

## Digital Typhoon: The Digitization of Real Earth into Digital Earth Using Various Sensors

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<http://www.digital-typhoon.org/>

The goal of 'Digital Earth' is the integration of various earth-related data on a unified space called Digital Earth built within the Cyberspace. Digital Earth is basically used as a metaphor of Real Earth, and has three spatial dimensions and one temporal dimension, but information visualized on Digital Earth is not necessarily visible on Real Earth. In fact, we claim that the value of Digital Earth is in the visualization of information which becomes visible through the digitization of Real Earth.

Our project 'Digital Typhoon' (<http://www.digital-typhoon.org/>) has the goal of building information infrastructure for integrating any kinds of typhoon-related information on Digital Earth and enabling people study a real world phenomenon 'typhoon' from many facets. This goal requires the 'digitization' of typhoons, or the conversion of information in Real Earth into a format that can be processed in Digital Earth.

One of the most established digitization processes is a global-scale observation by geostationary meteorological satellites, 'Himawari.' This digitization makes it possible to acquire the entire picture of the earth in infrared or visible wavelengths. 'Digital Typhoon' project has the comprehensive archive of meteorological satellite imagery since 1981, and has been involved in the analysis of cloud patterns of the typhoon. This viewpoint from space, however, is not enough for collecting information about what is happening on the ground, so we need to have another way to digitize events on the ground.

An example of digitization on the ground is the digitization of meteorological observation elements using AMeDAS stations. By digitizing the situation of rains on the ground as the amount of rainfall, information about where and how much rains we have can be transferred to Digital Earth with some accuracy. The usage of online news article, in addition, is the digitization of Real Earth through the eyes of correspondents, or in other words, events considered as important by correspondents (or media companies) are digitized.

But this is not enough. Some events are just locally and personally important, but may not be captured by the eyes of correspondents, so the digitization of Real Earth through the eyes of the general public is also required. This digitization process may result in subjective and fragmentary information, but this method can be considered as the only method for digitizing events distributed over Real Earth, so more research should be done into this direction.

Here comes the biggest problems ? how to organize the network of sensors that digitize Real Earth. Firstly we need a system that accepts information digitized by many kinds of sensors. Here sensors include human sensors such that people describe the situation of Real Earth, as well as machinery sensors such as meteorological satellites, so the information system needs to handle and link heterogeneous and voluminous information. Secondly we need to reach, digitize, and collect information in Real Earth yet to be digitized. The problem is how and to what extent we can build the network of sensors to pick up information that exists in Real Earth but yet to be digitized. We think that the richness of information space on Digital Earth depends heavily on the network of sensors that digitize Real Earth and transfer information to Digital Earth.

This paper focused on the aspect of 'Digitization' in the context of Digital Earth, and briefly described past trials and problems in 'Digital Typhoon' project. On the other hand, there are other types of data that are generated in the digital space from the beginning, such as simulation data. GPV data such as objective analysis and forecast data are important data source for typhoons. So in the future, we plan to build an information space that enables the seamless study of past, present and future data on Digital Earth by integrating data that digitize Real Earth and simulate in the digital space.