

Exploring vehicle allocation strategies for restoring balance of dockless bike-sharing systems at night

GA, UNITED STATES, October 11, 2024 /EINPresswire.com/ -- For the first time, researchers have applied the threeway decisions method and behavioral decision-making theory to solve the problem of rebalancing the bikesharing system. This method can effectively improve the authenticity and reliability of decision-making results and reduce the risk of decisionmaking mistakes.

In China, bike-sharing systems have already expanded to over 360 cities, with an average daily travel distance of 47 million kilometers. Consequently, the traffic congestion delay index has on average decreased by 2.2%, with a more pronounced effect on weekdays compared to weekends.

Nonetheless, making accurate decisions regarding urban dockless bicycle sharing systems (<u>UDBSS</u>) demand in different city locations is crucial, as incorrect choices can worsen transportation problems, causing difficulties in finding bicycles or excessive deployments leading to disorderly accumulation (Figure 1).



Figure 1a The bike-sharing system in a chaotic state.

"To address this decision-making challenge, it is essential to consider uncertain factors like daily weather, temperature and workdays," explains Chao Zhang, a professor at Shanxi University, who led a study on this area.

Zhang, together with a team of researchers from China, Mexico and Ireland, outlines a new vehicle allocation approach they have developed in a study published in the KeAi journal International Journal of Cognitive Computing in Engineering.

"Our three-way classification method and behavioral decision theory can individually classify all sites, and further derive the ranking of vehicle demands," shares Zhang. "Reasonably forecasting the demand for shared bicycles at different stations helps to better leverage the entire system's role



Figure 1b The bike-sharing system under reasonable allocation status.

in alleviating traffic pressure. Additionally, it reduces the likelihood of resource waste.

Notably, the three-way classification method offers a cognitive attitude to decision-makers, that is, 'no-commitment' when they are faced with complex problems and cannot make an attitude of 'accept' or 'reject'. It changes the two classification methods into three classification methods, which is closer to the cognitive model of human beings.

Furthermore, the three-way decision-making method can provide a separate space for stations that cannot be definitively classified at the moment, rather than forcibly categorizing them into a certain class, effectively enhancing the fault tolerance capability of the model.

"Considering the unique advantage of behavioral decision theory in portraying the mental state of decision-makers, integrating it into the three-way decision-making method can yield classification results that are more in line with reality," adds Zhang.

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