A Study on the Data Visualization in Intelligent Decision Support System for Disaster Response

Sang-Hyeok Nam*
ENGSOFT Inc., Seoul, Korea
Email: shnam@engsoft.kr

Chang-Woo Lee[1], Seonggon Kim[1] and Seunghee Park[2]
[1] ENGSOFT Inc., Seoul, Korea
[2] Sungkyunkwan University/School of Civil, Architectural Engineering & Landscape Architecture, Suwon, Korea
Email: cwlee@engsoft.kr, ksg@engsoft.kr / shparkpc@gmail.com

Abstract

In recent years, various disasters have been rapidly increasing with climate changes, and the frequency and intensity of the disasters have increased considerably compared to the past. These phenomena have greatly emphasized the need for effective disaster management. Disaster management includes procedures such as prevention, preparation, response, evacuation, restoration and so on. In particular, it is very important to respond appropriately early in the event of disaster, and it is very difficult to make decisions in the face of serious time pressure and high uncertainty.
In the past, we had to rely on the subjective experience of decision makers due to limitations of information available for decision making. However, the information gathering technology has developed so rapidly and the information available for disaster response has greatly increased. Disaster response is also a continual decision-making process based on a variety of information and experiences, and disaster response organizations often face complicated and unpredictable situations. Therefore, there is a limit to making the prompt decisions on disaster response using vast amount of information by human information processing ability.

The paradigm of disaster management is now shifting from post-disaster management such as response and recovery to full-time management such as prevention, preparation, response, and restoration. There is also a need for new disaster management strategies for disaster response using big data and artificial intelligence. Big data and artificial intelligence has made a significant contribution to the scientific decision-making process by evolving into a technology for predicting the future, and the use of big data and artificial intelligence in the disaster response can also have significant implications. Big data and artificial intelligence can be used to analyze past disaster situations and predict future disaster scenarios to develop effective disaster response strategies for future disasters.

In this study, we propose an intelligent visualization system to support decision-making for disaster response using big data and artificial intelligence algorithm. The Data visualization is an artificial fact created to facilitate visual thinking and visual communication. We determine data visualization items to support disaster response decision-making by classifying the disaster-specific data and analyzing the data components. We also visualize disaster-related information on a GIS-based map with efficient information representation method that improves understanding through defining input and output information for visualization by data type and analyzing input and output requirements. This decision support system (DSS) is a computerized information system designed to help human judgment for solving various complex problems that can arise in a disaster situation.

The results of this study will help decision makers to use AI's decision support functions based on big data in a decision-making situation in the event of a disaster to draw more objective and effective responses. If the results based on such scientific analysis techniques are actively used, it is expected that the scale of damage caused by disasters can be greatly reduced.

Fig. 1 Example of intelligent DSS for disaster response

***Index Terms*—disaster response, data visualization, decision support system, big data, artificial intelligence, intelligent system**

ACKNOWLEDGMENT

This research was supported by a grant(2019-MOIS31-011) of Fundamental Technology Development Program for Extreme Disaster Response funded by Ministry of Interior and Safety(MOIS, Korea).

* corresponding author