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Real-time flood extent maps based on social media

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During a flood event it is often difficult to get accurate information about the flood extent and the people affected. This information is very important for disaster risk reduction management and crisis relief organizations. In the post flood phase, information about the flood extent is needed for damage estimation and calibrating hydrodynamic models. Currently, flood extent maps are derived from a few sources such as satellite images, areal images and post-flooding flood marks. However, getting accurate real-time or maximum flood extent maps remains difficult.

With the rise of social media, we now have a new source of information with large numbers of observations. In the city of Jakarta, Indonesia, the intensity of unique flood related tweets during a flood event, peaked at 8 tweets per second during floods in early 2014. A fair amount of these tweets also contains observations of water depth and location. Our hypothesis is that based on the large numbers of tweets it is possible to generate real-time flood extent maps.

In this study we use tweets from the city of Jakarta, Indonesia, to generate these flood extent maps. The data-mining procedure looks for tweets with a mention of 'banjir', the Bahasa Indonesia word for flood. It then removes modified and retweeted messages in order to keep unique tweets only. Since tweets are not always sent directly from the location of observation, the geotag in the tweets is unreliable. We therefore extract location information using mentions of names of neighborhoods and points of interest. Finally, where encountered, a mention of a length measure is extracted as water depth. These tweets containing a location reference and a water level are considered to be flood observations. The strength of this method is that it can easily be extended to other regions and languages.

Based on the intensity of tweets in Jakarta during a flood event we can provide a rough estimate of the flood extent. To provide more accurate flood extend information, we project the water depth observations in tweets on a digital elevation model using a flood-fill algorithm. Based on statistical methods we combine the large numbers of observations in order to create time series of flood extent maps. Early results indicate this method is very promising.