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# **SIGNALIZED FUZZY LOGIC FOR DIAMOND INTERCHANGES INCORPORATING WITH FUZZY RAMP SYSTEM**

A thesis presented in partial fulfilment of the  
requirements for the degree of

Master of Engineering  
in  
Mechatronics

at  
Massey University,  
Auckland, New Zealand

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June 2009

## **ABSTRACT**

New dynamic signal control methods such as fuzzy logic and artificial intelligence developed recently mainly focused on isolated intersection. In this study, a Fuzzy Logic Control for a Diamond Interchange incorporating with Fuzzy Ramp System (FLDI) has been developed. The signalization of two closely spaced intersections in a diamond interchange is a complicated problem that includes both increasing the diamond interchange capacity and reduce delays at the same time. The model comprises of three main modules. The Fuzzy Phase Timing module controls the current phase green time extension, the Phase Selection module select the next phase based on the pre-defined phase sequence or phase logics and the Fuzzy Ramp module determines the cycle time of the ramp meter bases on current traffic volumes and conditions of the interchanges and the motorways. The developed FLDI model has been compared with the traffic actuated simulation with respects to flow rates and the average delays of the vehicles. The model of an actual diamond interchange is described and simulated by using AIMSUN (Advanced Interactive Microscopic Simulator for Urban and Non-Urban Network) software. Simulation results show the FLDI model outperformed the traffic actuated models with lower system total travel time, average delay and improvements in downstream average speed and average delay.

## **ACKNOWLEDGEMENTS**

Author wishes to express his deepest gratitude and sincerest appreciation to his advisors Prof. Peter Xu, Dr. Fakhrol Alam and Dr. Johan Potgieter for supervision, enthusiastic guidance and continuous encouragement throughout the course of study. Grateful acknowledgment is also extended to Dr. Clara Fang (University of Hartford) for her valuable comments and suggestions.

Gratitude is also expressed to the staffs of Auckland Traffic Management Unit for their help and support. Author is also thankful to his friends Ben Lin and Aeron Yu for assisting in many ways.

Finally author owes a special dept of thanks to his family members who have been behind all his achievements in life.

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## LIST OF ABBREVIATIONS

ADIM	Actuated Diamond Interchange Control with No Ramp Metering
ADIFM	Actuated Diamond Interchange Control with Fuzzy Ramp Metering
AIMSUN	Advanced Interactive Microscopic Simulator for Urban and Non-Urban Network
DAD	Downstream Average Delay
DAS	Downstream Average Speed
FLC	Fuzzy Logic Control
FLDI	Fuzzy Logic Diamond Interchange Control
HOV	High Occupancy Vehicle
SH1	State Highway 1
MF	Membership function
MOE	Measures of Effectiveness
MOTORWAY	Freeway (US)
NZMOT	New Zealand Ministry of Transportation
STTT	System Total Travel Time
TFL	Traffic Light
TNZ	Transit New Zealand (is now part of New Zealand Transport Agency)
TTT	Total Travel Time