

# Quantifying Dynamical Changes in Online Social Emotions

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## Abstract

Quantifying dynamical changes of social emotions based on empirical data is a new challenge for social science. Here we used more than three billion Japanese blog entries for eight years to extract dynamical changes of social emotions. We used psychological method, POMS, to extract social emotions with six dimensions from blog texts. We found that the total number of POMS related keywords suddenly increased at the time of the 3.11 earthquake in 2011. Furthermore, affections of *Tension-Anxiety* and *Confusion* relatively increased among 6 dimensions of POMS. Finally we also checked relative changes of adjectives and found that frustrated feeling covered the Japanese blogosphere at the quake.

**Keyword:** Social media, Sentiment analysis, Empirical analysis, Big data

The emerging online social media enables us to quantify social attentions and interests such as news and events. Furthermore, there is empirical evidence that online collective human behavior follows mathematical laws, it yields a predicted number of blog entries in the future [1]. However, quantifying ambiguous emotions such as *Confusion* and *Fatigue* that cannot directly be measured by one specific keyword is poorly understood.

Here we use more than three billion Japanese blog entries to quantify social emotions. In particular, we focus on the emotional changes during the 3.11 earthquake that is said to be during the extraordinary periods in Japan. We extract frequencies of emotion-related keywords that are based on psychological method POMS (Profile Of Mood States), and found that the total number of these keywords increased significantly for three weeks after the quake. Thus, we can define three weeks

after the quake is the “extraordinary” period based on the empirical big data.

Because POMS can classify emotions into six dimensions, *Tension-Anxiety*, *Depression-Dejection*, *Anger-Hostility*, *Fatigue*, *Vigor*, and *Confusion*, we also measure scramble that these emotions share. We found that *Tension-Anxiety* increased suddenly soon after the quake, and *Confusion* followed.

To extract more than six emotions from online social media, we compared an average number of adjectives before and after the quake. Some specific keywords such as “frustrating” enormously grew after the quake that reflected many people’s emotions at that time.

## References

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