

DOUBLE VISION

FRANCOIS GERVAIX LOOKS AT HOW THE UAV HAS BEEN CHANGING PHOTOGRAMMETRY IN RECENT YEARS AND WHAT ADVANCES WE CAN LOOK FORWARD TO IN THE YEARS TO COME

Since the turn of the century, photogrammetry has evolved significantly. Innovative technologies, such as unmanned aerial vehicles (UAVs), have complemented traditional, ground-based techniques and allowed photogrammetry to prosper, where once it was expected to fail. With such advances in hardware and software technologies facilitating faster, more accurate and efficient data collection and processing, photogrammetric solutions are now capable of providing a more holistic approach to image capture for professionals across a range of vertical sectors.

2017 saw the continued evolution of photogrammetric UAV methodologies, which have been refined to improve real-time processes. Such developments have helped this technology cement its reputation as dynamic, with further innovations expected in the near future. For instance, more complex and higher quality photogrammetric sensors mean that there is now a continuum in terms of distance to the object and angle of view, ranging from nadir to horizontal to zenith – ideal for complex applications such as under-bridge inspection. These product advancements, alongside the introduction of more complete, end-to-end solutions, have been

key in enabling UAV photogrammetry to expand its reach and, as a result, thrive.

Changing the status quo

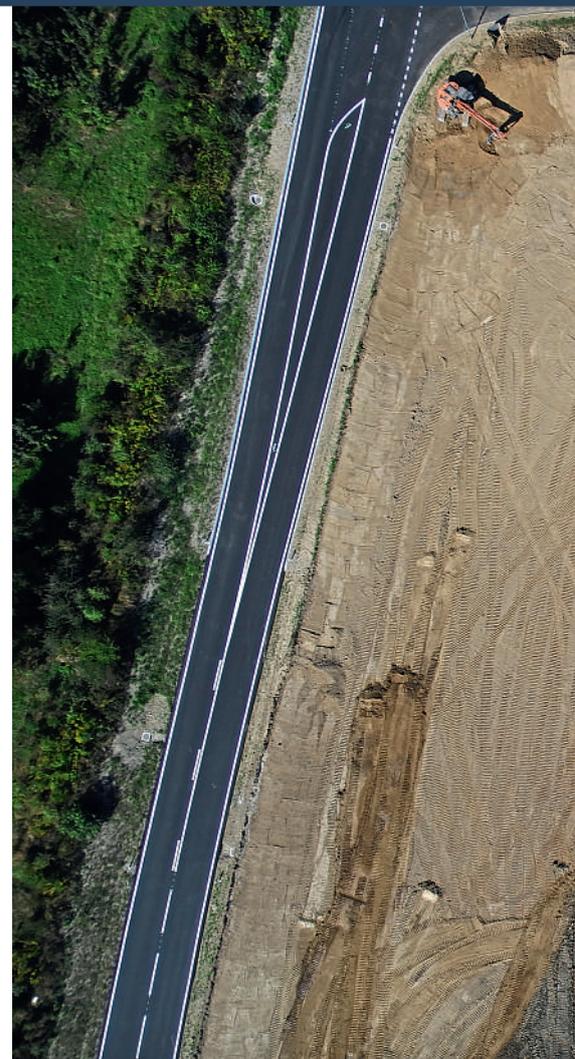
While far from a new technology, photogrammetric UAVs have become significantly more accessible in recent years. Many advantages, including improved efficiency and ease-of-use, as well as the high accuracy and quality of data obtained, have seen UAVs become an increasingly essential tool, capable of transforming data into insights from which to make fast, informed decisions. The introduction of structure from motion (SfM) software, which creates three-dimensional point cloud data from two-dimensional image sequences, has also helped professionals to streamline their image capture and processing, while facilitating a smarter, more integrated workflow.

In the past few years, the UAV has undoubtedly evolved to become an increasingly key technology for geospatial professionals, capable of making real improvements to photogrammetric imagery. However, with the industry moving at a faster rate than ever before, what role will UAVs play in 2018 and beyond?

Higher quality, better results

With the demand for more detailed photogrammetric imagery likely to increase, continued investment in tools that can achieve this – namely UAVs – will be vital. An important step will be the development of smaller, lightweight sensors that are more agile and ideal for use in UAVs. Reducing the size of sensors will enable faster and more efficient data collection, while also supporting the generation of more homogeneous orthomosaics and less noisy point clouds to create better quality images.

Optimising the pixel size of digital camera lenses will also be crucial to the standard of images collected by UAVs: too large and the resolution will be poor; too small and the lens may not be able to guarantee quality in different light conditions. With passive



sensors still depending heavily on natural or artificial light to function, striking the balance between the two pixel sizes is important to provide the most accurate, consistent imagery from which to make meaningful decisions. Ensuring consistent measurements and image capture will be particularly important in terms of safeguarding quality in applications where weather conditions may vary over a large area.

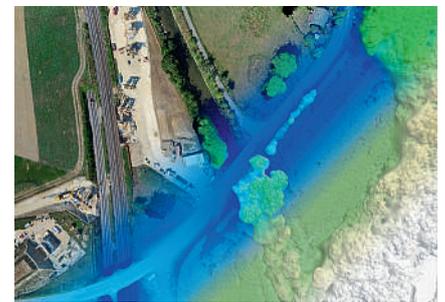
Streamlined, real-time processes

Aside from data quality, photogrammetric UAV systems can be further enhanced by streamlining and integrating processes, to optimise the speed, efficiency and ease with which it can be collected and analysed. This will be particularly beneficial in areas such as tunnels and secluded spaces where more innovative methodologies, such as UAV corridor mapping, can be used to best overcome challenging environments. As well as being plagued by poor lighting conditions, such terrains are also restricted by space and flight capacity for aerial equipment, which can limit the scope and quality of imaging.

Considering this, geospatial professionals are increasingly supporting traditional 'camera' photogrammetry with active sensor techniques such as LiDAR which, while heavier than photogrammetric UAV



A visualisation of a 3D model created using data captured by the senseFly SODA photogrammetry camera. Also shown is a senseFly eBee Plus drone with the senseFly SODA hardware



An aerial-view montage of a site created by merging a series of images collected by the senseFly SODA camera during a senseFly eBee Plus flight

Imagery of a site captured by a senseFly eBee Plus drone, using the senseFly SODA photogrammetry camera

The senseFly SODA, the first camera designed for professional drone photogrammetry

solutions, can complement and enhance data collection in narrow, difficult conditions.

The development of more real-time processes could also help to significantly improve UAV photogrammetry techniques. By monitoring image capture in real-time, users can identify ways in which apparatus settings can be optimised to best suit conditions during, rather than after, data collection. This has the potential to help eliminate the need for multiple flights, bringing about significant time and cost savings.

UAV photogrammetry developments

With clear direction on how UAV photogrammetry can be improved, and camera and sensor technology becoming more agile and compatible for use with UAVs, UAV solutions have the potential to significantly enhance data capture and analysis. While UAVs have several benefits as a tool in their own right, they work best as part of a holistic approach. Terrestrial and aerial photogrammetry techniques can complement, rather than challenge one another, and integration is key. This is especially true when using UAVs in

professional applications, such as surveying, precision agriculture and mining, where users can benefit from the provision of support throughout the data collection process.

For instance, this focus on end-to-end tools will continue to play a key role in our approach at senseFly, from our tailored 360° solutions developed to meet the needs of specific vertical markets to our partnerships with SfM developers. These are just two examples of how we are working to facilitate smarter day-to-day workflows and provide actionable insights from photogrammetric UAVs.

In addition to these ongoing developments, it is anticipated that the portability of UAVs will help to increase accessibility to challenging terrains in future – something with which terrestrial photogrammetry has historically struggled. It is also expected that UAVs will be able to integrate more smoothly with manned air traffic, which is increasingly relevant in light of recent developments in unmanned traffic management (UTM) systems. Some geospatial professionals are even predicting that UAVs will have the ability to remain airborne indefinitely, like satellites. These advances will not only help professionals collect higher quality

data, but will also support the growth of the photogrammetry field in general.

The future of photogrammetry

UAV technology has been a key disruptor in the geospatial industry, and experts predict that it will continue to have an influence on almost all aspects of the industry, including photogrammetry. Through a process of continuous improvement, UAVs can now work well with traditional terrestrial photogrammetry techniques, to help address some of the main challenges the industry faces today and deliver data that is consistent and meaningful.

In the short term, this can help professionals obtain more accurate, high-resolution imagery and reduce time spent in the field, while in the long term, the development of complete UAV solutions can have a significant impact on businesses' operational workflows. The benefits of integrated, end-to-end processes are evident and the collective adoption of this approach will be key to advancing UAV photogrammetry in 2018 and the years ahead.

Francois Gervais is surveying product manager at senseFly (www.sensefly.com)

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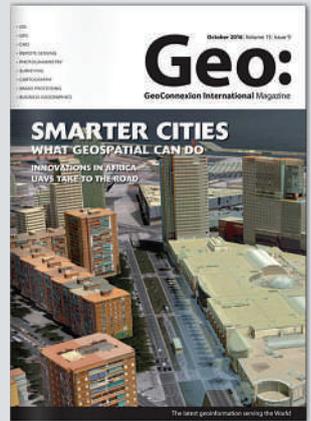
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