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WHY FACIAL RECOGNITION ON BODY-WORN CAMERAS WILL NOW TRANSFORM FRONTLINE POLICING

A New Approach to Digital Maps & Geospatial Data

Has the time come for rethinking processes, workflows and tools in order to leverage the massive amounts of geospatial data available? And how do we ensure that all this geospatial data can become the foundation from which the majority of geospatial 2D and 3D maps, charts and simulation databases are produced?

We are witnessing an explosion in the amount of geo-located information collected on a daily basis. In fact, there is more geospatial data being collected now than ever before. In just five years, there is likely to be a million times more geospatial data than we have today.

One. Million.

Why does this matter? And how did we get here?

> "People used to derive data from maps, now they derive maps from data"
>
> *Dr. Mike Tishcler - Director National Geospatial Program, US Geological Survey, GEOINT & Open Source Analytics Summit*

You Are Here

Historically, many different governmental organizations have been building maps, charts and simulation databases based upon perceived differing collection and exploitation requirements. For example, the maps produced by the military to plan an offensive, would not necessarily be useful to first responders dealing with a crisis.

Today, many governments have central, dedicated mapping or geospatial organizations responsible for collecting, processing, validating and curating geographical and geo-localized information. These organizations often strive to provide the vast majority of all geographic data necessary for government use and thus tend to work in a centralized approach, which can sometimes lead to delays and data access restrictions due to national security reasons. Consequently,

individual defense, intelligence and security agencies seek more independence from these central geospatial agencies in order to gain agility, autonomy to reduce the time between the collection and exploitation of geospatial data.

More Data. More Problems.

> "To manually exploit the imagery we will have over the next 20 years, we would need eight million imagery analysts. Even now—every day—in just one combat theater—with a single sensor, we collect the data equivalent of three NFL seasons in high definition"
>
> *Robert Cardillo, Director, United States National Geospatial-Intelligence Agency, GEOINT Symposium, June 5, 2017*

Whether it is sourced from satellites, drones, mobile phones, autonomous vehicles, open or commercial sources, or other means, the sheer volume of data is forcing agencies to rethink the way they produce maps, charts, simulation databases, and single or multi-source intelligence analysis material.

Agencies and organizations focused on security and defense – such as the Department of Defense, the Department of the Interior, Department of Homeland Security, and FEMA – traditionally employ a manual and siloed information/data storing technique when dealing with geospatial data. Traditionally, these silos, or stovepipes, were designed to provide very specific information for that agency's needs.

As the amount of geospatial data increases, and more demands are placed on these organizations, their inability to quickly adapt or scale their processes, or integrate new data or data streams makes them vulnerable to bottlenecks and inefficiencies.

However, this no longer needs to be the case.

From Months to Hours

The time has come to rethink processes, redefine workflows and seek new tools to enable and streamline the continuous consumption/ingestion of geospatial and sensor data to a centrally curated data repository. From this repository, agencies could very quickly generate and deliver nearly all geospatial 2D and 3D maps, charts, simulations, and derivatives to the point of need.

The benefits of this approach are multiple:

- **Increase in quality and accuracy:** through the fusion of multiple sources, maps can provide better situational awareness through access to the latest picture of the mission theater. For example, firefighters will have the most recent information to plan firebreaks, or FEMA can more accurately plan disaster assistance.
- **Faster production:** The application of these technologies will allow for augmented throughput of geospatial data and allow agencies to provide better quality of service to its stakeholders.
- **Less expensive:** This new approach requires less manual intervention, thereby permitting a strategic uses of your workforce. Additionally, the automation of tasks renders maps less prone to errors and ensures a more consistent quality.

By introducing and implementing cloud computing, computer vision, machine learning and artificial intelligence, the herculean task of quickly processing, ingesting, and transforming geospatial data into time-sensitive, useable, actionable intelligence is now possible. What used to take a large team of people several months to accomplish, can now be accomplished by a single computer in a matter of hours.

Leveraging Technology

In his GEOINT 2017 allocution, Robert Cardillo also stated: "We intend to automate 75 percent of the repetitive tasks our analysts perform so they have more time to analyze that last play and more accurately anticipate the next one. And then they can look much harder at our toughest problems—the 25 percent that require the most attention."

"VELOCITY responds directly to that challenge," says Stephane Blondin, Vice-President of Presagis. Presagis has over 20 years of experience providing geospatial processing tools and services to the defense and security simulation industry.

Presagis has developed VELOCITY, an automated solution supporting the continual production of 3D terrain and maps for use in defense and security personnel training, critical mission planning and intelligence analysis.

"By automating data cleanup and formalizing transformation processes, VELOCITY gives agencies and organizations the ability to produce 2D, 3D, or VR environments for a wide range of applications while providing traceability and repeatability. It also allows the drastic reduction – and sometimes the outright removal – of man-in-the-loop operations," adds Blondin.

Regardless of the solution or processes used, it is clear that the path forward requires the latest

and best technology, tools, and architecture.

Cloud Computing

Given the unprecedented amounts of geospatial data now available, it is unrealistic to adhere to traditional storing and processing methods. Cloud computing allows for the storage of massive amounts of data and externalization of resources and also gives agencies the ability to massively scale-up operations when timing is imperative.

Additionally, a cloud computing approach facilitates the integration and deployment of large "System of Systems" and the integration of complex business processes based on a wide array of technology from a disparate set of vendors that can evolve over time. Companies such as Google, Microsoft and Amazon have paved the way to define technologies and software architectures that facilitate the integration of these System of Systems.

Computer Vision & Artificial Intelligence

Computer vision allows for the acquisition, processing, analyzing and understanding of digital images, and extraction of high-dimensional data – without a "human in the loop".

The combination of computer vision and artificial intelligence (AI) algorithms opens one of the most interesting avenues to automate the processing, integration and analysis of GEOINT data. Thanks to the massive storage and processing capabilities in the cloud, the field of machine learning is progressing more rapidly than ever and can automate numerous tasks once relegated to human, manual interventions. These tasks include:

- Digital Terrain Model (DTM) extraction
- Road network extraction
- Building footprints, height and rooftop extractions
- Vegetation extraction
- Land use classification
- Temporal change detection
- GIS data and sensor fusion

The Advantage of 3D

The dynamic nature of digital maps allows better tracking and measurement of changes in land use and land cover and, of course, a third dimension.

Aside from the obvious visual appeal of 3D representations, is there an advantage?

"Absolutely," says Blondin, "3D gives you the ability to represent and navigate complex datasets and concepts. Whether it be the trajectory of an aircraft, line of sights, electro-magnetic signals, or the verticality of a dense urban environment, 3D maps are extremely effective at helping visualize space and relativity in an intuitive and natural way."

Instrumenting 3D maps also opens the door for simulation. The instrumentation of roads and lanes allows the simulation of ground vehicles on streets, the identification of sidewalks and pathways permits the simulation of crowds, adding airport runways, signage and navaid let virtual aircraft take off and land, while material definitions of terrain and features allow physics-based sensor simulations, such as IR, or night-vision. The possibilities are virtually endless.

Next Steps

As the amount of geospatial and geo-located intelligence data explodes, national geospatial agencies need to consider bringing automation to the siloed and manual processes that exist today.

A convergence of cloud computing, computer vision, and AI in solutions like VELOCITY can accommodate the coexistence of both centralized and decentralized approaches while still converging towards an integrated geospatial system.

Through its ability to rapidly and continually combine and fuse GIS data into a central 3D geospatial data repository, VELOCITY is able to support the production of maps, charts, and simulation databases in days rather than months. Because of its modular open architecture approach, VELOCITY workflows can be customized to meet any specific need. By leveraging widely used and recognized automation technologies such as Python™ and HTCondor™, and by integrating market best solutions from the geospatial, simulation, gaming, architecture and entertainment industries such as GDAL, Terra Vista™, Unreal Engine™, CityEngine™ and Cinema4D™, VELOCITY promises important productivity gains through automation and scalability and the assurance of coherent situational awareness at the point of need.