A Simulation Study on the Optimal Initial Bike Deployment for Public Bike Sharing Systems

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In order to catch the dynamic traffic of the real-world bike sharing systems in practice, this paper presents simulation models that mimic the movements of bikers generated based on historical rental data. Using these simulation models as a core, we further show how to calculate the optimal initial bike deployment for each rental site by techniques of Ranking and Selection in the fields of Optimization via Simulation. By integrating the procedures of ranking and selection into the Particle Swarm Optimization algorithmic framework, we can converge to a good solution within shorter time. In addition, we also evaluate the performance of the estimated initial bike deployment obtained by a simplified linear programming model, and conclude that our proposed technique gives better deployment, and should be useful for supporting the logistics decision in practice.

Keywords: Bike Sharing Systems, Ranking and Selection, Optimization via Simulation, Particle Swarm Optimization