Master thesis of *Bo-Hsien Chou*

Site Clustering and Bike Repositioning Strategies for Public Bike Sharing Systems based on Demand Profile and Temporary Bike Buffer Zone

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The public bike sharing system has become popular in many metropolitan areas worldwide, due to its contribution to the green transportation. This thesis focuses on more practical side of bike sharing system management. In particular, we first conduct big data analysis to learn the rental tendency pattern of demand profile for each rental site, and then use the tendency pattern as a key to simplify the procedures of site clustering and bike repositioning strategies. In our two stage strategy, we first give two methods to cluster rental sites, one by a modified K-means algorithm and the other by an integer program, and then we propose three dynamic repositioning models for each cluster managed by a single repositioning vehicle in the second stage. We also investigate the service quality improvement by installing a temporary bike buffer zone besides a rental site, based on the current practice of YouBike. To make it more realistic, we integrate the dynamic repositioning with a locational model to help decision maker to select suitable numbers and locations for installing temporary bike buffer zones. Based on the results of our computational experiments, by using the rental tendency pattern of demand profile, our proposed integer program models can calculate near optimal solutions within much shorter time, and makes the dynamic repositioning strategies feasible for large scale public bike sharing systems.

***Keywords*:** Bike sharing system, Site clustering, Demand profile, Dynamic repositioning, Temporary bike buffer zone, Integer program

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