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Supporting Situational Awareness for an Improved Triggering of Satellite-Based Emergency Mapping

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Abstract:

Due to their complexity, large-scale wildfire and flood events put immense pressure on authorities to quickly gain a clear overview of the disaster situation for an adequate operational planning. Satellite-based emergency mapping (SEM) services such as the Copernicus Emergency Management Service (CEMS) rapid mapping service provide geospatial crisis information on demand and fast in support of authorities and responders before, during or immediately following a disaster. Although the standard SEM workflow has evolved in recent years, particularly in the field of satellite image analysis, the gap between the initial warning and the SEM activation still delays product availability.

For understanding where the delays stem from, we analysed the steps taken by the actors involved in the SEM process. Service providers perform the rapid mapping upon SEM activation and publish the produced crisis information, e.g. via the CEMS. In order to produce timely and accurate map products such as burnt or flooded area maps service providers need the SEM process to be triggered as early as possible with clearly defined areas of interest (AOIs). The SEM is typically activated by end users such as civil protection authorities and emergency services. Though a number of early warning tools are available, some crucial steps until SEM activation remain user-driven (Mühlbauer et al., 2024). First, end users need to manually identify the AOI, often from multi-source data such as warnings, weather forecasts, observations, etc. In addition, they need to put effort in getting aware of the availability of satellite data to capture the AOIs once they get affected by the event. Service providers usually use acquisition planning tools where they intersect the AOI with planned satellite overpasses. Furthermore, it is unclear to end users when the generated products eventually become available.

Accordingly, our research question here revolves around technical ways of improving users' situational awareness and hence reducing the time needed from the initial warning to satellite data acquisition to the availability of analysis results. For addressing the latter, we examined and developed a tool that automatically processes and fuses multi-source web data (e.g., public alerts, sensor observations, weather forecasts), identifies AOIs and intersects them with relevant satellite acquisitions. Our approach improves the end user's situational awareness by automatically generating decision proposals regarding EO data and product availability. Situational awareness is further improved by an interactive spatiotemporal visualization of AOIs and satellite acquisitions. The user is supported by transparency on the underlying data sources, the expected (and actual) time of satellite data acquisition, attributes of relevance and overlap of satellites for events.

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References

Mühlbauer, M., Friedemann, M., Roll, J., Riedlinger, T., Henkel, F., Angermann, L., Böck, M., Kaminski, T., and Barginda, K. (2024). Improved Satellite-Based Emergency Mapping through Automated Triggering of Processes. In: *ISCRAM Proceedings*, 21