automatic self-leveling platform (precision equal to 3"); the platform is equipped with a keyboard unit for remote control and is supplied via cable from the slot of car-cigarette lighter.
In this way, it is always guaranteed the verticality of the rotation axis for the laser sensor, in order to simplify the cloud connection even if the car is on rough or sloping terrains.
The two satellite receivers record, during scanning, the row positioning and orientation data of the instrumental location, inside the European geodetic reference system, according to the national frame established by the Italian Military Geographic Institute (ETRF2000-RDN).
The measured absolute positions are then refined in differential mode, up to a centimeter level, on the basis of the correction values transmitted in real time from a network of permanent satellite stations (Network Real-Time Kinematic) or, possibly, in a post-processing way, using the measurement files recorded by the same permanent network during the survey campaign (acquisition frequency of 1 or 30 seconds).
Therefore, it becomes possible to know, with a centimeter accuracy, both the local coordinates of laser sensor (origin) and orientation target on the vehicle hood and their coordinates in the Italian geodetic frame.
So, it is known for each scan the double points needed to estimate the parameters of the geometric transformation between the instrumental system and the national reference one.
As regards the mechanical support to the scanner, with vertical lift up to 3.3 m, it is

Fig. 3 - The measuring system mounted on a vehicle.

evident its functionality in applications over objects extended in height; furthermore, the capacity of 35 kg allows the use with any laser sensor. The system Scan-and-Go is mounted above the carrier bars of a vehicle of any type (fig. 3), if only it is provided with a protruding hood enough. In this case, the orientation target may be framed by the laser system, despite the lower zone excluded from scanning, even with the telescopic tube extended to the maximum height (figs. 4a, b).

SYSTEM FUNCTIONALITY

The system management is wireless, through Bluetooth and WLAN connections (via PC), both for laser scanner with satellite positioning devices and for data management regarding real-time correction of the measured GNSS coordinates.

During the described application, the differential corrections were provided by the NetGeo network, developed in Geotop with Topcon technology; the Bluetooth connection was performed using a smartphone as a 3G hotspot (fig. 5).

The NetGeo network distributes, throughout Italy, code and phase corrections useful for differential positioning (DGPS and NRTK) according to some solutions, such as the *Nearest*, in which users receive the corrections produced by the nearest permanent station, or the *Virtual Reference Station*, in which the corrections are those of a virtual station rebuilt in a position close to the user one.

THE LAND EXPERIENCE

The integrated Scan-and-Go system, used during the test, has been provided with the latest terrestrial Faro scanner, two Topcon GNSS receivers and was mounted on an Audi private car. The survey experiment has regarded the urban historic area, tied to the Dalmine origins as meaningful city-industry, with the aim of producing a 1:100 scale model for the building façades designed by architect Greppi during the Fascist era. The interested land is characterized by an architecture of the early twentieth century, with two-story buildings and spaces to widespread planting, both along the streets and into the squares (fig. 6). In these situations (urban canyons and tree-lined avenues), the presence of obstacles can

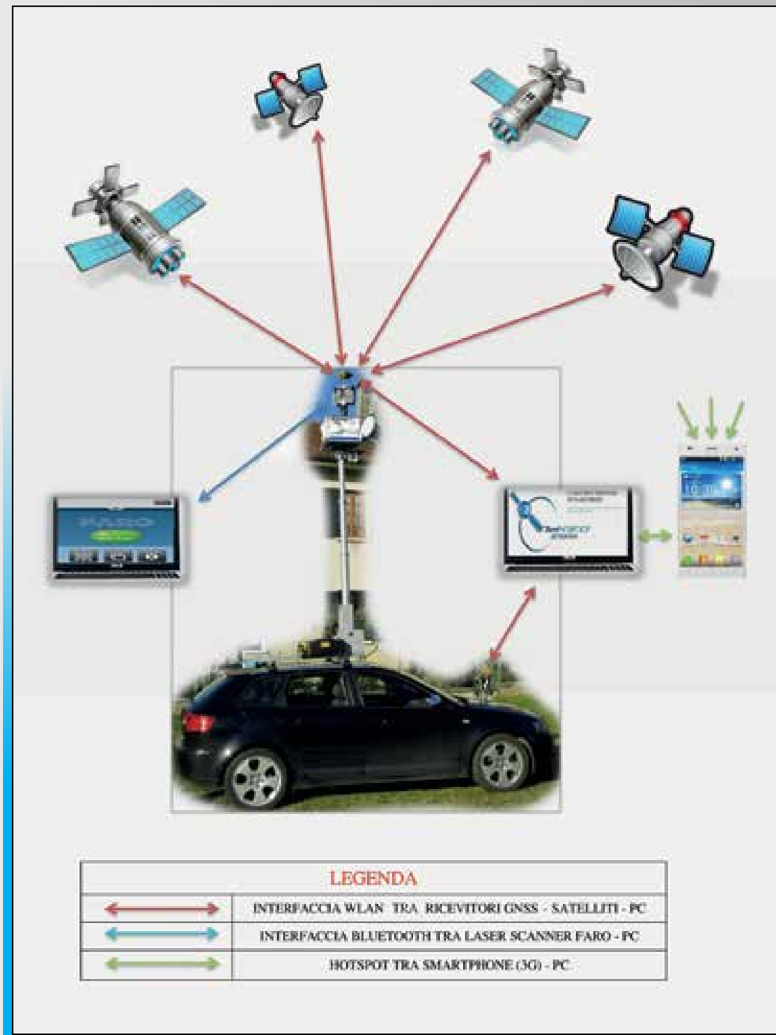


Fig. 5 - System components and wireless connections among the measurement units.


Fig. 4a - The lower zone excluded from the scanning.


Fig. 4b - Details of the self-leveling device.


Fig. 6 - System Scan-and-Go in action over the historic center of Dalmine.

Fig. 7 - Point model of the historic town center.

Fig. 8 - 3D model with textures: the town-hall square.

Fig. 9 - 3D model with textures: the land zone facing the Dalmine Spa headquarters.

Fig. 10 - 3D Model for the square in front of the Dalmine Spa headquarters.

create occlusions to satellite tracking: therefore, GNSS positioning is not continuously available for a direct georeferencing. So, there has been sometimes the need to perform point cloud alignment in a post-processing way, through a suitable software (JRC-3D Reconstructor and Faro Scene).
An appropriate overlap between clouds was requested, together with the use of ICP software function (Iterative Closest Point; Besl et al., 1992) over common geometric details (windows, doors, building façade edges), well recognizable onto the model. The JRC 3DReconstructor can even allow a multi-scan alignment, with a simultaneous registration for all the clouds, such as in a photogrammetric bundle adjustment. Figure 7 shows building elements surveyed in the historic town center; figures 8, 9 and 10 detail some views of the reconstructed spatial point model. The laser scanning survey was realized by setting the mechanical arm at different heights so as to optimize the acquisition according to geometry and morphology of the urban land.
As pointed out before, the cloud alignment was performed both *directly*, via GNSS support (Habib et al., 2010), and *indirectly*, through natural object control points, due to local difficulties in receiving the satellite signals (Ingersand, 2006). Operationally, the approach established the land locations of different scans; then, parked the vehicle on one of these positions, the laser sensor and the reference target with the GNSS receivers, have been leveled properly with a setting-up phase. Satellite receivers started to measure in a NRTK connection with the permanent NetGeo network, via Internet; this way, spatial coordinates (centimeter-accuracy) for scan station and orientation target were recorded in the Italian reference system. At the same time, laser scanning was performed, according to the designed sampling standards (grid scanning step), (Colombo et al., 2012), selecting the highest angular resolution allowed by the Faro laser and a station-object range within 25-30 meters. After collecting data, phototextures included, the survey vehicle moved to the next station, repeating the cycle up to the end, in order to realize the automatic 3D model of the zone. This approach has allowed to speed up the phase of land survey and geo-referencing, also for the scans with no common points, and to significantly improve the reconstruction process. This procedure can be developed when the satellite signals are received correctly; otherwise, a manual post-processing is requested. Figure 11 shows orthographic views related to some building façades along the square regarding the Dalmine SpA headquarters; they were extracted via software from the global 3D point model (Nalani et al., 2012).

DIMENSIONAL INSPECTIONS

A random check of some objects extracted from the measurable-textured model, produced during the survey campaign, was planned to investigate the reconstruction quality; reconstruction which in this test was performed in hybrid mode, both with *direct* georeferencing (via satellite support) and *indirect* (via manual alignment).
The dimensional inspection requested a comparison between a set of spatial distances, determined both on the point clouds and over the object elements, through well identified natural points. The rectangular coordinates of these points were measured in a local reference system (with free origin and orientation), using a Topcon total station (reflector-less) through a polar process; starting from these coordinates the related spatial distances were calculated. The same points were then recognized on the reconstructed point model within the package JRC 3D Reconstructor, deducting the spatial distance values for the comparison . Figure 12 shows the geometric check performed over a building, with the deviation values regarding each control distance. The deviation values (Δd) in the table respect the maximum admissible threshold (with a 95% probability level), i.e.
$T_{\Delta d}$ = 1.96 *standard deviation $_{\Delta d}$, inherent the functional model $\Delta d = d_{cloud} - d_{topographic}$.
It has been assumed:
. the distance standard deviation = $sigma_{distance} = sigma_{point}\sqrt{2}$,
. the point position standard deviation = $sigma_{point} = (sigma^2_x + sigma^2_y + sigma^2_z)^{0.5}$, respectively equal to ≈ 5 mm for topographic points and ≈ 10 mm for those extracted from the 1:100 scale scan model.

The maximum admissible threshold is therefore:
$T_{\Delta d} = 1{,}96 * sigma_{\Delta d} = 1.96 * [(sigma_{d\text{-}model})^2 + (sigma_{d\text{-}topographic})^2]^{0.5} = 1.96 * [(10\sqrt{2})^2 + (5\sqrt{2})^2]^{0.5} \approx 31$ mm.

Fig. 11 - Orthographic views of some historic building façades.

Fig. 12 - Orthographic view of an inspected building, with control distances and their deviations.

FINAL REMARKS AND PERSPECTIVES

The experience developed over the historic urban territory of Dalmine has showed a good functionality, versatility and speed of the survey multi-function system Scan-and-go.

Besides, it has pointed out a favorable benefit-cost ratio in applications with detail levels less than or equal 1:100 scale, where satellite geo-referencing is correctly allowed and satellite accuracy appears suitable for a *direct* model reconstruction. The system is equally advantageous when the survey requires several taking stations distributed over an extended open area, or when the zone is not easily accessible, or with different scanning heights due to the presence of obstacles and objects developed in height. Some limits in reliability were pointed out by wireless communications among different devices: Bluetooth and WLAN are effective technologies but require a good compatibility for the connected units. Besides, a good Internet coverage is needed for some basic operations, together with an extended and consistent power supply: limits unfortunately still current in every portable device. However, these details could be surely improved in the next future, as well as those related to power supply, car installation and acquisition price.

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KEYWORDS

Topographic survey; laser scanner; camera; GNSS; Scan-and-Go

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APPLIED TOPOGRAPHIC TECHNIQUES TO RESCUE ACTIVITIES

by Fabio Cuzzocrea and Fabrizio Priori

The various types of aid, which meets the daily Italian National Fire and Rescue Service (CNVVF) have between them a common denominator: the territory. In this regard, within the CNVVF has developed, for years now, operational support based on surveying techniques and the use of GIS, giving way to a new and innovative professional profile: topographer applied to the rescue.

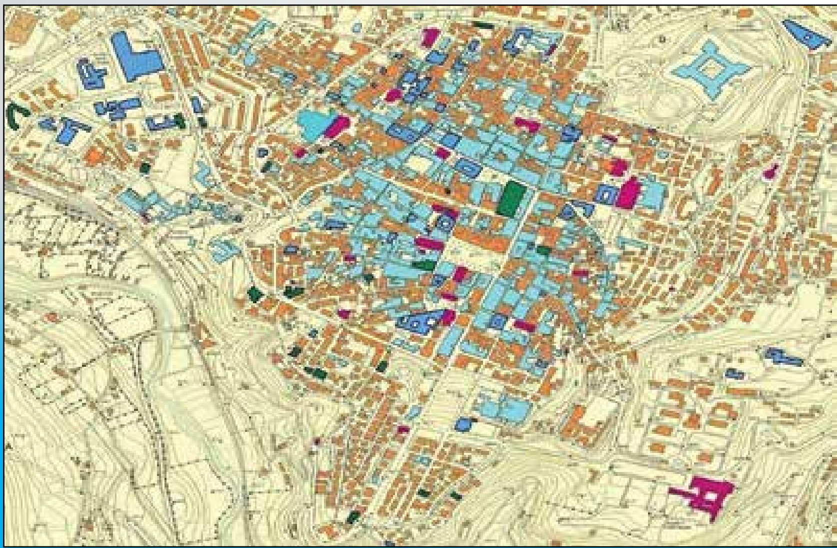

Fig. 1 - Elaboration of the situation of the manufactured during the earthquake in L'Aquila in 2009.

The Italian National Fire ad Rescue Service from several years put a big attentions about usage of geographic information and GIS software in order to give a faster and effective respond in case of major emergency.
National fire brigade is in charge of many activities and duties, but everyone has a common point: on field activity.
Applied topographic techniques to rescue activities is organized by three different layers of coordination:

- Provincial level - Local Command
- Regional level - Regional Command
- National level - Central Directorate for emergency and technical rescue

The experience of many years of activities have permit to understand that Applied topographic techniques to rescue activities (TAS) is an expertise used in all over National fire Brigade activities. This experience and knowledge is useful to better understand an emergency scenario, during the reporting and mapping operations and, most important, to support the management during all the rescue activities.
Starting from Abruzzo earthquake in 2009, until Emilia Romagna earthquake in 2012, passing by the Costa Concordia emergency, applied topographic techniques to rescue activities has permit to edit many specific report using also specific maps, 3D map in order to give as many information as possible to management during the planning and coordination activities.
To better understand the Applied topographic techniques to rescue activities, during the annual activities of forest fire in 2013, a topographic work station was establish inside the Crisis Room in the National Operation Center. During this experience topographic operator has geo-located on field units using special devices, and made special tridimensional reconstructions of Canadair flights during forest fire extinction operations.

THE TECNOLOGY - FIRE FIGHTERS TEAM GEO-LOCATIONS

During the last years TAS service has been updated with the introduction of special devices in order to gives a real time geo location of fire fighter team and units deployed on a scenario.
This technology mainly use the radio analogic private network managed and updated by ICT fire fighters operators. This radio private network use mainly 73 Mhz and 400 Mhz frequencies.
In each trucks or vehicles a radio device is installed and every operators use a mobile radio devices to communicate during emergency activities.
Every communication release a NEMEA string, basically an array of information with GPS coordination.
With a special device TAS unit may locate team on field in real time, and using a GIS software (Ozi Explorer) create layer with all the units deployed on field in case of major emergency.
This kind of implementation permit to geo locate every operators or vehicle in all over the country.

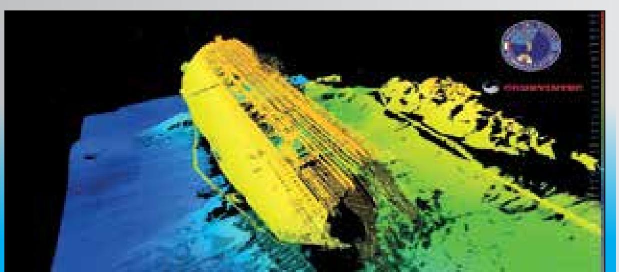

Fig. 2 - 3D Scanning and subsequent post-production of the ship Costa Concordia.

Fig. 3 - Elaboration of cartographic viability of the center of L'Aquila during the 2009 earthquake.

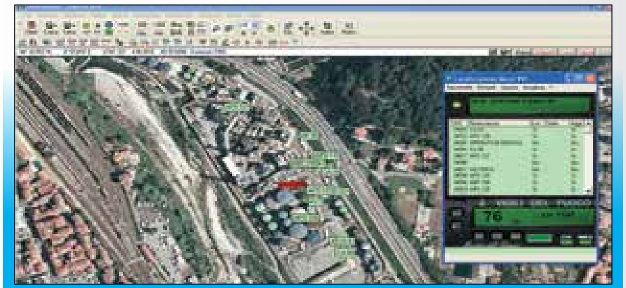

Fig. 4 - Screenshot of the software radiolocation vehicles VVF.

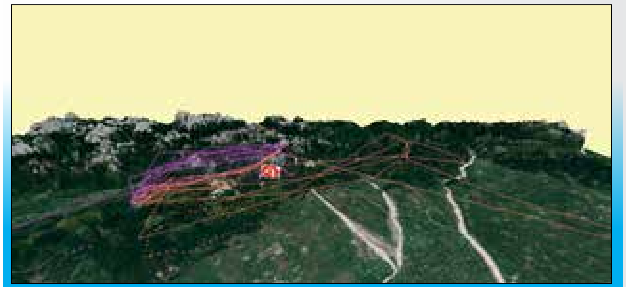

Fig. 5 - Mapping GPS and 3D processing of an air mission extinguishing forest fires.

Fig. 6 - Map of the focus areas subject to aerial activity VF during the campaign AIB 2013.

In order to give at the operators all the information they need to operate, the Italian National Fire and Rescue Service tested during the last years a geo location system using the public mobile network communications.
Using a specific software developed by fire fighters are able to locate a mobile telephone (and probably the owner), to help search and rescue teams for their activity. This information may be put on a maps and delivered to the operators in order to be more effective and faster in the searching activities.

TRAINING FOR OPERATORS

The training system provide two different level of knowledge for TAS operators.
TAS first level in a basic abilitation provide to all fire fighters operators (about of 30.000 operators). With this training all the fire fighters are able to move quickly and safe in mountain scenarios, using GPS devices, compass devices and maps with information of mountain path.
TAS second level is a high level training. This operators is able to use GIS software (Ozi explorer and Global mapper), using GPS information gathered by TAS first level operators and make maps to help decision and management process during and emergency.
TAS second level operators is generally deployed directly on the scenario and usually work inside the Crisis local Unit, creating specific maps or graphical elaboration in order to support local crisis manager.
In each local command there are twelve TAS second level available and more than 2000 TAS first level in Italy.
The TAS operators activities may be briefly report below:

- Fire mapping during forest fire activity
- Earthquakes
- Search and rescue activities,
- Water rescue activity;
- Industrial risks and emergencies

OPERATIVE PROCEDURE FOR SEARCH AND RESCUE

TAS activity was born to face search and rescue operations inside forest and impervious areas.
The operative procedures are basically divided in two steps:

- Zoning and mapping of the search areas;

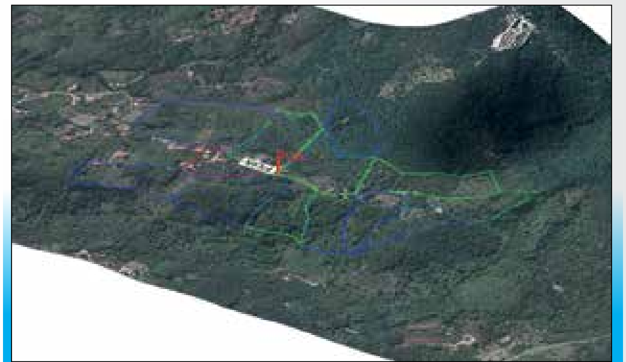

Fig. 7 - Zoning of areas to search for missing persons.

Fig. 8 - GPS Tracks activities SAR (search and rescue).

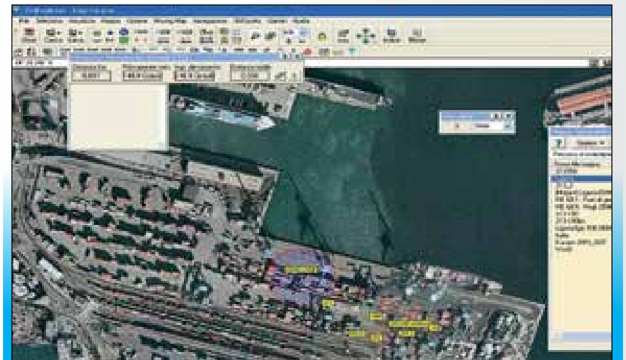

Fig. 9 - Coordination activities in units of CBRN emergencies.

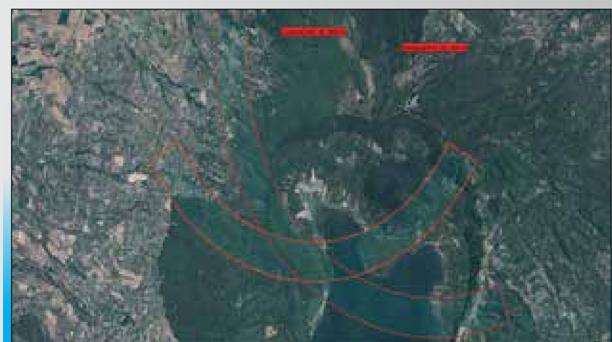

Fig. 10 - Tracing for the localization of scattered by analysis of the coverages of the cells for mobile telephony.

- Search and rescue activity with TAS first level operators

TAS second level operator provide to rescue team leader a GPS device with uploaded map of the assigned area. With this information the teams search inside the designed area and report the GPS tack to the TAS operator for further map elaboration. Generally on the scenario a Local Crisis Unit is deployed in order to provide all the communication to manage and control the scenario.
All the search and rescue team follow scour tactics below:

- Pectin
- Parallel patrol
- Spiral
- Linear

This kind of tactics are mainly used in statics scenarios. In case of dynamic scenario are preferred tactics below:

- Pincer patrolling
- Grid patrolling

In search and rescue operations firefighters often work with other operator such as police operators, volunteers operators, local citizen. It's very important the coordination of all this human resources. TAS second level operator provide instruments and procedures to local coordinator in order to manage the activity, exchange information with others operators, creating a local focal point.

PROJECT EVOLUTIONS

Many activities are put on field to improve applied topographic techniques to rescue activities. Basically national fire fighters is involved to sign agreement with public institutions to share geodata and other information in order to improve the national database of available information.
An other issues is about creating specific operative digital maps such as water risk maps, industrial risks maps, hydrogeological risks maps in order to gather basic information about this risks and give to the local commander all the information about the scenario.
This creation activity involve all the three level of national fire fighters organization (provincial, regional and national) in order to split the activity and gather all the information in a faster and more affective way.

Fig. 11 - Units operating in an AF / UCL engaged in coordination activities during search operations for missing persons.

KEY WORDS
Topographical techniques; rescue; TAS; CNVVF

ABSTRACT
The Italian National Fire and Rescue Service is involved in several emergency scenarios, but all this have a common focal point: on field activity.
From many years the National Fire fighters has developed on field activity using topographic applications using GIS software, creating a new professional profile.
This new high performed operator, highly trained in theorical and practical formation, give a high support to coordination activity in major or multiagency events with specific graphic elaboration.
This new operators use specific GIS application mixed with real time radiolocalization equipment, in order to improve the coordination activity.
All the aspect concerning training and technological improvement are developed by National Fire fighter officers and operators.

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SMART CITIES OR DUMB CITIES? THE CHALLENGES

by Beniamino Murgante and Giuseppe Borruso

Very often the concept of Smart City is strongly related to the flourishing of mobile applications, stressing the technological aspects and a top down approach of high-tech centralized control systems capable of resolving all the urban issues, completely forgetting the essence of a city with its connected problems. The real challenge in future years will be the huge increase of urban population and the changes this will produce to energy and resources consumption.

Despite the evolution of modern and contemporary cities has led to disadvantages resulting from congestion, urban poverty and security, in every developed country cities are the economic heart and the most densely populated places, very attractive for people who want to exchange knowledge. Cities can be identified with places where activities and functions are located and concentrated, so that not just they are places where people and infrastructures are concentrated. So a city is not just based on steady, fixed elements as buildings, infrastructure and localized economic activities, but on movements, too. Typically commuting is identifying metropolitan areas defining the range of a city in terms of its (physical) attractiveness over a certain geographical distance. So smart cities are strongly related with concepts and metaphors of networks, both in terms of the characteristic of cities of acting as nodes within an interconnected system of relations in space, and in terms of the urban scale where (linear) infrastructures connect places and allow flows of people, goods and data to be interchanged and interact. Castells talked about 'spaces of flows' and of a network society, referring to technological and industrial changes intervened in contemporary society. Transport and communication networks contribute the setting of phenomena of spatial interaction and to play a relevant role in the location process. According to Bettencourt, a city is a complex system characterized by a twofold soul: it "works like a star, attracting people and accelerating social interaction and social outputs in a way that is analogous to how stars compress matter and burn brighter and faster the bigger they are". Also, "Cities are massive social networks, made not so much of people but more precisely of their contacts and interactions. These social interactions happen, in turn, inside other networks – social, spatial and infrastructural – which together allow people, things and information to meet across urban space". So, smartness, rather than being just a sort of telephone prefix to put before each term or concept already defined in literature, should be meant as a way of optimizing in their different aspects the benefits of interactions taking place in cities, and therefore adopting the best technologies available – possibly but not only the ICT ones – to pursue a general improvement of citizens and city users' life.

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MT-PANOPTES: A PLATFORM FOR THE INSPECTION OF PHOTOVOLTAIC PLANTS WITH SMALL DRONES

by Panoptes

The Company has recently released the mT-Panoptes, a platform for the inspection of photovoltaic plants with small drones.

The mT-Panoptes consists of a two-channel sensor that records videos in the visible (VIS) and in the Thermal Infrared (TIR). The sensor is coupled with a software assisting the user during the data acquisition and post-processing tasks, up to the generation of final reports about the status of the plants.

The system is based on the recognition of unusual overheating of specific components (cells, modules and strings), which are related to malfunctions or failures.

Once identified, these "hot spots" are automatically placed over a map of the plant.

The automatic placement is an essential feature in the case of monotonous landscapes, such as large solar fields. This functionality is handled by exploiting geographical analysis techniques that allow to display on a map the footprint of each video frame.

The thermal anomalies are identified by examining the TIR channel, while the VIS one is used to detect any false positives or to complement the observations.

The mT-Panoptes hardware records on board both channels and is able to transmit (in real time) the thermal one to the ground. This allows an early recognition of the main criticalities during the data acquisition, while it can be refined at a later time.

The mT-Panoptes has been designed having in mind light drones and the typical workflow of drone surveys. It is very light (about 250 grams), has its own battery which provides over one hour of continuous operating and fits easily with the main platforms of flight. The associated software (provided in two different versions: Solar Viewer and Solar Inspector) includes all the tools needed to collect and analyze data.

At the end of the workflow, the user will be able to generate an automatic report, which includes:

- Coverage map (which part of the plant has been really examined during flights),
- Anomaly sheets (one for each thermal anomaly detected),
- Map of the anomalies (position on the PV plant map of the identified thermal anomalies).

PANOPTES
the spatial way to small drones inspections

The Panoptes Srl is an Italian company, which designs and produces sensors for light RPAS.

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EUROPEAN MARINE OBSERVATION DATA NETWORK - EMODnet PHYSICS

by Antonio Novellino and Paolo D'angelo

The EMODnet Physics Project, coordinated by ETT S.p.A. in collaboration with the most important European Oceanographic Institutes, has the overall objective to coordinate and harmonize the access to physical parameters of the sea and oceans as monitored by fixed stations, and ferrybox lines, ARGOs, gliders in all the European sea basins and oceans and to determine how well the data meet the needs of users.

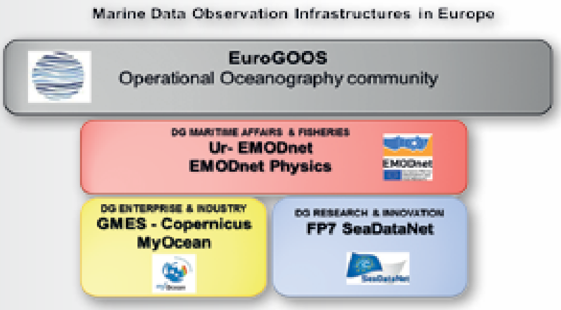

Fig. 1

The "Marine Knowledge 2020" [1] aims at bringing together marine data from different source at European Level to support industry, public authorities and researchers in finding the data and make more effective use of them to develop new products and services and improving our understanding of how the seas behave. In this context National data do not tell us all we need to know about the seas as a global system connected by shifting winds, seasonal currents and migrating species, and the analysis at European level is essential.
Member States already share their observations made in coastal, transitional and marine waters with other Parties such as Marine Conventions and with the EEA through the EIONET. The advent of the INSPIRE Directive (2007/2/EC) [2] and Marine Strategy Framework Directive (2008/56/EC) [3] made compulsory a comprehensive monitoring of the marine environment beyond the geographical limits by means of better discovery of data, free access to data and few restrictions on use and re-use of data.
To accomplish sharing of marine data and information between Member States, the Marine Conventions, and the EEA, an efficient data and information system needs to be put in place. The Commission conceived WISE [4] as the water related component of environmental data reporting and access to marine data available on the European level under the proposed Shared Environmental Information System (SEIS) [5]. As a result, in its Blue Book for Maritime Policy the European Commission undertook to take steps towards a European Marine Observation and Data Network (EMODnet) [6] in order to standardize method for observing and assessing the grade of the Member States seas and improve access to high quality data.
Since 2008-2009, European Commission, represented by the Directorate-General for Maritime Affairs and Fisheries (DG MARE), is running several service contracts for creating pilot thematic components of the ur-EMODNET: Biology, Bathymetry, Chemistry, Geology, Habitats, and Physics.

METHODS

The EMODnet Physics was designed to work on and exploit a strong cooperation between the EuroGOOS association and its regional components (ROOSs), the Copernicus/GMES MyOcean project and the SeaDataNet consortia (Figure 1).
The goal is to provide a comprehensive dataset of in-situ observations from both operational oceanography programmes and scientific surveys to serve both the Operational Oceanography and research communities as well as other users
The EMODnet Physics project provides integration of data coming from members of EuroGOOS, MyOcean and SeaDataNet where:
EuroGOOS (http://www.eurogoos.org) now has 37 members in 16 European countries. Among its priorities are the improvement of the observing system for operational oceanography in Europe, its contribution to global systems and the further development of GOOS, in particular by taking the lead in advancing Coastal GOOS. Activities of EuroGOOS associates and Regional Members are organised at regional level. The EuroGOOS Regional Ocean Observing Systems (ROOSs) are the core of the EuroGOOS association and acts as the operational arm of EuroGOOS and are responsible for the collection of data to fulfill the aims of the regional service needs.
MyOcean (http://www.myocean.eu.org) is the implementation project of the GMES Marine Core Service, deploying the first concerted and integrated pan-European capacity for Ocean Monitoring and Forecasting. Within this project, the in-situ Thematic Assembly Centre (in-situ TAC) is a distributed service integrating data from different sources for operational oceanography needs, in particular in-situ TAC has been designed to fulfill the GMES Marine Core Service needs and the EuroGOOS regional systems (ROOS) needs. The focus of the MyOcean in-situ TAC is on parameters that are presently necessary for GMES Monitoring and Forecasting Centres namely temperature, salinity, sea level, current, chlorophyll / fluorescence, oxygen and nutrients.
SeaDataNet (http://www.seadatanet.org) is a European Infrastructure project that is developing and operating a infrastructure for managing, indexing and providing access to ocean and marine environmental data sets and data products, once data resources are quality controlled and managed at distributed interconnected data centres. The data centres are mostly National Oceanographic Data Centres (NODCs) which are part of major marine research institutes that are developing and operating national marine data networks, and international organizations such as IOC/IODE and ICES. SeaDataNet is also

Fig. 2

establishing and maintaining accurate metadata directories and data access services, as well as common standards for vocabularies, metadata formats, data formats, quality control methods and quality flags.
The EMODnet Physics represents these groups and their infrastructures and combine considerable expertise and experience of collecting, processing, and managing of ocean and marine physical data together with expertise in distributed data infrastructure development and operation for a pan-European marine data management and data access system.

RESULTS

The EMODnet-Physics portal (www.emodnet-physics.eu) makes layers of physical data and their metadata available for use and contributes towards the definition of an operational European Marine Observation and Data Network (EMODnet), in particular, it provides a single point of access to near real time and historical achieved data (www.emodnet-physics.eu/map) regarding:

- wave height and period
- temperature of the water column
- wind speed and direction
- salinity of the water column
- horizontal velocity of water column
- water clarity (light attenuation)

The monitored areas are the Baltic, Black, Mediterranean and North Seas, and jurisdictional waters, including continental shelf, of European Member States and Norway for the North East Atlantic (i.e. Celtic Seas, Iberian Coast and Bay of Biscay, Macaronesia, Norwegian Sea) as well as Icelandic Sea and Barents Sea.

Besides coordinating and managing the project, ETT SpA (www.ettsolutions.com) is developing the EMODnet Physics portal.
The portal is composed mainly of three sections: the Map, the Selection List and the Station Info Panel.
The Map is the core of the EMODnet-Physics system: here the user can access all available data, customize the map visualization and set different display layers. Figure 2 shows the map and its features.
The dots on the map represent the stations in the system, the color of the marker indicates the type of platform and the shape (circular or triangular) visually indicates if there are recent data associated with that particular station. It is also possible to interact with all the information on the map using the filters provided by the service that can be used to select the stations of interest depending on the type, physical parameters measured, the time period of the observations in the database of the system, country of origin, the water basin of reference.
It is also possible to browse the data in time using the slider in the lower part of the page that allows the user to view the stations that recorded data in a particular time period. Finally, it is possible to change the standard map view with different layer that provide additional visual information on the status of the waters.
By selecting one or more stations on the map, the user can display the Selection List page (Figure 3).
This provides detailed information on each platform (name, WMO code, location, provider, data assembly center, acquired parameters) and let users easily download the associated measurements. These data consists on observations of both the last 60 days (the so-called NRT - Near Real Time Data) and the correspondent long term time series (monthly, historical validated data) and are available in different format: .xls, .csv and .nc (NetCDF - Network Common Data Form, the standard interoperability format used in the marine area).
The Station Info panel (Figure 4), available from the main map by clicking on a single platform, provides information on the measurements carried out by the station.
The page is divided into 3 sections where the user can: view the charts representing the curve trend of different parameters through an interactive plot, check the availability of data over time, download selected data and access the CDIs Data Access Service, the SeaDataNet system that provides historical data.
To this day, the portal already provides data discover, view and download features for about 2100 platforms (fixed stations, ferry-box platforms, argos, gliders, etc..), The following table shows the available parameters for each sea basin.
Moreover, the system provides full interoperability with third-party software through WMS service, Web Service and Web catalogue in order to exchange data and products according to the most recent

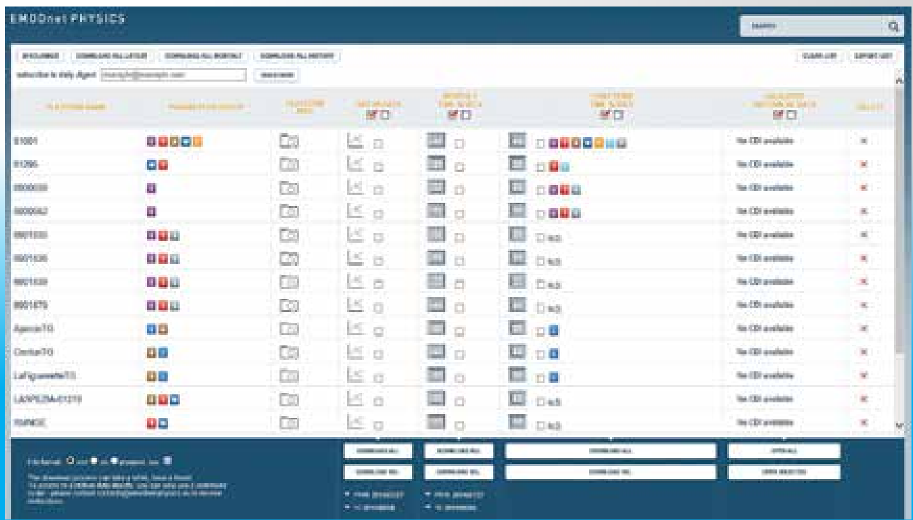

Fig. 3

interop standards. Further developments will ensure the compatibility to the OGS-SWE (Sensor Web Enablement) standard for the description of sensors and related observations using OpenGIS specifications (SensorML, O&M, SOS). The full list of services is available at www.emodnet-physics.eu/services.

The result is an excellent example of the application of innovative technologies for providing access to geo-referenced data for the creation of new advanced services.

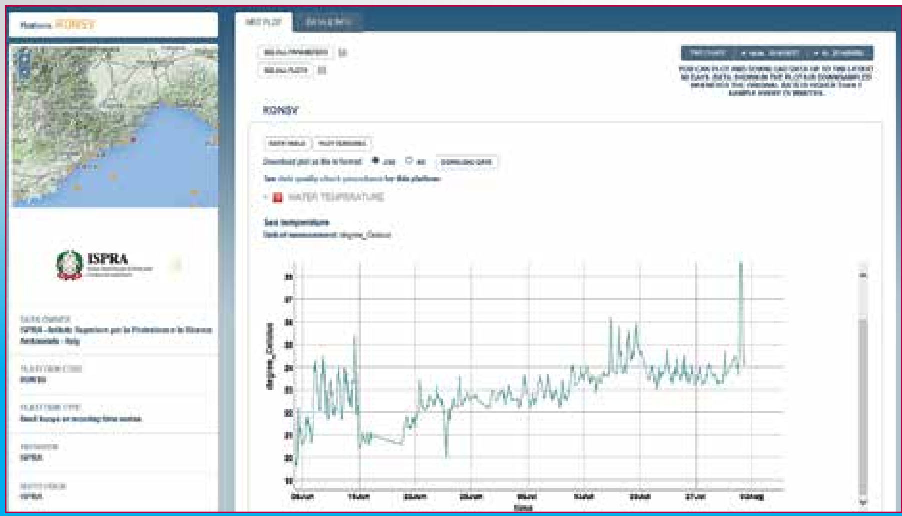

Fig. 4

Tab. 1 – Parameters for each sea basins.

	Waves and wind	Water Temperature	Water Salinity	Currents	Light Attenuation	Sea Level	Atmosphere	Other Parameters	Chemical Parameters	TOTAL
Artic - Barrents - Greenland - Norvegian Sea	0	22	13	0	1	4	4	44	6	94
Baltic Sea	13	26	15	4	4	108	5	10	10	195
Black Sea	0	12	11	0	0	2	0	13	3	41
Global Ocean	26	245	205	11	0	14	34	404	39	978
Atlantic - Bay of Biscay - Celtic Sea	45	79	34	15	3	117	56	36	41	426
Mediterranean Sea	48	107	77	11	3	29	45	90	49	459
TOTAL	132	491	355	41	11	274	144	597	148	2193

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KEYWORDS

Oceanography; Marine Monitoring; Interoperability; Data management; OGC standards

ABSTRACT

Recently the European Commission undertook steps towards a European Marine Observation and Data Network (EMODnet) in order to standardize method for observing and assessing the grade of the Member States seas and improve access to high quality data. Since 2008-2009, European Commission, represented by the Directorate-General for Maritime Affairs and Fisheries (DG MARE), is running several service contracts for creating pilot thematic components of the ur-EMODNET: Biology, Bathymetry, Chemistry, Geology, Habitats, and Physics.

The existing EMODnet-Physics portal (www.emodnet-physics.eu) is based on a strong collaboration between EuroGOOS member institutes and its regional operational oceanographic systems (ROOSs), and the National Oceanographic Data Centres (NODCs), and it is a marine observation information system. It includes systems for physical data from the whole Europe (wave height and period, temperature of the water column, wind speed and direction, salinity of the water column, horizontal velocity of the water column, light attenuation, and sea level) provided mainly by fixed stations and ferry-box platforms, discovering related data sets (both near real time and historical data sets), viewing and downloading of the data from about 2100 platforms (www.emodnet-physics.eu/map) and thus contributing towards the definition of an operational European Marine Observation and Data Network (EMODnet).

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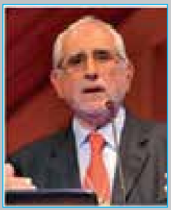
IT IS TIME TO HEAD FOR END USER SATISFACTION BY IMPLEMENTING LOCATION AS SERVICE COMPONENT

by Mauro Salvemini



There are no doubts that INSPIRE, as legal and technical initiative carried out by the European Commission fully politically supported by the European Union, has interested and is still fascinating the international community of geo information. From South America to Far East, as I personally had the opportunity to verify in technical and professional missions, the interoperability dogma is widely accepted and the praxis of concentrating on metadata and web services as well. INSPIRE 2014 Conference demonstrated that individuals, organisations and also nations, referring to thousands of pages of regulation, specifi cation and guidance documents, could relate to their own benefits. It has also to be recognised that presently the shared datasets are still very basic while the organizations' behaviour of not sharing data is still often to be seen in many countries. European nations differ among themselves on final user satisfaction while the involvement of the local public authorities in realising the National SDIs deeply varies within the Union nations. The paradigm of data flow from central to local and vice-versa is conjugated differently depending on the administration organizational and functioning model . INSPIRE application, use and achievements, besides the reporting to the Commission, are to avoid any infringement procedure which may be applied to the nation not meeting the requirements of the directive. The success of interoperability and of SDI depends on the cultural environment where it is going to be applied. It has to be considered that INSPIRE is not only a technical directive but it is having some substantial ideological, political and economic fundamental components. Interoperability is the tool while the principles are the foundations.

INSPIRE addresses national data sets and deals with themes specifi cally oriented to environment and the representation scale is located in the middle and small cartographic range. On the other hand, presently, the most used geographic information for satisfying end user needs is the micro geographic information. The answer of basic question "where" has the solution, for common users and citizens, in the large scale range about from 1:2000 to 1: 500, the typical walking distance.

The semantic and visual aspect of the answer to "where" has also the most relevant value because the common end user is not interested in digits representing coordinates but in recognising the "place" described in an easy to understand model. To this regard INSPIRE sets the foundations but the already defi ned data specifi cations have to be developed to match the needs of semantic management of data sets and spatial knowledge.

It is matter of the fact that, for the time being, public central administrations, specially in Europe, delegate their functions more and more to local authorities. Data sets are originated locally for detailed purposes and at suffi ciently large scale, they flow through the national SDI only if they are compliant to data specifi cations and services' standard. The interoperability from local to central has to be in place for insuring the SDI running. Since data are originated locally and are shared accordingly to sub-national administration's rule, it can be said that SDIs are very much dependent on local culture and local originated data.

Public administrations' functioning modes, places fruition and use, toponyms and their languages or dialects are components of the culture. It is my opinion that in order to guarantee a strict adherence between GI and final users - citizens satisfaction, it is necessary to move from the position paradigm (the cartographic coordinates) to the location paradigm which solves the "where" issue and gives the location knowledge to the end user. SDIs are data and services oriented but it is time now to head for end user satisfaction by implementing location as service component. This is the challenge to be faced by public administrations implementing GI in public services provided to citizens.

The present situation is having a positive trend to develop in this sense offering to SDIs the way to fulfil the mandate of making data and services interoperable for user needs satisfaction. The so called Location Framework has been already pursued by some member states in Europe and it may be considered as the unifying system for providing GI integrated services to citizens.

Just considering the ancient maps not using exact cartographic and projection systems, they were not giving positioning data to users but location useful information for travellers, sailors and explorers. They were used for centuries in multi-cultural and multi-language environment: which are beautiful examples of interoperability, of distributed service and of standards. Are we aiming to that?

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The article was published in July 2014 issue of Coordinates magazine

EUROGI INTERVIEW WITH MR ROBERTO VIOLA, DEPUTY DIRECTOR GENERAL, DIRECTORATE GENERAL FOR COMMUNICATIONS NETWORKS, CONTENT AND TECHNOLOGY, EUROPEAN COMMISSION

Mr Viola will be a keynote speaker at EUROGI's imaGIne conference to be held in Berlin on 8 and 9 October – see http://www.imagine2014.eu for details.

It is commonly stated that 80% of all decisions taken by politicians, business people or individuals are related to a place on Earth and benefit, consequently, from good geo-referenced information. The Technical University of Dresden has recently challenged this saying and brought about as a result, that 57% of all items listed in Wikipedia have a location reference.
Given your portfolio as deputy Director General in the EC's Directorate General in charge of ICT and the Digital Agenda for Europe, how would you assess the significance and role of geo-information (GI) and geo-technologies (GT) within the overall information technologies and for the information society?

The Commission's DG CNECT is responsible for the implementation of the Digital Agenda, including actions encouraging the emergence of a truly data-driven economy in Europe. The impact of geo-information and geo-technologies is particularly visible in the context of our efforts to open up public sector information (PSI) for wide re-use. Geospatial data is a subset of PSI which is widely considered as having a very high re-use potential, allowing for the creation of innovative information services and products with a high added value.

We trust that the opportunities to innovate with geospatial information will largely increase thanks to the recent revision of the Directive on the re-use of Public Sector Information (PSI Directive) – the legal cornerstone of Open Data initiatives in Europe. The new rules, to be implemented on the national level by July 2015 will put in place a genuine right to re-use public information so that all public data should soon become re-usable by default and at no or a much lower cost.

The Directive will therefore impact national cadastres (land registers), and many of them may need to revisit their charging policy. This in turn, should considerably increase the supply of Geographic Information to the market.

Recent Commission initiatives prove that the role of geospatial data is due to increase even further. Two important documents adopted by the Commission in July this year (the Communication on the data-driven economy and a Notice 'Guidelines on recommended standard licences, datasets and charging for the re-use of documents') encourage activities and policies on EU and national levels that should lead to an even further use and re-use of geospatial data within businesses and governments alike. The mentioned guidelines recognise the value of geospatial data considering them as one of the five categories of data to be a priority for release, due to their highest demand from re-users across the EU.

GI as a cross-cutting tool has brought about networks of communities of interest, which serve as platforms for the exchange of knowledge between the different thematic areas, transmit and stimulate innovation and, more generally, advance economic growth and social benefit.
How do you judge the importance of networks such as EUROGI for the GI business sector in Europe?
How ready is the European Commission to cooperate with such networks in order to get the federated and neutral view of the European community as a whole?

The Commission greatly appreciates efforts undertaken by umbrella organisations representing different user communities, including citizens, academia and the private sector, to offer a coherent and inclusive expression of needs on different policy developments. This helps us maintain a reality check and makes sure that the worries, hopes and suggestions of various stakeholder groups do not go unnoticed. This is especially relevant for the geospatial sector, which includes thousands of large and small companies across the whole European continent.

The Commission is ready and willing to associate such networks to the different stages of policy making – from participating in public consultations or offering advice within experts groups to final implementation actions in the framework of Public Private Partnerships.

Internet based meeting facilities are now widely available and much used. Given this reality, how important do you consider face-to-face gatherings such as EUROGI's imaGIne conference? What do you consider the main benefits of such a conference on European level as compared to the many national and regional meetings?

Although internet based meeting facilities are increasingly efficient, I believe that face-to-face gatherings such as the imaGIne conference offer a unique opportunity to exchange views, initiate new contacts, brainstorm and compare best practice – all of which would be much harder in a digital environment.

The US plays a globally dominant role in a wide range of digital fields, including GI/GT. What does Europe need to do to catch up? What will be the policy of the new Commission? Will work programmes and innovation projects target to strengthening competitiveness of European providers on the world market, including exploitation of specific European assets such as cross-cultural, cross-border and multilingual solutions, maybe in a context of higher data protection standards? Will your speech address such points?

This is a very relevant and timely question.

Today barriers like fragmented research efforts on data, the absence of a data ecosystem where the different parts work together, the absence of reliable pricing models for data assets, or the lack of a sufficient number of data professionals across Europe prevent the EU from making full use of what a data-driven economy offers. With the rise of major players on the global scene and for reasons linked to economies of scale, it is essential that actions be coordinated at European level. In the European data policy which is currently being developed, we focus on those areas and segments where Europe can make a difference in the global market.

I would encourage you to take a closer look at the Commission Communication 'Towards a thriving data-driven economy' COM 2014(442), which includes not only an ambitious vision of a data-driven EU economy able to compete on the global level but also lays down a first set of actions designed to ensure the right framework conditions for the emergence of a thriving data ecosystem. In this context, the availability of good quality, reliable and trusted geospatial data is considered a key factor for the data driven economy.

GI's role in unlocking the innovative potential of data-driven businesses will be a key enabler in this important EU-wide process and I would encourage the GI community to participate actively in one regular stakeholder consultation processes.

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