Relocating Bike-Kiosks to Maximize Ridership – A Weighted Matching Optimization Problem

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Bike share infrastructure can benefit from optimized allocation of resources, such as bike share stations or kiosks that have relatively high capital costs. Suboptimal placement of stations increases the cost of service and may impede membership. If impedances like distance to kiosk is high then ridership may decrease thereby not allowing the system to reach its full potential. Currently, the 25 bike-share stations managed by the non-profit Indiana Pacers Bikeshare program are located around the Indianapolis downtown area and the Indianapolis Cultural Trail. We developed a weighted matching solution to minimize the distance potential users must travel to reach a kiosk while taking into account the pairing of existing kiosks with new locations. We also provide a model to introduce several new locations that restricts maximum distance traveled by customers to the nearest kiosk. For both, we apply integer programming heuristics to solve the optimization problem – an NP hard problem. NP hard problems are computationally prohibitive and require specialized mathematical programming for robust solutions. Analyses show that 20 optimally located kiosks will serve the 25 existing kiosks clientele without any increase in impedance to kiosk access – a 20 percent increase in efficiency.

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