Study of University Course Scheduling for Crowd Gathering Risk Prevention and Control in the Context of Routine Epidemic Prevention

Authors : Yuzhen Hu, Sirui Wang

Abstract : As a training base for intellectual talents, universities have a large number of students. Teaching is a primary activity in universities, and during the teaching process, a large number of people gather both inside and outside the teaching buildings, posing a strong risk of close contact. The class schedule is the fundamental basis for teaching activities in universities and plays a crucial role in the management of teaching order. Different class schedules can lead to varying degrees of indoor gatherings and trajectories of class attendees. In recent years, highly contagious diseases have frequently occurred worldwide, and how to reduce the risk of infection has always been a hot issue related to public safety. "Reducing gatherings" is one of the core measures in epidemic prevention and control, and it can be controlled through scientific scheduling in specific environments. Therefore, the scientific prevention and control goal can be achieved by considering the reduction of the risk of excessive gathering of people during the course schedule arrangement. Firstly, we address the issue of personnel gathering in various pathways on campus, with the goal of minimizing congestion and maximizing teaching effectiveness, establishing a nonlinear mathematical model. Next, we design an improved genetic algorithm, incorporating real-time evacuation operations based on tracking search and multidimensional positive gradient cross-mutation operations, considering the characteristics of outdoor crowd evacuation. Finally, we apply undergraduate course data from a university in Harbin to conduct a case study. It compares and analyzes the effects of algorithm improvement and optimization of gathering situations and explores the impact of path blocking on the degree of gathering of individuals on other pathways.

Keywords : the university timetabling problem, risk prevention, genetic algorithm, risk control
Conference Title : ICMSE 2024 : International Conference on Management Science and Engineering
Conference Location : Singapore, Singapore
Conference Dates : March 25-26, 2024