

運用 ETC 開放資料進行雪山隧道交通管制成效之評估與分析

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摘要

當車流超出道路設計的運量時就會引起塞車的現象，再加上長隧道經常是兩地區間的交通要道與瓶頸，每逢尖峰時段無法避免將成為可預期性重複發生塞車的路段。雪山隧道每逢連續假期必定塞車即為一例。行政單位曾實施差別費率、大客車行駛路肩等管制措施，但皆未能有效改善隧道內車速過慢的問題。本論文將應用雪山隧道的ETC開放資料來分析塞車時段與駕駛行為之間的相關性。因為隧道內禁止變換車道，一旦出現慢車時，會嚴重影響後方跟車的速度，形成隧道內走走停停的主因。也由於行車速度和間距與駕駛的開車習性直接相關聯，因此如何克服駕駛在隧道內維持正常的行車速度和合理的間距，方能緩解隧道內車速過慢的問題。再從ETC資料分析得知高乘載管制時段之車速遠高於匝道儀控管制時段的車速，平均是時速80比35，但其車流量幾近相同。因此，可推論出在高乘載時段共乘人數較多，駕駛為較有經驗的機率相對高於匝道儀控時段。本論文將以此觀點提出以一線預約制高乘載一線匝道儀控之差速管制措施來提升隧道內之總運量與流量，使能維持較高速度與較短間距之駕駛集中行駛預約車道，並在不影響用路人的權益下，

讓不習慣高速行駛之駕駛集中使用傳統匝道儀控之車道。在總運量不變的條件下，推估出新管制措施的效益為預約車道全日可17.4分鐘過雪山隧道，整體而言每人次平均可縮短約22分鐘的旅程，相當節能減碳。

關鍵詞：ETC開放資料，高乘載管制，匝道儀控管制，差速管制

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Evaluation of Traffic Management Strategies for Hsuehshan Tunnel Based on ETC Open Data Analysis

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Abstract

Traffic is congested if the flow of vehicles is over the road capacity. Since long tunnels usually become bottlenecks between two regions, expected recurring congestions are inevitable during traffic peak time. Taiwan's Hsueh Shan tunnel is a typical recurring congestion case during long weekend. In order to mitigate the traffic jam, many traffic management controls, such as "Discrimination of Pricing on Peak and Off-peak Periods" and "Bus on Shoulder," were tried without improving the tunnel congestion. In this paper, the ETC open data of the tunnel will be used to analyze the correlation between traffic congestion and driving behavior. Because lane changes are prohibited in the tunnel, once a driver slows down, will seriously reduce the speed and spacing of the rear followers, this causes the stop-and-go traffic flows in the tunnel. But also due to the driving speed and following distance directly related to driving habits, how to overcome the driving in the tunnel to maintain normal driving speed and reasonable following distance become

the key problem to mitigate the tunnel traffic congestion. Further analysis revealed that the speed of the high-occupancy vehicle lane control period was much higher than the speed of ramp metering control period, with an average speed of 80 to 35, but both traffic throughputs were almost the same. Therefore, it can be deduced that the probability of skilled drivers selected for each high-occupancy vehicles is higher than that of drivers during the ramp metering control period. In this paper, in order to improve the total traffic volume and flow rate in the tunnel, we propose a new traffic control scheme by using the differential lane speed control, that is, one higher speed reservation lane for high-occupancy vehicle and the other much lower speed lane for ramp metering control. With the approach, not only we can collect the skilled drivers to use the reservation lane to maintain a higher speed with a shorter following distance, but also without affecting the unskilled drivers to use the other traditional ramp-controlled lane. Under the same traffic volume condition, the reserved vehicles and buses can pass the tunnel within 17.4 minutes and the overall average per person can shorten the journey about 22 minutes, a considerable energy-saving carbon.

Keywords: ETC open data, high-occupancy vehicle lane control, ramp metering control, differential lane speed control.

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