Optimal Placement of Near Ground VHF/UHF Radio Communication Networks as a Multi-Objective Problem

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Ultra high frequency (UHF) and very high frequency (VHF) bands are widely used with near ground applications especially for communication purposes. However, due to the limited antenna height, the VHF/UHF signals are very sensitive to the surroundings. The signal may attenuate, fade or loss depending on the condition of the environment. Therefore, it is a challenging task to find the optimal values for network topology planning. In this paper, three multi-objective algorithms namely NSGA-II, SPEA-II and OMOPSO are considered to mitigate the problem. This paper also intends to maximize the electromagnetic fields and signal propagation. On the other hand, it intends to minimize path loss and signal attenuation. Different environment settings such as diverse foliage depth and tree trunk height are considered to evaluate the proposed model. From the experiments, it is shown that NSGA-II outperforms other algorithms. The experiment also shows that the optimal foliage depth between sender and receiver is less or equal to 2 km and the optimal tree trunk height is less or equal to 7 m.

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