Dual-Objective Scheduling of Rescue Vehicles to Distinguish Forest Fires via Differential Evolution and Particle Swarm Optimization Combined Algorithm

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***Abstract*—With the increasing issue of global warming, the problem of forest fires during summer seasons is becoming more severe every year. For this reason we decided to focus our attention on a project that could possibly deal with this problem. Our attention landed on the paper *"Dual-Objective Scheduling of Rescue Vehicles to Distinguish Forest Fires via Differential Evolution and Particle Swarm Optimization Combined Algorithm"* written by *Guangdong Tian, Yaping Ren, and MengChu Zhou, Fellow, IEEE*. In this paper the authors present a method to optimize the fire distinguish time and the number of vehicles used to distinguish a set of fires and their approach is applied to a real-world scenario in Mt. Daxing'anling, China. The focus of our project is the implementation and testing of their approach.**

***Index Terms*—PSO, DE, NSGA-II, Pareto Solutions, Genetic Operators, MHDP**

I. Introduction

The problem of forest fires is becoming a big issue all around the world. With the continuous rise in temperature and with the less frequent rains in summer, the number of forest fires is increasing every year. However, the number of rescue vehicles is limited and, in case of multiple fire points, deciding how many vehicles to use for each fire point is a difficult task that has to be solved very quickly. In particular, different fire points may have different weather characteristics, like the temperature and the wind speed, and different terrain characteristics, like the slope and the type of terrain, and these parameters have to be taken into account during the decision of the number of vehicles for each fire point. Finally, the distance of the fire point to the fire department and the time that each vehicle takes to extinguish a fire are very important parameters.

In the paper *Dual-Objective Scheduling of Rescue Vehicles to Distinguish Forest Fires via Differential Evolution and Particle Swarm Optimization Combined Algorithm* [2], by Tian, G., Ren, Y. & Zhou, M., the authors present a Multi-objective Hybrid Differential-evolution and Particle-swarm-optimization (MHDP) algorithm to minimize the time spent to extinguish a fire while minimizing the total number of vehicles used.

II. Problem Statement

Spiegazione fitness functions

III. MHDP Algorithm

Spiegazione algoritmo MHDP

IV. Implementation of MHDP

Spiegazione dell'implementazione

V. Results and analysis

Risultati e grafici

VI. Conclusion

Conclusioni

References

[1] H. Kopka and P. W. Daly, *A Guide to LaTeX*, 3rd ed. Harlow, England: Addison-Wesley, 1999.

[2] Tian, G., Ren, Y. & Zhou, M. Dual-Objective Scheduling of Rescue Vehicles to Distinguish Forest Fires via Differential Evolution and Particle Swarm Optimization Combined Algorithm. *IEEE Transactions On Intelligent Transportation Systems*. **17**, 3009-3021 (2016)