On time into the city

A study into travel time prediction on the urban road network using an artificial neural network

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Travel times are a good means to inform about the situation on the road. By predicting these travel times it becomes possible for the road supervisor to possibly manage the traffic in advance. For a highway network a study into travel time prediction using a neural network has already been carried out by Zee[1]. The results of that research are however not applicable for an urban road network. The traffic processes in the city are significantly different. Also in the city not the same traffic data like for a highway network are available. For this reason the study into travel time prediction has been carried out again, this time for the urban road network.

Overall the research can be divided into three steps. Step one concerns the creation of a set with traffic data of an urban road network. The second step is to pre-process this set of data up to a number of alternatives for training the neural network. The third step is the actual prediction of travel times by training a neural training network with the different alternatives.

On the urban road network traffic data, particularly intensities, green - and cycle times, are supplied by traffic lights. By the lack of a vast set with these data and travel times acquired from the real world, simulations are used in this research to generate the required data and travel times.

Based on the traffic data three alternatives for training the neural network have been created. The pre-processing aims at finding an alternative which is able to predict travel times better and more rapidly. The basic alternative where all data of car traffic have been taken along without pre-processing, serves as a frame of reference. The second alternative has been built from a minimum amount of car traffic data. The last alternative has been derived from a travel time algorithm for the urban road network[2]. This alternative is based on “meetvak” travel times.

[1] Zee, J.C., *Oude Reistijden Actueel, het voorspellen van reistijden met een artificieel neuraal netwerk op basis van achteraf geschatte reistijden*, Afstudeerverslag Universiteit Twente, Zeist, augustus 2001

[2] Tampère, C.M.J. en E.A. Berghout, *Reistijd algoritme voor het stedelijk wegennet, Deel 1: algemeen toepasbare rekenkern*, TNO-rapport Inro/VK1999-12a, Delft, december 1999

Finally the three alternatives have been presented to a neural network. As neural network a standard "feed forward back propagation" network with one hidden layer has been used. In general the travel times are reasonably well predictable. The results of the alternative based on the travel time algorithm (MV) however are significantly better than those of the basic alternative (IG). MV performs the best for all the defined criteria. Also the alternative MV trails the travel time course the most accurate of all while using an independent, never before used set with data. The alternative based on a minimum quantity of data (IGmin) clearly lags behind at both IG and MV.

Travel time prediction in the city is in spite of the complexity of the traffic process feasible. The predictions can best be done using “meetvak” travel times. During the morning rush hour the results of the predictions thereby lie within an average 12 percents of the travel time. This runs up to a maximum of 32 percents. For the evening rush hour it is an average 8 percents up to a maximum 19 percents. During the period in between the results run from an average 8 percents up to a maximum 18 percents of the to be predicted travel time value.