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Safety evaluation of building and layout, using evacuation simulation

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SUMMARY

Against terror or earthquake, The attention is currently focused on "Soft Disaster Prevention" that is not to set up the building's performance of anti-disaster but using IT effectively to gather data on real-time (LIVE) and find optimal way to survive in order to reduce damage. This suggestion is proposed by G.Dasgupta (Colombia University) in response to The September 11 attacks on 2001 upon US. It is named "Live Design".

The scene people evacuating from building is often seen as on September 11 attacks on 2001 or Tohoku earth quake and tsunami on 11 March 2011, with increasing buildings which is more complex and larger. When emergency in buildings, the response plan should be developed for each building. The best plan of evacuation and the best way to lead evacuees are influenced by character of evacuees and structure of buildings. In this study we model flow of people in the building by using simulator, and seek a more effective, safer evacuation plan by changing variable elements. Here variable elements are the initial position of evacuees, the map plan, the leading line, and pre-educating for evacuee. In order to prevent and reduce disaster we figure out the building's, floor's, room's rate of survival and degree of importance.

At the start of this study, we put a model-case. That is how to make evacuation of 66 character-fixed patients efficient at a certain hospital by optimizing their initial positioning. 66 patients have 66 variety of individuality, degree of severity, move speed, movable area, walk or wheel chair, follower type character or leader type character, whether knowing evacuation route or not, whether be got evacuation training or not, etc… the combination of 66 hospital rooms and 66 patients affects their evacuation at various steps. So there is a safe and secure combination. The proposed method puts result of evacuation showed by simulator as object function and optimizes combination using GA. In this model-case optimized combination shortens evacuation time by 76%.

By applying other general case, optimized combination shows safer results than existing combination. It is found that the proposed method has an advantage in safety evaluation of building and layout.