Institut für Photogrammetrie
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Flood mapping and Investigation of the permanent water body changes based on multi temporal SAR satellite data

Proposal for a Master thesis topic (EN)

Flood is one of the costliest natural disasters leading to extensive damage and loss of life, therefore flood mapping is essential to improve crisis management and consequently and reducing human and socio-economic losses. Synthetic Aperture Radar (SAR) sensors with long wavelengths can see through clouds, haze, and the dark, making it possible to analyze changes on the ground, regardless of the weather conditions or time of day. The inherent capability of SAR observation to observe during cloud cover and its frequent revisits makes it ideal for flood monitoring especially to delineate the early flood map as most of the flooding caused by heavy rainfall characterized by severe weather conditions. Water bodies appear as dark areas in SAR images and smooth water surfaces typically reflect the radar signal in the specular direction away from the antenna, thereby producing a very low backscatter. Considering a single SAR observation, we can simply detect floodwater by recognizing the dark regions, although change detection approaches are often used to mask out permanent water or false alarms caused by shadows or smooth surfaces such as tarmac. The presence of water in urban areas, e.g., on a road in front of a building could enhance the double-bounce scattering mechanism caused an increase of surface reflectivity. However the double-bounce increase, due to the presence of floodwater, may not be high enough if the building facades are not parallel to the SAR flight. To increase the potential for detecting buildings when the line of sight is not orthogonal to the building facade, cross-polarization backscattering is also used, as it rises when rotated dihedrals are present.

The proposed study will be using all the free available sentinel-1 data to produce a flooding map of the area affected by flood disaster. There is no limitation to select the study area as sentinel-1 mission provides an extend coverage whole over the world.

Sanaz Vajedian will supervise this thesis.

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