Reduce difficulty in understanding data by ingenious presentations of data

In recent years, new forms of media such as the Web and Twitter have emerged, and information communicated by politicians, businesspeople, and researchers is considered to have news value on many occasions. Scientific data, on the other hand, has also been disclosed, but their use by the general public is still limited due to difficulty in understanding the meaning of data. Research is underway to surmount this situation so that information is conveyed to the general public in an easy-to-understand way. The outcomes of this research were also utilized to tackle with the Great East Japan Earthquake.

Conveying scientific data to people in an easy-to-understand way

A project called "Digital Typhoon" *1 is going on with the aim of developing a comprehensive collection of all kinds of data related to typhoons. Accumulated data includes image data of meteorological satellites "Himawari" since 1979, typhoon track data since 1951 and Automated Meteorological Data Acquisition System (AMeDAS) data since 1976, and it has developed into one of the world's largest scale database on typhoons. Project leader, Dr. Kitamoto, Associate Professor of Digital Content and Media Sciences Research Division, NII, states: "We hope to make these scientific data, accumulated over a long period, available not only for scientists, but also widely to the general public. Recently we also study methods for conveying data to people in an easy-to-understand way."

Asanobu Kitamoto
Associate Professor, Digital Content and Media Sciences Research Division, NII

As a solution, Dr. Kitamoto focuses on methods for indicating the meaning of information using a large volume of data as evidence. For example, when the intensity of a typhoon is presented, ranking information such as "the XXth strongest typhoon in history" is presented with numeric values. Ranking information may be easier to interpret even when the meaning of numeric value itself is complicated. "But this is not enough," says Dr. Kitamoto. He has succeeded in attracting people's attention with diverse search and visualization functions that provide a historical context to understand the meaning of data with links to a wide range of related information to enrich the context.

"Digital Typhoon aims to establish an information environment in which users can refer to scientific data anytime they need," says Dr. Kitamoto. "Some people may not be satisfied with a simple form of information, such as the XXth in history. They may want to explore related situations, or broaden their scope of interest after searching, for instance, for the strongest typhoon in history. Providing scientific data as a reference, Digital Typhoon can be used not only as a useful database for inquisitive people, but also as a system for raising new interests".

Supporting people with scientific data during the aftermath of the earthquake

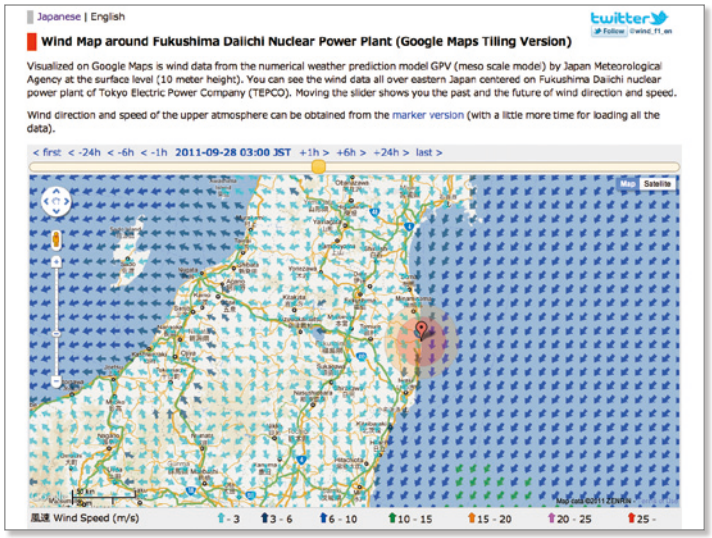
He proposes an approach to use real-time data for understanding ongoing phenomenon to make evidence-based decisions, and he applies the same approach to other cases than typhoons. Facing with a tragic situation after the Great East Japan Earthquake, Dr. Kitamoto thought about how he can contribute to recovery from the disaster using his experience with Digital Typhoon.

"When radioactive materials were released from Fukushima Daiichi Nuclear Power Plant, many people were searching on the Internet looking for wind direction information," says Kitamoto. "I realized that people wanted easy-to-understand and reliable wind direction information that can be used as evidence for predicting the dispersion of radioactive materials."

He then prepared "Wind Map around Fukushima Daiichi Nuclear Power Plant," displaying wind direction and speed using GPV (meso-scale model)*2, data from a numerical weather prediction model of Japan Meteorological Agency. Arrow directions and colors on Google maps show the wind direction and speed respectively, and the center of the map was set to Fukushima Daiichi NPP. The map was released on March 22. This wind map may be different

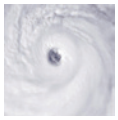
Wind Map around Fukushima Daiichi Nuclear Power Plant

The map, released after the earthquake by Dr. Kitamoto, shows wind direction and speed in the vicinity of Fukushima Daiichi nuclear power plant. The pin indicates the location of the plant. Wind direction is shown by the direction of arrows and wind speed by the color of arrows. Blue shows a gentle wind and higher wind speed is represented by green and red in that order.

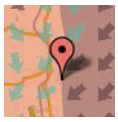


URL http://agora.ex.nii.ac.jp/earthquake/201103-eastjapan/weather/gpv/wind/index.html.en

Twitter account (Tweets in English)



Digital Typhoon
@DigitalTyphoonE



Wind Map around Fukushima Daiichi Nuclear Power Plant
@wind_f1_en

from real observations because this is based on simulation data, but he explained this problem on his blog post so that users can interpret the data properly based on comparisons. Past and future data can also be shown by moving the slider at the top of the map. Here, all the visualizations are based on data from Japan Meteorological Agency.

"Looking at tweets on Twitter, we can see that many people are using this map for making decisions in their daily lives, such as whether to wear a protective mask or to hang laundry outside," says Dr. Kitamoto. "Some researchers requested me to provide past data to study the mechanism of hot-spot generation. In fact, there are only a few websites, even today, that compile past meteorological data or make the database of them."

Utilizing experiences from the Great East Japan Earthquake for research in the future

The map of wind direction and speed around the Fukushima Daiichi NPP has attracted a great deal of public attention, but this is just one way to use the map. "This map is a general-purpose tool, rather than a special tool designed for the accident at Fukushima Daiichi. The wind direction and speed map covers the whole area of Japan, so any place can be used as the center, with a pin," says Dr. Kitamoto. By changing the location of the pin, we can provide the map of wind direction and speed for other nuclear-related facilities. This map is now being extended to include precipitation and other meteorological data.

In addition to the map of wind direction and speed, Dr. Kitamoto is also working on the development of a tool for mapping news articles related to the earthquake. "By mapping news articles on the map, we can perceive the occurrences of events at different places in a more intuitive manner. We wanted to release this tool immediately after the earthquake, but unfortunately we could not make it. But we have been working on archiving news articles for making the long-term records of the earthquake," says Dr. Kitamoto.

These tools were built rapidly to catch up with the unexpected earthquake, and this experience suggested him several clues for the future development of Digital Typhoon, which he has been working.

"During the time of disaster, people want to get information related to the projection of the future, in addition to information about the current situation," says Dr. Kitamoto. "For example, we observed higher needs for information on the forecast of wind direction, and other information about the future. We are planning to summarize our experience during the earthquake and feed it back to Digital Typhoon, with the idea of extending the system for future information."

The project seems to have progressed from analyzing real-time information to analyze the present situation to a phase of exploring new directions. Will it be a reference to the future using information about the past and present as evidences? Future developments seem to hold a great deal of promise.

(Written by Kaoru Watanabe)

*1 Digital Typhoon: http://agora.ex.nii.ac.jp/digital-typhoon/

*2 Numerical prediction model grid point value (GPV; meso-scale model): Numerical prediction is a method for predicting the future atmospheric state, by calculating changes in wind, temperature and other factors via computer. The meso-scale model predicts meteorological phenomena in areas around Japan for up to 33 hours in advance.