

**“Traffic flow prediction for freeway 5 in Taiwan” (交通資訊預測先期研究計畫)**

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The traffic congestion problems of the Freeway No. 5 in Taiwan during weekday rush hours, weekends, and holidays are challenging problems. In order to provide the prediction of traffic flow to drivers and the traffic control agency, this study is conducted to use statistical methods to develop traffic flow prediction models. The forecasting methods are divided into short-term and long-term regimes.

The short-term regime consists of four models: (i) prediction for the weekends, (ii) prediction for the workdays of Monday and Friday, (iii) prediction for the workdays of Tuesday, Wednesday, and Thursday, and (iv) prediction for one single holiday. These models predict the traffic flows for every five minutes in the next thirty minutes. Both southbound and northbound flows on mainstreams and ramps are included.

For the short-term prediction problem, the auto-regressive time series model and the neural network model are used. Both methods have similar performance regarding the medians of prediction errors. However, the auto-regressive time series model has lower prediction errors in rush hours and thus is recommended.

For the long-term forecast problem, the training data cover weekends, holidays and the days before. An extension of latent class model is developed to predict the traffic flows for every thirty minutes in these days.

The prediction results are presented on a website in a visualization fashion.

Key Words: short-term forecast, time series, neural network, long-term forecast, latent class

為了改善國道五號在平日尖峰、週末、例假日或節日交通壅塞問題，提供車流量資訊給用路人與交通管理人員參考，本研究採用統計方法分析交通資訊的車流量，提供預測車流量架構和流程。預測發佈機制分為短期模式和長期模式。

短期模式包含四種平假日模式，均含雙向主線及匝道，每30分鐘發佈未來30分鐘內、以5分鐘為間隔之預測：(1) 週末流量預測：每週六凌晨零時起至當日24時。每週日凌晨零時起至當日24時；(2) 週一/週五流量預測：每週一、週五凌晨零時

起至當日24時；(3) 週二至週四流量預測：每週二、三、四凌晨零時起至當日24時；(4) 單一假日流量預測：假日凌晨零時起至當日24時。

長期模式在長假開始前一日至長假結束前一日，發佈隔日以30分鐘為間隔之雙向主線及匝道流量預測。

在短期模式下以所有平日和例假日的歷史車流量資料，建立週期類別自迴歸模型和應用類神經網路模型，預測並發佈未來三十分鐘之每五分鐘車流量預測值。上述兩種方法之預測誤差的平均數和中位數，在四種平假日模式下的國五各地點ETC和匝道VD的表現差異不大，而前者方法在尖峰時刻的誤差峰值較小，因此建議實作時優先考慮週期類別自迴歸模型。

在長期模式下以連續假日、連續假日放假前的日子和例假日的歷史車流量資料，建立迴歸潛在類別模型，預測並發佈未來特定連續假日的二十四小時之每三十分鐘車流量。

兩種模式依各觀測站建立對應的車流量預測模型，結果以視覺化方式呈現在網頁。

關鍵字：短期模式、長期模式、週期類別自迴歸、類神經網路、迴歸潛在類別模型