Applying Ant Colony Optimization Algorithms for a RFID Deployment System in Theme-Oriented Expositions

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ABSTRACT

In recent years, theme-oriented expositions or amusement parks attract so many people to visit for business or leisure purposes. However, if someone gets lost in a large trade show or lost a child in an amusement park, how to find target visitors from the large area becomes a great challenge. Therefore, people tracking service becomes an important service quality index for an exposition or recreation system. Instead of one-way, long waiting time and uncertain replying broadcasting system, RFID system not only can offer quick response whether the visitor's is still in the exposition or not, but also can reduce the searching area for finding visitor if indicated still in the exposition. Therefore, this research proposes a RFID deployment system which applies ant colony optimization (ACO) algorithm to find the best locations of RFID readers. This system considers two objective functions. One is readers should be deployed at corners cover grids which have higher critical values. Another is it should avoid interference among readers. In addition, this research proposes a budget constraint since whenever a corporation plans to deploy (or improve) its RFID system, its budget is limited. The limited budget could affect how many and what kind of RFID readers are purchased. This research also proposes a consideration of service level. Service level is decided on the percentage of the exposition or theme-oriented amusement park area been fully covered by RFID readers and how large the reading distance of a RFID reader is. From the experimental results, it is clearly knows that the relationship between service level and cost, and the proposed service level index can be used to evaluate the deployment results for users.

Keyword: RFID Deployment System　Ant Colony Optimization Algorithm　Location System　Theme Park