Providing Timely Very-High Resolution Imagery and Geodata in Case of Flood Events to First Responders Using Web-Based Solutions

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Abstract:

Disasters such as floods cause severe damage and affect millions of people every year. To respond quickly and effectively, emergency services need up-to-date, comprehensive and accurate information on the extent of the hazard, exposed assets and damage. In recent years, the rapidly growing number of satellites in orbit and the data they provide have also made it possible to prepare for specific events or to monitor vulnerable regions of the world on an ongoing basis.

The recent floods in Germany, for example, demonstrated the importance of continuous monitoring and close cooperation with humanitarian actors. The heavy rainfall events and subsequent widespread flooding in southern Germany in June 2024 were preceded by official warnings from the German Weather Service, and emergency services were able to take preparatory measures before the onset of the flooding. In addition to the activities by the Copernicus Emergency Management Service (CEMS) and national entities, the Center for Satellite-based Crisis Information (ZKI) of the German Aerospace Center (DLR) provided first aid responders with updated web-based crisis information on the evolving flood situation. To improve the situational awareness of the event, the web application included not only aerial images and the analyzed flood extent from different satellite sensors but also datasets on population, buildings, land use and critical infrastructure (ZKI, 2024).

As part of the Indicator Monitoring for Early Acquisition of Innovative Satellite Sensors in Natural Disasters (IFAS) project, the DLR is working to improve satellite-based emergency mapping by initiating the process chain in anticipatory action. Hydrological forecasts demonstrate the potential to improve the timeliness of satellite-based emergency mapping by enabling early tasking, while a combination of process automation and open web data triggering offers a pathway to faster and more efficient workflows (Mühlbauer et al., 2024; Wania et al., 2021). To improve the response time for flood disasters, the DLR is collaborating closely with European Space Imaging (EUSI), an industrial partner providing very high-resolution satellite imagery, as well as with first aid responders. By automating components of the rapid mapping process, this project aims to minimize the time delay in the availability of satellite data and the provision of crisis information to anticipate the development of a crisis at an early stage.

The project therefore touches on various aspects of the different phases of the disaster management process: In the monitoring and preparedness phase, heterogeneous data sources including official alerts and forecasting information are collected and matched with possible satellite overpasses to initiate a timely acquisition of (very high-resolution) satellite data for a potential crisis event. The aggregation of data sources can further facilitate the pre-definition of areas of interest for satellite data acquisition, which is then automated using EUSI's Tasking Archive API. Once satellite imagery has been delivered, the data is automatically downloaded, rapidly analyzed, and integrated into a web-based crisis information product and shared with dedicated civil protection actors to support response activities. Their feedback is then used to continuously improve the visualization of crisis information products.

References

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