

Optimum Cycle Clusters to Create Net-zero Transport Sector within University of Peradeniya (UOP)

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Many green environments are affected by the use of motorized vehicles. Considering the University premises as a case study this research proposed a bicycle sharing system so as to reduce the carbon emission from the vehicles and to facilitate pedestrian commuting. In achieving this, the locations of the bicycle parking stations, and the number of bicycles needed at each parking station needed to be obtained while optimizing the available resources and minimizing the waiting of the users. The methodology for this research involves collecting data using Google Maps, and two GPS trajectory tracking applications. Multiple clustering algorithms were used to analyze GPS data to identify optimal parking stations for the bicycle sharing system. The data was used to develop a computer simulation model which simulates a bicycle sharing system. The model was designed to simulate various scenarios to minimize waiting for users and maximize bicycle utilization. The collected data, simulation results, and probability curves were analyzed using descriptive statistics and data visualization techniques. The research offered recommendations for the optimal number of parking stations and bicycles to be deployed in each parking station, considering the potential scalability of the system. In conclusion, this project showcases the successful integration of data collection, parameters, and analysis to optimize the bicycle sharing system. Through data-driven insights and heuristic guidance, the system achieves an efficient number of bicycle parking stations and bicycle allocation for each parking station, enhancing sustainability and user satisfaction.

Keywords: Bicycle sharing system, GPS trajectory analysis, Cluster analysis, Simulation model

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