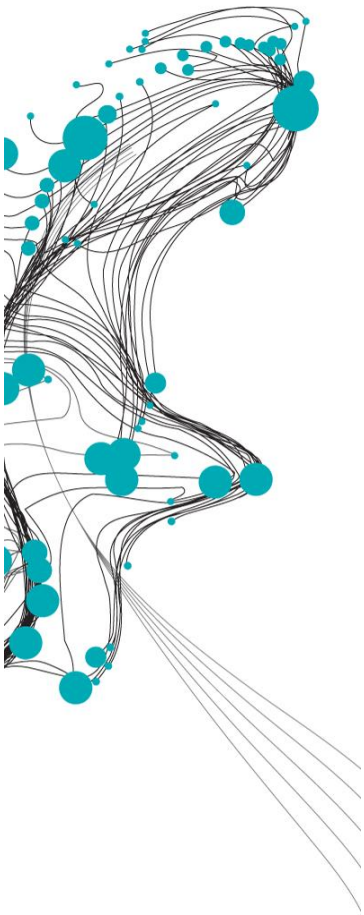
Potential of Twitter derived flood maps: comparing interpolation methods and assessing uncertainties



Given the drawbacks of traditional flood mapping methods and the recent growth of a large number of social networks, the potential of using social media derived data to create flood maps was reviewed. This research focussed on using Twitter data. Since previous studies on the use of such data did not compare multiple methods for creating the flood maps or discuss the uncertainties in these maps, these two points were addressed. Additionally the applicability of the maps was investigated. Two case studies of recent flood events in Jakarta and York were reviewed.

For both case studies several flood mapping methods were evaluated. Results were compared to validation datasets, to assess the relative performance of each method. The best results were generated by separating observations belonging to separately flooded areas and using the hydrological characteristics of the area in interpolation. Especially the flood maps created for York corresponded well with recorded flood extents. The quality of the resulting flood maps however mainly depended on the topographical characteristics of the area. Therefore the results for downtown Jakarta, a relatively flat area, were worse than those of York, which had steeper terrain slopes.

The uncertainty caused by errors in positioning of the Twitter messages, water depths mentioned by the messages and elevation errors was assessed using Monte Carlo simulation (figure 1). The degree of uncertainty heavily depended on the topographical characteristics of the area. Both locational errors and errors in the elevation data were found to mainly affect flat areas and especially these errors caused the uncertainty in downtown Jakarta, a relatively flat area, to be high. In the inner city of York flood extents were less uncertain. Also the effects of using a 20 m resolution were limited for York. Uncertainties caused by errors in water depths were limited for both cases.

The combined results of both case studies indicate that only neighbourhood scale flood maps can be created for Jakarta. Around the inner city of York however, uncertainties are considerably lower and inundation maps could be made at street level using the Twitter data. In view of the general applicability of the interpolation method, the same method was found to perform best for both case studies, although the quality of the maps and parameters used in interpolation varied. Overall however, relatively good flood maps were generated for both case studies.

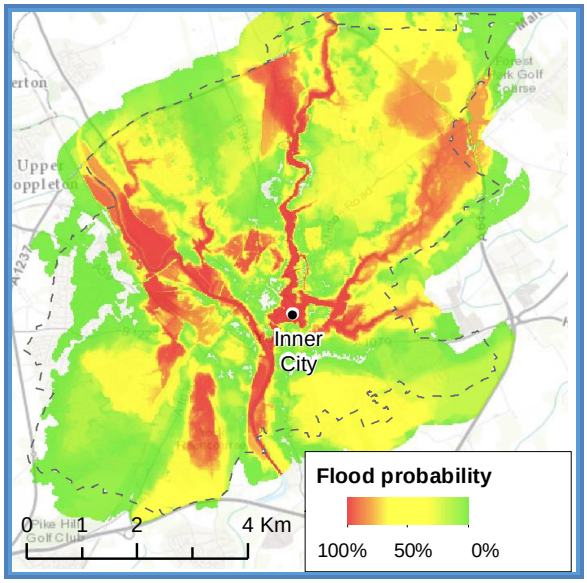


Figure 1: Results of Monte Carlo simulations, simulating errors in location water depth and elevation data for York. Flood probability of each cell is given.

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