一個使用於市區環境中基於兩段式左轉和交通資訊的機車路徑規劃演算法

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摘要

由於資訊科技的繁榮發展，車輛路徑問題對於設計者而言有了更多可實行的方式來達成他們的構想。一個良好的路徑規劃演算法不僅可以有效地解決路徑選擇問題，同時還可能緩解由交通壅塞、管制或事故等狀況所引起的交通問題。除了考慮歐幾里德距離，道路的條件狀況和交通流量的影響也可以用於提高搜索演算法運行的有效性。大多數的路徑規劃演算法是專為汽車或其他大型車輛所開發的，然而在許多人口稠密型國家中，特別是在於一些亞洲的城市，常常可以觀察到由於複雜之交通流量而引起的交通壅塞現象。因此本論文針對在台灣國內高度汽機車混合車流情況下的機車族，開發了一種基於兩段式左轉和具重複路由策略的旅行導航系統。本系統可以利用車輛的行駛資訊和道路運行狀況來改善車輛旅行效率。提出的演算法能夠定期地檢查所規劃路線其所能持續的有效性，考量交通流量的影響與交通號誌控制的因素，為每個目標機車尋找出最快速的行經路徑。模擬結果顯示，本導航系統可以有效地為在市區環境中的機車族來改善他們的實際旅行時間。此種方法顯著的減少了在複雜交叉路口中的等待通行時間。

關鍵字：車輛路徑問題、路徑規劃演算法、兩段式左轉、汽機車混合車流、交通號誌控制因素

A Path Planning Algorithm for Scooters Based on the Hook-Turn Constraint and Traffic Information in Urban Environments

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Due to the prosperity of information technology, vehicle routing problems have much more feasible manner for designers to achieve their ideas. The favorable path planning algorithms can effectively not only solve the path selection but also ease up many traffic problems, such as the traffic congestion, the traffic control, and the traffic accidents, especially in heavy urban environment. In addition to the Euclidean distance, the road conditions and influence of traffic flow could be used for improving effectiveness of search algorithm as well. Most of path planning algorithms are developed for cars or other large vehicles. In many densely populated countries, however, traffic congestion is commonly observable due to the complex traffic flow, especially in some Asian cities. Therefore, this thesis develops a novel travel navigation system based on hook turn constraint and rerouting policy for scooters with the heavy scooter–vehicle mixed flows in Taiwan. The system can improve the travel efficiency by using the vehicular driving information and the on-road conditions. The proposed algorithm can periodically check the continuous efficiency of the routes, the traffic flow impact, and the traffic light control factors to search for the fastest route for each task scooter. The simulation results show that the navigation system can effectively reduce the travel time for scooter riders in urban environments. This approach substantially decreases the waiting time at the complex intersections.

Keywords—vehicle routing problems, path planning algorithm, hook turn, scooter–vehicle mixed flows, traffic light control factors