Validating Space Observations for Flooding with Crowdsourcing In-Situ Observations

Success story using crowdsourcing for obtaining in-situ data for EO, whether it is for an immediate emergency, or a more slowly evolving disaster

Summary

In the framework of the FP7 SPACE Project GEO-PICTURES, AnsuR and United Nations (UNOSAT) collaborated on using a smartphone App for crowdsourcing geo-referenced in-situ images for the purpose of improving flood assessment from Radar EO Images, that were regularly provided over time. The approach was a great success and has lead to initiatives with Statoil for using the same approach for improved Environmental Monitoring within the Oil and Gas industry.

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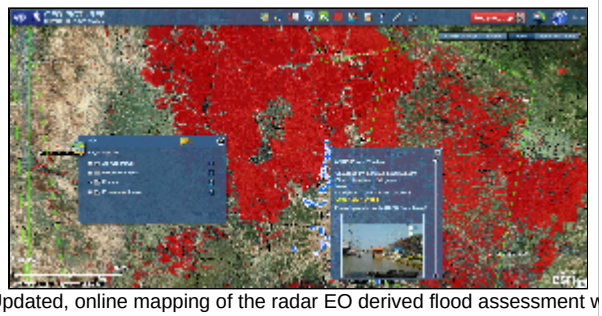
Project Background

During the 2011 monsoon season in Thailand, severe flooding occurred. Over 800 people died, 77 provinces were declared disaster zones and the world bank estimated the total cost approaching 50 billion USD, ranking it as the 4th most costly disaster in the world. The flood lasted close to 6 months, from July 2011 to January 2012. Close to 15 million people were directly affected.
In order to prevent further damages, accurate monitoring of the extent of the flood was required, and UNOSAT provided periodically updated flood maps based on using radar satellite images every few days for a period. These were provided by KSAT as a partner in the GEO-PICTURES project. The flood maps were offered publicly. Both the Thai government, the Asian Disaster Prevention Center (ADPC) and Google.org used them in their disaster management.
When the flood approached the larger cities, and specifically Bangkok, a larger disaster was possible. More frequent and more accurate flood predictions were needed than in the rural areas, as much more was at stake.



Updated, online mapping of the radar EO derived flood assessment v

Issues & Needs

While the importance of up-to-date monitoring of the flooding in the city areas increased, the quality of the radar observations was reduced due to increased backscatter from objects and infrastructure in the urban areas, making it very difficult under a flood with rainy conditions daily to determine if an area was flooded or if reflections were just from wet surfaces like a motorway.

In a satellite radar image, the intensity of each pixel represents the proportion of microwave backscattered from that area on the ground which depends on factors like types, sizes, shapes and orientations of the objects providing scatter in the target area as well as the moisture content, frequency, radar polarization and incident angles of the radar beam.

This makes interpreting a radar image not a straightforward task. It very often requires some familiarity with the ground conditions of the areas imaged. In-situ observations and validations become essential. This can be done best using geo-referenced photos, and make them available to the experts interpreting the satellite images in close to real time. Bot how does one get access to a large set of in-situ photos over such a long duration as a 6-month flood?

UNOSAT sent a team to observe the situation and provide geo-referenced field photos in order to validate the satellite observations. However, they could not remain in Bangkok for more than a week, and travelling around was very difficult. Thus, the professional field photos were taken in a limited geographical area and over a limited time. More photos were needed over a larger area and over a longer time. Via the collaboration between AnsuR and UNOSAT in the FP7 SPACE project GEO-PICTURES we found a better solution.

Solution

AnsuR has for many years worked with efficient communications of geo-tagged pictures, commonly using traditional cameras and a specialized smartphone application as a tool for communicating photos quickly and reliably. Over in May 2011, a few months before the flooding started, AnsuR released a Crowdsourcing version of the ASIGN application for UNOSAT at the GDACS stakeholder meeting in Bergen, Norway. This tool was meant for use of people associated with UN. However, AnsuR suggested during the Thai floods to release this application for the public in Thailand, in order to provide input to the validation of satellite images as well as allow other use of the images that were input.

The announcement of the availability of the crowdsourcing solution, how to obtain it and how to use it was done in Thai by AnsuR partners, and already the following day the first photos came in. Over the following months close to 1000 geo-referenced photos from the greater Bangkok area came in to the AnsuR server, and was shared with UNOSAT whom were able to provide better flood maps that in turn helped manage the disaster better.

Results & Perspectives

The crowdsourcing using the smartphone application had achieved the broader geographic distribution of photos over time that was needed, and improved the reliability of the space-based observations. Since this use on 2011 this was a very first attempt, and since flooding is expected to occur every year to some degree, from now on one is more prepared and can use the technology both earlier and broader.

The success-story was announced by UNOSAT in their website and picked up by a large number of other media. Google offers more then 11000 hits for “UNOSAT Thailand Crowdsourcing”. UNOSAT also has the QR code for the app on their website, front page. In addition to the Android App, and iPhone version called “UN-ASIGN” has been released by AnsuR at the Apple App Store.

Also the Bangkok post had a large article, which also be found online here, titled “Android Lends a helping hand”.

The results offer an interesting idea for Oil & Gas, that AnsuR and Statoil currently are working on, namely environmental monitoring with the support of the same technology. Earth Observations play a major role on the Oil and Gas industry, and so does environment, and so does public concern. The concept being that the Oil & Gas industry welcomes public participation in identifying any environmental concerns and (also) complementing their use of satellite observations in this respect. Public data input could also be made available to the public, thus creating a transparency that in turn may enhance credibility of the conclusions.

The use of crowdsourcing for obtaining in-situ data for EO, whether it is for an immediate emergency, a more slowly evolving disaster as a flood or general environmental concern is but one set of ways for using the described approach here.

In addition to the crowdsourcing approach described about, the ASIGN technology is still used with professional in-situ validation photos, sent via smartphones, PC, satellite or 3G or other means. In this context the use of small unmanned aerial vehicles is interesting, and another topics for EO and Oil & Gas. AnsuR has a project with Statoil that targets the same environmental monitoring as mentioned above. In this context the crowdsourcing also complements the aerial observations.

Related Info

About AnsuR: AnsuR is a Norwegian technology developer for visual situational awareness, initiator and coordinator for the FP7 SPACE project GEO-PICTURES and developer of ASIGN for emergency and disaster management. ASIGN, available for PCs and smartphone, sends geo-refererenced images quickly and reliably from the field to an ASIGN server at CERN over even unreliable networks. ASIGN offers image analysts access to full photographic details, and supports using any satellite or mobile communications.

About UNOSAT: UNOSAT is a technology-intensive programme delivering imagery analysis and satellite solutions to relief and development organisations within and outside the UN system to help make a difference in critical areas such as humanitarian relief, human security, strategic territorial and development planning. UNOSAT develops applied research solutions keeping in sight the needs of the beneficiaries at the end of the process.

About Statoil: Statoil is a major Norwegian oil and gas company.

About GEO-PICTURES is an FP7 SPACE project, coordinated by AnsuR, where both AnsuR and UNSOAT developed, tested, validated and used the ASIGN technology for rapid access to in-situ images and the online real-time mapping based on latest satellite imagery.