

Reducing Congestion of Transfer Subway Stations During Peak Hours: the Case of Study Guerrero Station

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Abstract

Among some of the deficiencies that the subway of Mexico City presents in the transfer stations, that cause problems to the adequate flow of passengers, are the lack of signaling, the limited infrastructure in the pedestrian facilities, the large passenger flow, and the installation of shops that limit the physical space in the pedestrian facilities. The aim of the study is to implement an agent-based simulation system that contributes to the understanding of the mechanisms of passenger transfer to reduce congestion at critical points during peak hours and improve levels of service and security. First, we conceptualize the transfer subway stations as complex adaptive systems (Bucley, 1967). Then, we develop and implement an agent based-simulation technological system using AnylogicTM software, that contributes to the understanding of the mechanisms of passenger transfer in Guerrero subway station. The simulation model is calibrated using real data in order to represents the real Guerrero transfer station dynamic. Finally, plausible simulation scenarios based on layout configurations, are designed for reducing congestion levels. We consider that the agent-based simulation system implemented can support the optimization of making decision process of subway authorities, and also it can be used to test new subway stations layout configurations before their physical implementation.

Keywords: subway; transfer station; agent-based simulation model; Mexico City.

1. Introduction

Mexico City subway system transports more than 1.6 billion passengers each year. The physical infrastructure consists on 195 stations: 24 terminals and 171 local stations. It is important to note that 56 stations have the main function of transfer stations. The Guerrero station has the function of passenger's transfer from line 3 to line B and viceversa. The problem in this station is the high level of passenger's congestion and bottlenecks from Monday to Friday morning during peak hours mainly due to the lack of signaling, the physical infrastructure with limited capacity, the passengers that walk at different velocities, etc. Some solutions to reduce the congestion have been implemented such as the use of metal fences, however, the problem persists impacting negatively the mobility of passengers every day. The aim of the study is to implement an agent based-simulation system that contributes to the understanding of the mechanisms of passenger transfer in Guerrero station to reduce congestion at critical points during peak hours and improve levels of service and security. We consider that our proposal can provide transfer scheme reference for passengers at Guerrero transfer station, meanwhile support the decision-making on the operational management of the Mexico City subway.