

New dimension in Earth observation

M ROKONUZZAMAN

AMONG many applications, ride-sharing taxis guided by real-time geo-locations have empowered common people to enjoy the utility of Earth observation from the sky in their daily lives.

A seminar in SoftExpo 2019 introduced a possibility of Earth observation through the fusion of images captured by satellites, manned and unmanned aerial vehicles (UAVs).

This fusion approach expands the possibility of remote sensing from understanding the situation to taking action on the ground, whether for precisely distributing fertilisers or estimating river erosion or assessing road damage in centimetre accuracy.

Over the last 70 years, the era of space-born observation platforms (satellite), fitted with diverse sensors starting from camera to synthetic aperture radar, has come a long way to unlocking the possibilities of remote sensing.

In addition to defence purposes, commercial applications are increasingly benefitting from images sent by orbiting sensing platforms.

Despite progress in the frequency of traversing area of interest and resolution of images, satellite-born remote sensing are facing limitations.

But fortunately, we are witnessing the increasing complementary roles being played by both manned and unmanned aerial imaging platforms.

The fusion of these three platforms is taking Earth observations at higher height.

As of April 2018, there were 1980 operational satellites, according to the Union of Concerned Scientists (UCS) satellite database.

Among them, Earth Observation (EO) satellites (684) currently account for over one-third of them.

Due to increasing innovations in using images and data sent by these satellites, the number of EO satellites has been rapidly increasing, reaching 684 in 2018 from 192 in 2014.

More than 80 percent of EO satellites have onboard optical, radar, infrared, and hyper-

spectral/multispectral imaging sensors.

Government agencies, civilian applications and military are the major users of imaging and data products of the EO satellites.

At the beginning, governments, primarily for the purpose of military, used to dominate satellite launches.

But in the recent past, there has been increasing launches from private companies for the purpose of trading images and data products.

Increasingly, government agencies, including military, are becoming customers of imagery products delivered by commercial satellite operators.

The usage of satellite imageries in major civilian projects has already started in Bangladesh.

For example, a local IT firm did a 3D mapping from very high resolution (0.5 metres) satellite images and also prepared a digital elevation model of 10-metre resolution of Dhaka Metropolitan Development Plan area for Rajuk.

Similarly, the preparation of a development plan for Benapole-Jessore Highway Corridor Project benefitting from 3D mapping from satellite images.

Dhaka WASA also outsourced work for developing maps from 3D satellite images for the design and implementation of water supply projects.

Satellite imagery usages also generate service revenue for local IT firms. Roughly, the derivation of insights from \$1 worth of image produces \$2 to \$3 data analytic and mapping service revenue.

Satellite imagery plays an important role in offering timely, reliable and accurate maritime security and environmental monitoring services, which will come to use in exploiting the blue economy potential.

The fusion of satellite images produced by radar and optical sensors with images produced by manned aerial vehicles could lead to all-weather detection, classification and tracking of illegal or unauthorised vessels in exclusive economic zones, territorial waters and restricted areas.

Satellite imagery can be used to detect and classify infrastructure whether for planning, compliance or development. Satellite images are now extensively used in mapping, 3D modelling, detecting change over time, asset and facility monitoring, and humanitarian and disaster response.

Most EO satellites carrying remote sensing instruments are orbiting the Earth at relatively low altitudes; below 500-600 kilometres is in gener-

functional during night time. Moreover, cloud and fog also limit the quality of images produced by the satellites.

Although radar sensors can address these limitations, often images delivered by them do not provide the same type of information. Rather, radar complements other passive sensors relying on electromagnetic energy radiated and reflected by Earth.

Images of EO satellites provide

by UAVs could be processed in developing both 2D and 3D models of the landscape in developing high-resolution maps.

Among other applications, through data analytics, intelligence could be extracted from images captured by UAVs to develop fertility and moisture maps of lands, and also chlorophyll maps leading to precise fertiliser dose determination.

With very high accuracy, river erosion could be assessed, and the

In the estimated \$127 billion of global UAV-based remote sensing industry, the UAV analytics market is projected to grow from \$1.57 billion in 2017 to \$5.41 billion by 2022, at a CAGR of 28.11 percent from 2017 to 2022.

Which remote-sensing platform is more suitable than others in a particular task is a question. The common solution is to choose a satellite when a "macro" view of the terrain is needed. UAVs are great to get the "micro" view of fields of specific areas of interest, often detected from the satellite-provided "macro" view.

Basically, it all depends on the goals of the end user and what they want to accomplish.

Moreover, satellite imagery also provides the basis for planning the mission of UAVs.

Satellite imaging is often economically more attractive than other means when a large amount of data over a vast area must be gathered quickly.

Aerial imaging complements satellite's capability, consequentially expanding the possibility of remote sensing.

It is being reported that some companies are already trying to merge their fleets of satellites with drone data to provide their clients with a holistic approach tailored to their needs.

Often UAVs are perceived as toys creating nuisance in the airspace. Such perception often leads to the restricted regulatory framework.

But such regulatory approach appears to be a barrier to the exploitation of UAVs as a remote sensing platform.

On the other hand, the emergence of a considerable number of commercial satellites fitted with diverse sensors is opening the opportunity of fusing satellite imagery with images captured by manned and/or unmanned aerial vehicles to derive actionable insights in serving diverse purposes.

The writer is a professor of North South University's department of electrical and computing engineering.



ally avoided, because of the significant air-drag.

By lowering the altitude and adopting higher resolution sensors along with optics, resolution of images provided by EO satellites has increased significantly over the decades, reaching 30 cm.

Further enhancement of resolution is not a viable option, due to the economics of cost of image products per square km and the cost of launching and operation.

As most of EO satellites use the sun for radiating energy from the Earth, these satellites become non-

high-level intelligence of large areas. For example, river erosion or overall road damage could be detected in satellite images, but getting further clarity leading to accurate estimation could be provided by UAV or drone-based imaging platforms.

Although drones are perceived as toys, modern UAVs could be fitted with diverse, powerful sensors, starting from a low-cost video camera to LIDAR to multispectral as well as infrared image sensors, making them high-performing remote sensing platforms.

High-resolution images produced

estimation of road repairing cost could be determined from UAV images.

3D models developed from images of a construction site could be compared with the planned model to understand the progress as well as compliance.

Moreover, UAVs fitted with gas and infrared sensors could produce images with signatures of the health situation of gas pipelines and power networks.

Across the globe, UAV imaging-based remote sensing service innovation has been growing rapidly.

Germany under increasing pressure to boost spending

AFP, Washington

European economic power Germany is coming under increasing pressure to boost spending to accelerate economic growth, as its massive surpluses create growing friction with other countries.

The dispute has simmered since the 2008 global financial crisis but French Finance Minister Bruno Le Maire warned Friday that widening differences over economic policy among eurozone countries could undermine the currency union itself.

"Growing economic divisions among member states are unsustainable in the long term and could result in the disappearance of the common currency project," Le Maire told reporters on the sidelines of the International Monetary Fund and World Bank Spring meetings.

"Countries with solid budgets must invest more," Le Maire said. "Those with the means shouldn't hoard money for years and years, allowing growth to deteriorate."

That was the same message pushed by the IMF itself, which on Friday again urged Germany to boost spending in order to accelerate growth a raise wages while reducing its budget and trade surpluses.

"We continue to see a case for eurozone countries that have fiscal space, like Germany, to increase spending or cut taxes to help boost potential growth," Poul Thomsen, head of the IMF European Department, told reporters.

He highlighted Germany's very large budget and trade surpluses, which traditionally would have caused the national currency to strengthen, something that is no longer possible given the common currency in the eurozone.

That means that even with low unemployment wages are rising very slowly, Thomsen said. While he acknowledged that Germany's spending increase in 2019 amounts to 0.7 percent of the economy, which he called "notable," he said "we need to see more and keep it coming."

Amid a "pronounced and worrisome" global economic slowdown, Le Maire called for a European "growth pact" which would include increased spending by economies with the "fiscal space" to do so, an allusion to Germany and the Netherlands.

Chill in global economy prompts G20 call for trade truce

REUTERS, Washington

THE risk that global economic growth could slow more than expected spurred a call on Friday from top finance officials for countries to overcome trade differences and opt for multilateral cooperation and "timely policy action."

Policymakers from the Group of 20 industrialized countries are worried that the weakness evident in key economies could spread, especially if elevated trade tensions, such as those between the United States and China, escalate further.

"The balance of risks remains skewed to the downside," Japanese Finance Minister Taro Aso said at a news conference following a meeting of G20 finance ministers and central bankers. "We recognize the risk that growth prospects might deteriorate if weakening in key economies feed into each other."

Aso's remarks dovetail with those of other officials gathered in Washington for the spring meetings of the World Bank and International Monetary Fund, many of whom fret that self-inflicted wounds from protectionist trade policies are to blame for the weakness. The week's proceedings kicked off with another downgrade of global growth estimates from the IMF.

Bank of Japan Governor Haruhiko Kuroda emphasized the need for countries to take steps to foster a more dynamic global economy.

"There was a shared understanding among the G20 members that each country needs to take timely policy action," Kuroda said at the news conference.

As the chair country of this year's G20 proceedings, Japan wants to deepen talks on global imbalances - an effort to divert Washington's attention from bilateral trade imbalances and stave off US pressure to negotiate two-way trade deals.

German Finance Minister Olaf Scholz, speaking at an event on the sidelines of the meetings in Washington, said the rules-based order of multilateralism is increasingly under threat and leaders must uphold international cooperation.

Scholz called on the United States to overcome trade differences with Europe, which erupted this week when US President Donald Trump threatened to impose tariffs on \$11 billion worth of European Union products, including commercial aircraft.

"I believe this is a matter of principle, it's not just about achieving some short-term economic gain. It's not about the art of the deal," Scholz said in reference to the best-selling business advice book credited to Trump.

Scholz's consternation is understandable given the global downshift

holders on the need to boost the global lender's resources and update its governance, although it does support extending a portion of the IMF's \$254 billion crisis fund.

Treasury Secretary Steven Mnuchin repeated the US opposition to increasing overall funding and shareholding quotas, likely meaning the effort to lift IMF funding and reshuffle voting rights was a dead issue at this week's meetings.

The voting quotas were last altered nearly a decade ago.

"In our view, the IMF currently has ample resources to achieve its

was agreed in 2010, boosting the shareholding and influence of major emerging markets including China and Brazil.

The IMF has current total lending capacity of about \$1 trillion, including the New Arrangements to Borrow crisis fund that was greatly expanded in 2009 at the depths of the last financial crisis.

That fund is set to expire in November 2022. Mnuchin said it was important for the IMF to maintain sufficient financial resources to respond to potential crises.

British finance minister Philip Hammond expressed concern the



Finance ministers, bank governors and their staff gather for a G-20 meeting at the IMF and World Bank's 2019 Annual Spring Meetings, in Washington on April 12.

in growth is most evident at the moment in Europe, where the outlook has been further clouded by the uncertainty over Britain's departure from the European Union.

An internal European Central Bank model presented to policymakers on Wednesday indicates euro zone growth was just above 0.2 percent in the first three months of the year and could be somewhat weaker in the second quarter, two sources told Reuters on Friday.

The Trump administration was also at odds with other IMF stake-

mission, and countries also have considerable complementary resources should a crisis emerge," Mnuchin said in a statement for the IMF's steering committee meeting that was posted on the IMF's website on Friday.

Without US backing for an update to the IMF's stakeholding weights, there was little prospect for a change at this week's meetings.

"There is no majority in sight for any changes regarding IMF quotas," a German official said on condition of anonymity.

The IMF's last quota increase

lack of a funding boost could hamper the IMF's ability to step in to help Venezuela respond to its worsening humanitarian and economic crisis.

"This set of meetings is crucial to the debate about IMF quotas and funding for the IMF," Hammond said.

"We all anticipate that as events unfold in Venezuela, at some point there will be a need for a major program to support Venezuela. So the UK is very keen to ensure that the IMF in particular is properly funded."

US oil giant Chevron says will acquire Anadarko for \$33b

AFP, New York

Chevron announced Friday it will acquire smaller US rival Anadarko for \$33 billion in a deal that strengthens the oil giant's exploration and production holdings in its home market.

The cash-and-stock transaction is centered on Anadarko's properties in the Permian Basin in Texas and the Gulf of Mexico, two areas where Chevron is already a big player and where economies of scale can help drive value with suppliers and in key drilling and production operations.

Anadarko also has a handful of overseas ventures, including a major liquefied natural gas project in Mozambique that Chevron said would help bolster one of Chevron's major global businesses.

"This transaction builds strength on strength for Chevron," said Chevron Chief Executive Mike Wirth.

"The combination of Anadarko's premier, high-quality assets with our advantaged portfolio strengthens our leading position in the Permian, builds on our deepwater Gulf of Mexico capabilities and will grow our LNG business."

For Chevron, the second-biggest US oil company after Exxon Mobil, the takeover of Anadarko marks its biggest deal since its purchase of Texaco, which closed in 2001.

In another transaction, Chevron in 2005 bought Unocal for \$18.3 billion after raising the price during a high-profile bidding war with China's CNOOC that drew interest from lawmakers in Washington.

The acquisition is composed of 75 percent stock and 25 percent cash, with Anadarko shareholders receiving 0.39 shares of Chevron and \$16.25 in cash for each Anadarko share held.

By combining the companies, Chevron expects to cull \$1 billion in costs. The oil giant will also "high grade" its portfolio and sell off some \$15 billion to \$20 billion of assets.

In 2018, Chevron had \$42.4 billion in revenues and pumped 3.1 million barrels oil-equivalent per day, above the level of most members of the Organization of the Petroleum Exporting Countries.