EVACUATION ROUTING OPTIMIZER (EROP)

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Ybhg. Prof,

LAPORAN AKHIR PENYELIDIKAN

Merujuk kepada perkara di atas, bersama-sama ini disertakan 2 (dua) naskah Laporan Akhir Penyelidikan bertajuk "**EVACUATION ROUTING OPTIMIZER (EROP)**".

Sekian, terima kasih.

Yang benar,

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Semua yang telah memberikan kerjasama dan sokongan di dalam menjayakan penyelidikan ini

Abstract

This report presents the solution to the two of the most critical processes in planning for flash flood evacuation: the evacuation vehicle assignment problem (EVAP) and the evacuation vehicle routing problem (EVRP). With these solutions, the evacuation routing optimizer (EROP) is constructed. The EVAP is firstly solved, followed by the EVRP. For EVAP, discrete particle position is proposed to support the implementation of discrete particle swarm optimization called myDPSOVAP-A. Particle positions are initially calculated based on the average passenger capacity of each evacuation vehicle. We experiment with different numbers of the potential flooded areas (PFA) using two types of sequences for vehicle capacity; random and sort ascending order. Both of these sequences are tested with different inertia weights, constriction coefficients (CF), and acceleration coefficients. We analyse the performance of each vehicle allocation in four experiment categories: myDPSOVAP-A using inertia weight with random vehicle capacity, myDPSOVAP-A using inertia weight with sort ascending order of vehicle capacity; myDPSOVAP-A using CF with random vehicle capacity, and myDPSOVAP-A using CF with sort ascending of vehicle capacity. Flash flood evacuation datasets from Malaysia are used in the experiment. myDPSOVAP-A using inertia weight with random capacity was found to give the best results for both random and sort ascending order of vehicle capacity. Solutions reached by analyses with CF random and inertia weight sorted in ascending order were shown to be competitive with those obtained using inertia weight with random capacity. Overall, myDPSOVAP-A outperformed both a genetic algorithm with random vehicle capacity and a genetic algorithm with sort ascending order of vehicle capacity in solving the EVAP. Consequently EVRP, myDPSO_VRP_1 is modified and named as myDPSO_VRP_2, adopts a new solution mapping which incorporates a graph decomposition and random selection of priority value. The purpose of this mapping is to reduce the searching space of the particles, leading to a better solution. Computational experiments involve EVRP dataset from road network for flash flood evacuation in Johor State, Malaysia. The myDPSO_VRP_1 and myDPSO_VRP_2 are respectively compared with a genetic algorithm (GA) using solution mapping for EVRP. The results indicate that the proposed myDPSO_VRP_2 are highly competitive and show good performance in both fitness value and processing time. Overall, DPSO_VRP_2 and myDPSOVAP-A which are the main component in the EROP gave good performance in maximizing the number of people to vehicles and minimizing the total travelling time from vehicle location to PFA. EROP was embedded with the DPSO_VRP_2 and retrieved the generated capacitated vehicles from the myDPSOVAP-A. EROP is also accommodated with the routing of vehicles from PFA to relief centres to support the whole processes of the evacuation route planning.

Keywords: Discrete particle swarm optimization, evacuation route planning, evacuation routing optimizer, evacuation vehicle assignment problem, evacuation vehicle routing problem, particle swarm optimization, vehicle routing problem