摘　要

由於巨大的地震災害發生時，造成道路系統遭受毀滅性的破壞，致使災區緊急救援與工程搶修等車輛無法通行，嚴重影響救災計畫之進行，尤其於災害發生期間，道路交通系統嚴重受損導致部分路段無法通行。因此，如何維持災區運輸系統功能，以有效提升緊急救援效率，並減少人民生命財產損失，成為災害發生期間最基本且重要工作。

本研究目的即在構建交通管制決策工具，祈能建立不同救援需求目的之交通管制策略，而能有效控制私人車輛及管理緊急救援車輛，並充分發揮震後受損道路系統應有之功能。由於交通管制決策過程中『決策者』與『用路者』之間係相互影響之互動決策過程，本研究乃應用二階數學規劃方法及路網最佳化理論，建構多目標「交通管制策略模式」。基本模式架構決策目標，乃以緊急救援車輛為最高優先考量，並在道路容量許可前提下，使進入管制區車輛最大化為目標之管制策略，另為因應災區瞬間產生擁擠車流及平衡災區交通需求與供給，乃尋求最短路徑旅行時間方式用以分析旅運行為，以符合災區緊急救援需求。

修正模式架構則同時考量滿足『救災需求』與『民眾需求』為目標之管制策略，並於模式下階考量結合路網均衡指派與旅次分布之整合模式（Combined Trips Distribution/Assignment Model, CDA）探求問題之本質，以同時考量地震發生後旅次重分布行為，並藉由旅運行為分析尋求最短旅行時間路徑。為實證分析所建構交通管制決策模式之可行性及合理性，以及求解模式之效率性，分別應用模糊互動規劃法及基因演算法分析；最後經由情境假設分析結果顯示，本研究因應地震災區所建構之交通管制決策模式，能充分發揮都市地震災區道路網系統功能，並有效提昇緊急救援工作之效率。

關鍵字：交通管制、二階規劃、緊急車輛、基因演算法、模糊互動規劃、CDA 模式

ABSTRACT

When a severe earthquake takes place, the road network system often suffers serious destruction and results in malfunctioning of network systems. In particular, impassable roads and streets block transportation in the periods of evacuation, rescue and restoration. How to maintain traffic functions to facilitate rescue missions and save more lives will turn out to be an essential task during the post-quake period.

This thesis aims at developing a decision-making tool that can potentially be used in managing the traffic flows of emergency vehicles and controlling those for private use in earthquake disasters. Methodologically, it addresses a multi-objective, two-modal network flow problem based on the concept of bi-level programming and network optimization theory. The objective of the Basic Model is to allow as many non-rescue vehicles to enter the disaster areas as possible with two requirements: not to disturb necessary rescue vehicles entering the disaster areas and not to exceed the left available roadway capacity.

In order to balance travel demand and traffic supply and to find the minimum travel time path for emergency rescue, the Revised Model sets two levels of objectives and takes both the needs of rescue and non-rescue vehicles into consideration. Given the route choice behavior and the most likely OD trip distribution pattern, the lower level objective will meet the above two levels objectives and integrate the CDA (Combined Distribution/Assignment) concept into the minimum link travel times. To prove the feasibility of the model and make it more efficient, the fuzzy interactive algorithm and genetic algorithm (GA) will be applied. Lastly, a hypothetical scenarios analysis shows that this study can create an effective way to implement traffic regulation during earthquake disaster.

***Keywords:* traffic regulation, bi-level programming, emergency vehicles, genetic algorithm, fuzzy interactive programming, CDA (combined distribution/assignment model)**

CONTENTS

TABLE CONTENTS

FIGURE CONTENTS