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短期交通量變化混沌特性之探索與預測

Testing and Prediction for Chaotic Short-term Traffic



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Flow Dynamics

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ABSTRACT

This research attempts to test for the presence of low-dimensional chaotic structure and to make predictions for traffic flow time series data. In order to test for chaos phenomena, we undertake a comprehensive comparison of promising plots and statistics between the observed freeway traffic flow data and their surrogates. The most crucial indexes are selected to develop the parsimony procedure. We also utilize some well-known time series data generators to validate the proposed procedure and further apply it to test for the chaoticity of traffic flows at different sites. Our results have shown strong evidence of chaoticity, rather than stochasticity, existent in the nature of freeway short-term (minute) traffic dynamics. In addition, this research develops three prediction models to forecast the chaotic traffic flow time-series data. The temporal confined (TC) model employs temporal similarity of flow trajectories to perform the prediction reasoning. The spatiotemporal confined (STC) model incorporates both spatial and temporal similarities into the prediction reasoning. The spatial confined (SC) model considers the spatial similarity to perform the reasoning. It is found that the three proposed models have demonstrated high prediction accuracy in capturing the short-term traffic flow dynamics.

Keywords: chaos, prediction models, short-term traffic dynamics, time series data,
surrogate data

TABLE OF CONTENTS

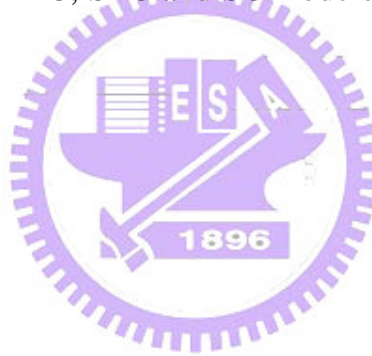
	<u>PAGE</u>
<u>ABSTRACT</u>	
<u>ACKNOWLEDGEMENTS</u>	
<u>LIST OF TABLES</u>	v
<u>LIST OF FIGURES</u>	vi
1 <u>INTRODUCTION</u>	1
1.1 The Problem and Its Significance	1
1.2 Motivations and Purposes of the Research	3
1.3 Methodologies and Framework of the Research	5
1.4 Organization of the Research	9
2 <u>LITERATURE REVIEW</u>	11
2.1 Testing for Chaos	11
2.2 Prediction of the Chaotic Time Series	24
2.2.1 State-space prediction	24
2.2.2 State-space averaging	25
2.3 Other Relevant Works	27
2.3.1 Application on Abnormal Diagnosis	27
2.3.2 Application on Chaos Control	29
2.4 Some Comments	32
3 <u>PROPERTIES OF CHAOS</u>	35
3.1 Definition of Chaos	35
3.2 Some Properties of Chaos	36
3.3 Geometric Plots and Statistics	41
3.3.1 Geometric Plots	44

3.3.2	Statistics	48
3.4	Takens' Embedding Theorem	51
4	<u>TESTING FOR CHAOS IN TRAFFIC FLOW DYNAMICS</u>	53
4.1	Original and Surrogate Data	53
4.2	Empirical Testing Results	54
4.3	Development of Parsimony Procedure	57
4.3.1	Proposed testing procedure	58
4.3.2	Validations	58
4.3.3	Applications	60
5	<u>DEVELOPMENT OF PREDICTION MODELS</u>	71
5.1	Proposed Models	71
5.1.1	Temporal Confined (TC) Model	71
5.1.2	Spatiotemporal Confined (STC) Model	74
5.1.3	Spatial Confined (SC) Model	76
5.2	Empirical Results	78
5.2.1	Data	78
5.2.2	Prediction performance	79
5.3	Sensitivity Analysis	81
6	<u>CONCLUSIONS</u>	93
6.1	General Conclusions	93
6.2	Possible Extensions	94
	<u>REFERENCES</u>	97

VITA

LIST OF TABLES

<u>NUMBER</u>	<u>PAGE</u>
3-1 Summary of geometric plots and statistics for time series data	42
4-1 Statistics of minute-flow time series for eight stations	57
4-2 The parsimony procedure validated by known time series generators	60
4-3 Applications of the parsimony procedure	61
5-1 Prediction results of TC, STC and SC models	91



LIST OF FIGURES

<u>NUMBER</u>	<u>PAGE</u>
1-1 Comparison of hourly- and minute-flow patterns for ten morning rush hours (Station 50, US I-35 Freeway, Minneapolis)	2
1-2 State space reconstruction	8
1-3 Framework of this research	9
3-1 Logistic function $x_{t+1}=3.750x_t(1-x_t)$, $x_0=0.10$ (60 iterations)	38
3-2 Lorenz attractor from the X-Z plane	38
3-3 Logistic function x_{t+1} vs. time	39
3-4 One-dimensional state-space plots for the examples	40
3-5 Two-dimensional state-space plots for the examples	41
3-6 Three-dimensional state-space plots for the examples	41
3-7 Fractal umbrella trees	41
4-1 One-dimensional state-space plots	62
4-2 Two-dimensional state-space plots	62
4-3 Three-dimensional state-space plots	62
4-4 Return maps	63
4-5 Two-dimensional phase-space plots	63
4-6 Three-dimensional phase-space plots	63
4-7 Two-dimensional Poincare' movies	64
4-8 Three-dimensional Poincare' movies	64
4-9 IFS clumpiness maps	64
4-10 Probability distributions	65
4-11 Correlation function	65

<u>NUMBER</u>	<u>PAGE</u>
4-12 Power spectrum	65
4-13 Proposed parsimony procedure	66
4-14 Power spectra for known time series generators	67
4-15 IFS clumpiness maps for known time series generators	68
4-16 Power spectrum for station 32	69
4-17 IFS clumpiness maps for station 32	69
5-1 Selection of “similar trajectories” by a temporal threshold	83
5-2 Similarity membership degrees for TC Model	83
5-3 Selection of “similar trajectories” by spatial and temporal thresholds	84
5-4 Similarity membership degrees for STC model	84
5-5 Selection of “similar trajectories” by spatial threshold	85
5-6 Similarity membership degrees for SC model	85
5-7 Autocorrelation function	86
5-8 Comparison of predicted and observed traffic flows (Station 32, for example)	87
5-9 Comparison of predicted and observed traffic flows (Station 55, for example)	88
5-10 Prediction errors versus traffic volumes	89
5-11 Sensitivity analysis for temporal threshold value ϵ_t	90
5-12 Sensitivity analysis for spatial threshold value ϵ_s	90

