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論　文　要　旨　(博士)

論文題目	Self-organizing Network of Relief Logistic and Inventory

(要旨　1,200 字程度)

The operation of logistic and inventory has been recognized as an important aspect of disaster relief. The role of logistics is delivering the needed items to the disaster victims quickly and efficiently even in very remote parts of the disaster area and under difficult circumstances. Furthermore, inventory play critical role in managing all the life support items and delivering those items to the victims whenever they need it. Pre-positioning relief inventory during disaster preparedness enable each inventory location to fulfill the demand for the short period after the disaster. However, due to sudden demand after disaster and chaotic condition at that moment, relief inventory level at each inventory location may vary significantly and some of them may shortage of necessary items.

Accurate information about demands and supplies acquired during disaster is extremely important in generating action plan of relief logistic and inventory including lateral transshipments. The operational research approach is the best option for modeling lateral transshipments operation assuming an existence of that accurate information. However, accurate information about demands and supplies during disaster is difficult to acquire due to loss of communication abilities and infrastructure damages. To overcome this constraint, we propose a lateral transshipment model of relief inventory to leverage the inventory level between locations using self repair and self recognition network designed for relief logistic and inventory management. This model uses cellular automata and spatial game theory. We address the following research question in detail: (i) How does the self-repair and self-recognition network of relief logistic and inventory improve their system performance? (ii) What is the best model to choose and under which circumstance that model work well? (iii) What the necessary preparation for getting the best performance of lateral transshipment and avoiding the reverse effect?

In self-repair network model, we use eight parameters to characterize the dynamic interactions among inventory location (disaster's shelters). This model is able to increase performance of lateral transshipment under inaccurate information situation, however there is no mechanism to control the dynamic of the lateral transshipment. To overcome that, we further developed self-recognition network model using spatial game theory. Finally, we enclosed our research with cluster formation of inventory location before disaster, to further increase performance of the lateral transshipment.　The case of two volcanic eruptions in Indonesia (Merapi Mountain and Sinabung Mountain in 2010 and 2013) validates the robustness of our approach. On the basis of our finding, we provide a guideline for relief organization on how to use and get benefit from our approach in post disaster situation.