



PINPOINTING

THE TRUTH UNIFLY'S MARC KEGELAERS AND HERE'S LEON VAN DE PAS EXPLAIN HOW THEIR COMPANIES ARE WORKING TOGETHER TO CREATE MAPS OF THE SKIES FOR UAVS

UAVs will be the ultimate users of the Reality Index, the rich real-time digital representation of the physical world HERE and Unify are creating

May 2013. It was late on a warm Spring evening and I was about to call it a day after a long shift at the office. My monitor alerts me to an incoming Skype call from a colleague. "We've just gotten a request for an urgent UAV flight," he says. "We need to determine whether it's possible and what paperwork is needed."

We'd now received a handful of calls like this. Just a few weeks earlier we'd begun offering a service to UAV operators: tell us where you want to fly, and we'll tell you if you can and arrange for the necessary permits.

"Purpose of the flight – a mapping mission with a fixed-wing UAV at the coastal area," my colleague continues. "Do

you have a KML-file? Please send it. Hmm, it appears there's an airport in the area."

I dig out the relevant airspace map. "Found it," I say. "I think we're in a controlled traffic region. However, it's not fully clear looking at the map. Let me look into it and call you back."

To be sure, I consult an aerospace manual to get the exact coordinates of the controlled region. I then create a KML file and overlay it in my GIS.

It's now past midnight and two hours on from that Skype call. This still needs some time and I should continue in the morning, I think to myself.

I pore over an open-source street map. It seems there are some higher

buildings and a road in the area. When was this information last updated? I make a note to check later and call my colleague back.

"First thing tomorrow, we'll need to file a notice for this flight with the civil aviation authority (CAA). Let me get you the number so you can give them a ring in the morning."

I hang up. Our UAV operator would have to be patient. Getting approval from the local CAA could take at least two weeks.

We've come a long way

That evening serves as a reminder of how far we've come in the past four years. Thanks to new technologies and faster administrative procedures, processing UAV flight requests is not quite the same slog through endless paperwork, manually comparing notes and maps to create a viable and legally-sound flight path.

UAVs need to take into account obstacles, buildings and people's privacy. As airborne objects, they are also subject to various airspace regulations. For UAVs to operate safely and predictably, access to rich and accurate data sources is paramount. Standards to support interoperability, just like those practised by the aviation industry, are needed.

While there are now rich information sources available, there is still a long way to go. Open source map data can be a useful aid, though it's often incomplete, outdated and the margin for error can be too big for comfort.

For UAVs, which increasingly are flown remotely out of view of their operators, that's unacceptable, while the safety risks with autonomous UAVs are even more pronounced.

Ideally, there needs to be a single point of truth to enable the safe flying of UAV. Unifly and HERE Technologies, the location data company, are now working together to create just that.

Time is of the essence. UAV usage has grown rapidly, with industry observers tipping global sales to have surpassed three million units last year – a 39% increase on 2016.

The surge in their popularity has highlighted the difficulty of navigating these devices in a dynamic, 4D airspace.

A highly accurate map, rich with semantic layers, is therefore a critical tool assisting users to accurately pilot their device.

The airspace is described as four-dimensional as it includes the three regular dimensions plus time. Airspaces can be active for only a certain time period. Some datasets are temporal due to their nature – such as meteorological conditions and other air traffic.

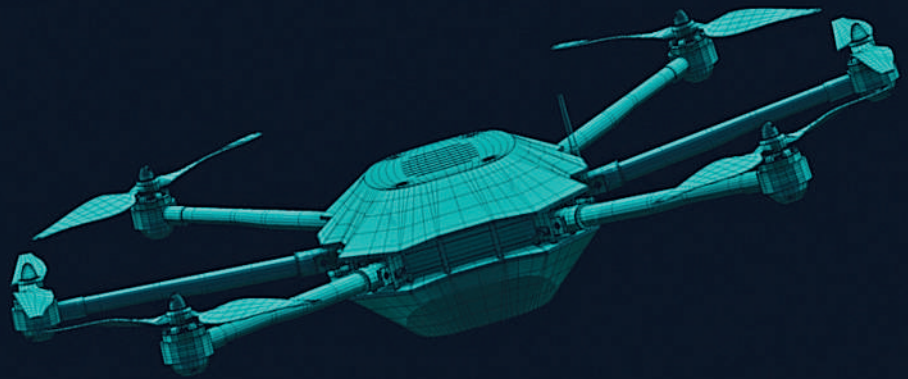
to inform the UAV pilot about relevant changes to the environment or situation.

UAV traffic does not exist in a vacuum – there is no dedicated airspace for UAVs. As such, authorities want to visualise and manage UAV flights and define no-UAV zones. This necessitates dynamic UAV flight and airspace management including real-time UAV surveillance and tracking.

WHILE THERE ARE NOW RICH INFORMATION SOURCES AVAILABLE, THERE IS STILL A LONG WAY TO GO

Aeronautical information publications are where aviation authorities officially communicate changes in the aerospace. Short term changes about airspace structure and authorisations are communicated through messages called 'notice to airmen' (NOTAM). Unifly's unmanned traffic management (UTM) system parses and filters NOTAMS

Unifly and HERE are now working together to provide a more complete picture of the UAV airspace. In the first phase of our cooperation, we plan to create a 4D airspace map for UAVs. This will cover rural and urban areas, and mark out no-fly zones, such as airports, residential areas or sensitive government installations and military zones.





In the future autonomous world, the traffic of both airborne and ground vehicles will need to be well orchestrated to ensure safety and efficiency



The aim of the collaboration between HERE and Unify is to explore how UAV transport and logistics can be integrated seamlessly into the broader transport system

Unify and HERE will initially focus on making this airspace map available in the US and Western Europe by the end of this year. After that, they plan to add more regions, while also adding new capabilities to aid with the management of UAV traffic flow and even collision avoidance, much like air traffic controllers do for the airline industry today.

From the ground to the skies

HERE has been developing high-precision 3D mapping the car industry for several years. It is currently piloting high-definition maps for automated and fully autonomous cars. These are accurate to 20cm, and for the most part cover the road surface and the roadside environment, extending upwards by about 40m. The company is also developing its

map to extend beyond the road network to support various Internet of Things use cases. HERE's mapping team also maps buildings and large venues around the world, and uses GPS probe data and satellite imagery to enrich the map creation process.

With HERE's sights on UAV maps, the task can be seen as two-fold: a UAV generally needs a map from ground level to about 150m up, so first, these high precision maps need to extend further into the air and incorporate additional physical features and map attributes – especially in an urban environment, where buildings represent 'no-go' areas for UAVs.

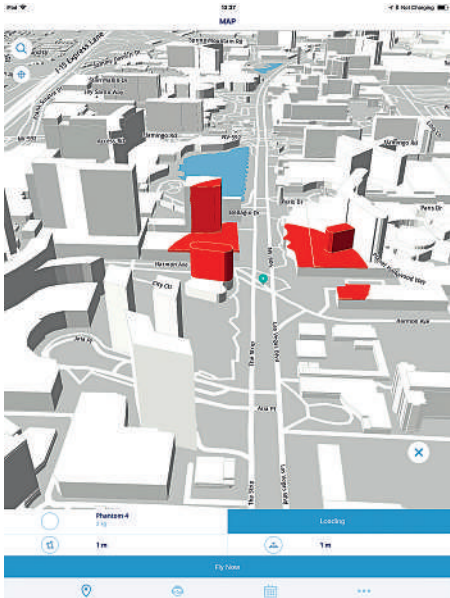


For UAVs to operate safely and predictably, access to rich and accurate data sources is paramount. These data sources must also be kept updated to ensure usefulness

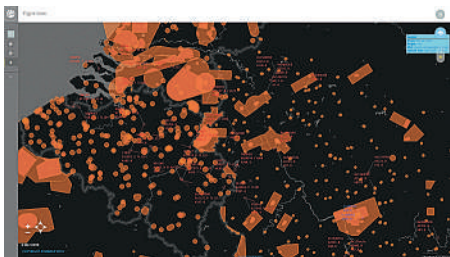
Secondly, these maps must be kept updated. It's no good building a precise map of the world if you can't maintain its accuracy and usefulness. The solution here lies in creating a loop between the UAV and the map. HERE is already doing this with vehicles by extracting information from the car's sensors and then using that data to generate map updates.

For example, if a Mercedes-Benz is driving along the highway and its camera or radar detects a lane is closed for construction, it shares this information with HERE in real-time, which then updates the map in the cloud for the benefit of other vehicles; similarly,

THESE RULES ARE OFTEN COMPLEX AND THERE ARE MANY VARIABLES TO CONSIDER



A UAV generally needs a map from the ground up to an altitude of about 150m



Unify shows the invisible limitations imposed by aviation regulations, as well as real-time information on both manned and unmanned air traffic in the vicinity

if the car's windscreen wipers are on full speed, HERE translates that information into heavy rainfall and alerts other vehicles accordingly. UAVs, which are also equipped with various sophisticated sensors, could detect changes in the real-world environment and aid map updates in the same way.

By aggregating data from many UAVs, the airspace map could be enriched with precise information about hyperlocal weather conditions, potential hazards and the best navigable routes.

Who and where

Unify plays a vital role here too. Its UTM platform connects official entities with operators to integrate UAVs into the airspace safely and securely, making it possible to follow them in real-time. Unify can also determine who is flying where and whether they are supposed to be there.

This approach dovetails with the European initiative U-space, which aims to make possible denser traffic from automated UAV operations, opening the door to a European UAV service market. U-space proposes a step-by-step approach to develop into a fully automated, connected digital infrastructure by 2025.

Unify's technology already complies with the 'U2 phase' of U-space, which



By aggregating data from many drones, the airspace map could also be enriched with precise information about hyperlocal weather conditions, potential hazards and the best navigable routes



UAVs need to take into account obstacles, buildings and people's privacy. As airborne objects, they are also subject to various airspace regulations

covers services such as flight planning, airspace approval, live tracking and dynamic situational awareness.

These are handy tools for UAV users, setting out local, national and global rules and providing important local context for given locations. These rules are often complex and there are many variables to consider. After factoring in real-time information as

The ultimate users

In a way, UAVs are the ultimate users of a map – they need to know every centimetre of the world around them or flying becomes a very risky business. It's therefore critical that they can rely on accurate and up-to-date mapping and other data sources.

There are many organisations investing in UAV technology. HERE and

SUCH A MAP IS REALLY NEEDED IF PEOPLE WISH TO FLY UAVS REMOTELY WITHOUT LINE OF SIGHT

well, the UTM system immediately gives the user a clear and actionable answer. It means the UAV pilot can proactively plan and validate UAV flights, acquiring the necessary permissions to make sure their flights are legal.

Whereas most current UTM tools focus on presenting information to the operators of UAVs, we are very rapidly moving to a world in which UAVs will fly fully automatically without human intervention. These automated UAVs will need the same data and the same data validation protocols as those now being used by humans.

Unify hope that by combining our efforts in this airspace mapping initiative, we can help a UAV and its operator to fly viably, safely and legally. Such a map is really needed if people wish to fly UAVs remotely without line of sight. And it will be even more essential in future with autonomously-flying UAVs on the horizon.

Marc Kegelaers is CEO of Unify (www.unify.aero). Leon van de Pas is senior VP, Internet of Things, at HERE Technologies (www.here.com)