Development of an Emergency Response Algorithm Focusing on Shortening of Response Time

Assistant prof., Tatsuya Suzuki, Faculty of Engineering and Design
Email: suzuki.tatsuya@kagawa-u.ac.jp

1. Background and Aim of this Study The purpose of this study is to propose new emergency response management when emergency demand occurs. In Japan, establishing an efficient management method that produces the utmost effect with as few units as possible is an urgent task in responding to emergency demand, which is one of public services. At present, ambulance dispatch management in Japan is to search for the nearest unit by GPS and make a request for dispatch. However, this is an early first-come-first-served system, and if it looks backwards, there may be a case that the pairing of inefficient dispatch was done. For this reason, we developed a dispatch algorithm superior to traditional dispatch management.

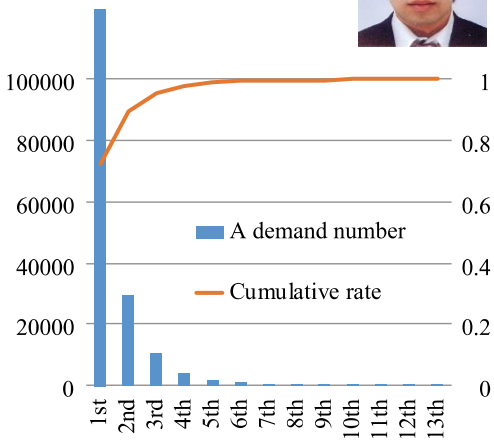

Fig.1: To dispatch the n-th ambulance

2. Grasp the Current Situation Fig.1 show past performances by each fire stations in a certain city. The proportion of dispatching the nearest ambulance is about 70 percent of demands in the past nine years. Therefore, 30 percent of the people who called an ambulance can't know where will come the ambulance from somewhere. From the above, it was shown that there is room for improvement in the system that dispatches in the order near in the distance.

3. Outline of the New Dispatch Algorithm The new algorithm was built by grasping demand occurrence risk level in the region calculated from the location of emergency demand in the past nine years and the extended time of the second and subsequent emergency services arrival time. The new dispatch algorithm step outline of the dispatch algorithm is as Fig.2.

4. Comparison of the New Algorithm and the Traditional System A comparison of simulation results of the traditional algorithm and the new is shown in Table 1. As a result, it can be improved distance to the demand compared with the conventional system in all years from 2007 to 2015.

5. Conclusions We could construct the new algorithm and prove the validity by comparing the result of simulation with the conventional model.

Acknowledgment This work was supported by JSPS KAKENHI Grant Number JP17K14776.

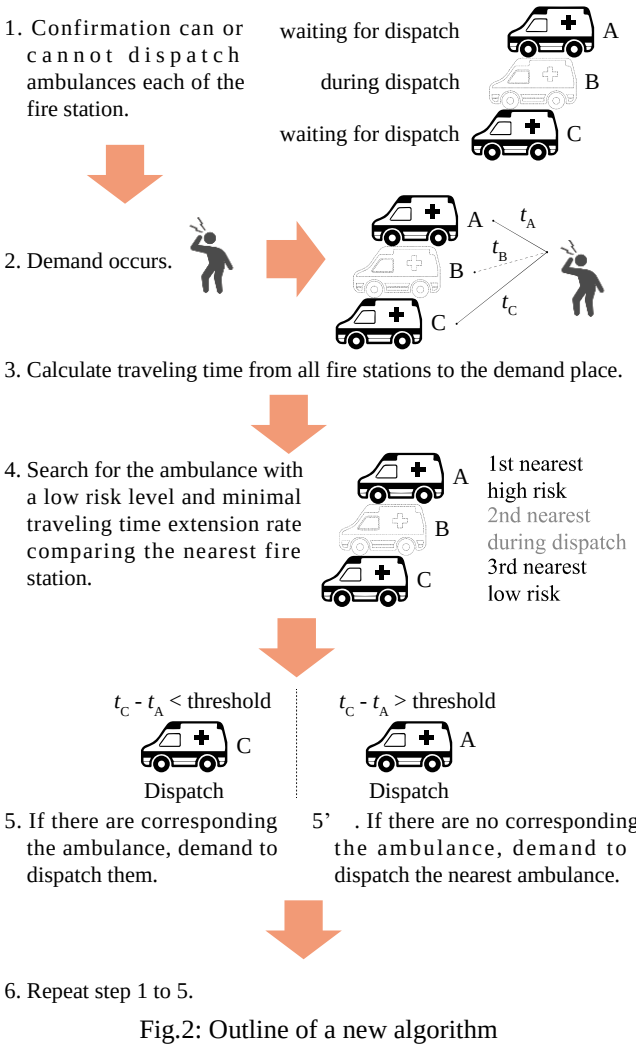

Fig.2: Outline of a new algorithm

References
1) Tatsuya Suzuki, Eiji Satoh: Development of an Emergency Response Algorithm Focusing on Shortening of Response Time, 15th International Conference on Computers in Urban Planning and Urban Management, ID 35621, No.11, 2017.7

Table1: Comparison of mean distance

Mean Distance (m)	total	2007	2008	2009	2010	2011	2012	2013	2014	2015
Traditional System	2752.547	2712.192	2654.085	2669.404	2757.248	2765.596	2788.139	2798.465	2798.251	2800.796
New Algorithm	2746.541	2709.201	2650.369	2666.778	2752.193	2755.077	2779.030	2796.091	2789.969	2792.579
Difference	6.006	2.991	3.716	2.625	5.056	10.519	9.109	2.374	8.282	8.217