



Weather Impact on Passenger Flow of Rail Transit Lines

Yongqing Guo ^{a, c}, Xiaoyuan Wang ^{b, c*}, Qing Xu ^d, Shanliang Liu ^b, Shijie Liu ^a,
Junyan Han ^a

^a School of Transportation and Vehicle Engineering, Shandong University of Technology, Zibo 255000, China.

^b College of Electromechanical Engineering, Qingdao University of Science & Technology, Qingdao 266000, China.

^c Joint Laboratory for Internet of Vehicles, Ministry of Education - China Mobile Communications Corporation, Tsinghua University, Beijing 100048, China.

^d School of Vehicle and Mobility, Tsinghua University, Beijing 100084, China.

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Abstract

Passenger flow prediction is important for the planning, design and decision-making of urban rail transit lines. Weather is an important factor that affects the passenger flow of rail transit line by changing the travel mode choice of urban residents. A number of previous researches focused on analyzing the effects of weather (e.g. rain, snow, and temperature) on public transport ridership, but the effects on rail transit line yet remain largely unexplored. This study aims to explore the influence of weather on ridership of urban rail transit lines, taking Chengdu rail transit line 1 and line 2 as examples. Linear regression method was used to develop models for estimating the daily passenger flow of different rail transit lines under different weather conditions. The results show that for Chengdu rail transit line 1, the daily ridership rate of rail transit increases with increasing temperature. While, for Chengdu rail transit line 2, the daily ridership rate of rail transit decreases with increasing wind power. The research findings can provide effective strategies to rail transit operators to deal with the fluctuation in daily passenger flow.

Keywords: Weather Effect; Rail Transit Line; Passenger Flow; Estimation Model.

1. Introduction

The passenger flow estimation of urban rail transit is widely used as the foundation for the planning, design, and daily operations of rail transit. Weather can influence people's travel behavior and traffic safety, and then have an impact on passenger flow of rail transit line. For example, rain is considered one of the most common adverse weather that may lead to change or cancellation of trips. But, weather factors are not usually presented in the existing models for estimating rail transit line ridership, which results in an insufficient or excessive estimation in the design stage, and unexpected large fluctuations in operation stage. It is essential to identify the impacts of weather factors on passenger flow of rail transit line. The relevant research mainly includes three aspects: data preprocessing of passenger flow [1, 2] quantitative analysis of impact factors [3-7] and development of estimation models [8, 9].

Several studies have explored the effects of rain and snow on public transit ridership. Inclement weather has an impact on people's travel modes and travel routes, and further effects on passenger flow in public transport [10, 11]. Changnon [12] found that summer rain days have a reduced number of passengers using public buses compared to summer sunny days. Cravo et al. [13] found that rain and snow have negative impacts on passenger flow of bus and subway. Guo et al.

* Corresponding author: wangxiaoyuan@qust.edu.cn

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