Congestion Mitigation Verification using a Theme Park Guide Schedule

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Abstract

Congestion occurs at theme parks and at event sites. Increased waiting times attributable to congestion can cause visitor dissatisfaction and loss of theme park organizer profits. This study assesses schedule recommendation as a congestion mitigation method. After we propose a schedule correction method that can be realized on a large-scale, we verify it by simulation.
Keywords: Theme park problem, Schedule optimization

1. Introduction

In the presentation of waiting time, the ratio of users affects congestion mitigation. Congestion might actually worsen if the ratio of users exceeds 80%. Nevertheless, schedule recommendation is apparently able to mitigate congestion without depending on the ratio of users. However, long computing times are necessary for large spaces. This study tackles computation time reduction and verifies the effects of applying congestion mitigation by recommending a guide schedule in a large space.

2. Proposed Method

As described in this paper, we optimize a group by creating a guidance schedule based on a visitor's visit schedule location information. We apply user information including a visitor's visit schedule and visited locations as input data. A guidance schedule is created based on those data, the waiting time at each location, and the time. Congestion mitigation effects are lessened when visitors do not follow a guidance schedule, or when an increase in new visitors occurs. Therefore, a schedule must be corrected sequentially. The system flow is presented in Fig. 1.

Our proposed system necessitates creation of a guidance schedule in realizable time to correct a schedule sequentially. First, the system creates the cluster according to a visitor's visit schedule, and creates the cluster from a visit history. Secondly, the system conducts final visitor classification based on combinations of the two created clusters. Finally, the schedule is created by reducing the number of elements by summarizing optimization problems and by regarding each cluster as one visitor. For this study, we apply neighborhood search for schedule optimization. We regard neighborhood search as suitable for schedule correction: although the system cannot obtain a strict optimal solution, its computation time is short.

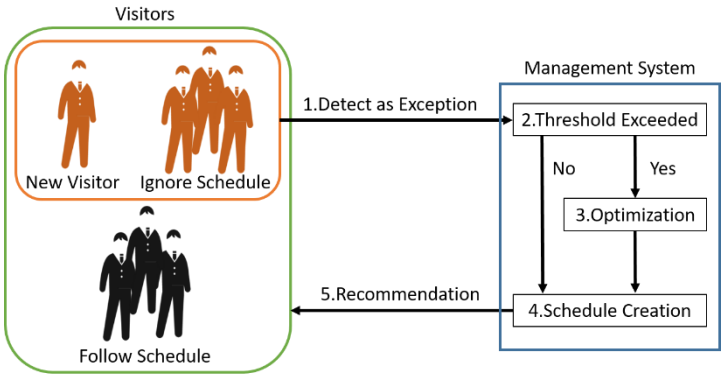

Fig. 1. Flow of the proposed system.

3. Performance Evaluation

We considered and evaluated the proposed system. We evaluated the congestion mitigation effect of the proposed method by comparing two guidance methods: the proposed method and the shortest path. Visitors have eight locations to visit. They leave the theme park after all locations are visited. This simulation ends when all visitors have left. The simulation model was Higashiyama Zoo and Botanical Garden amusement park in Nagoya city similar to the related research. The number of visitors was also 3000. The waiting time to staying time ratio is about 6 percent smaller when using the proposed method. Therefore, congestion mitigation effects can be confirmed.

4. Conclusion

As described in this paper, we specifically emphasized guidance based on schedules as a method for congestion mitigation in large environments. The problem of optimization was shortened by clustering to reduce calculations. Congestion mitigation was achieved by schedule recommendation. Performance evaluation results confirmed that congestion was alleviated by schedule optimization using the proposed method.

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