**A conceptual framework for studying reactions to events in location-based social media**
Dunkel, Alexander; Andrienko, Gennady; Andrienko, Natalia; Burghardt, Dirk; Hauthal, Eva; Purves, Ross;

Keywords: event, reaction, spatial-temporal, social, semantic, information-spread

Events are one of the core concepts of spatial information identified by Kuhn (2012), and location based social media provide a prominent source of information of reactions to events. When considering reactions to events it is important to note the perceived degree of agency which individuals may have in, for example initiating, reacting to or modifying the course of an event. Thus, humans may have limited to no agency with respect to some natural events (e.g. a sunset) but may have considerable perceived agency for example in organising and participating in political activities. Thus, reactions to events can take the form of a simple observation of occurrence, an expression containing sentiment or emotions or a call to actively react. Key characteristics of all individual reactions in location-based social media include a referent event, and information about  who reacted, when, where and how, as well as information relating one reaction to others with respect to these characteristics. Collective reactions to an event are thus composed of multiple individual reactions sharing a common referent event. They can be characterized according to the following dimensions: spatial, temporal, social, semantic, interlinkage. Within each dimension there may be variations among individual reactions. Our conceptual framework allows us to characterize and compare reactions. For example, for a thematically well defined class of event such as cherry blossoming we can explore differences and similarities in space and time for instances of cherry blossoming in different towns, countries and even cultures. Other classes of events may have very complex spatio-temporal signatures (e.g. political processes such as Brexit or elections) which may be decomposed into a series of individual events (e.g. a temporal window around the result of a vote) whereby reactions can be characterised and compared with respect to this event. The main purpose of the proposed framework is twofold: firstly we wish to explore ways in which reactions to events in location-based social media can be usefully described and secondly, we wish to use the framework to underpin the development of methods for analyzing and understanding collective reactions to events.