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# Automated adaptive traffic network: Adapting the M50 in real-time by optimising speed limits using a hybridised optimisation algorithm and artificial neural networks

Since the last century, traffic congestion has been one of the most important issues in urban areas, which results in pollution, fuel cost, loss of time (work hours), and stress and anxiety. Two main solutions have been tested to solve this problem: a) expanding the traffic infrastructure, which is significantly costly and hard to implement, and b) reducing the number of vehicles by encouraging people to use shared transportation (providing cheap and convenient shared transport alternatives) and discouraging the usage of private vehicles (such as tolls and fines), which is crucial due to growth in demand and people's expectation.

It is possible to increase the traffic network efficiency by adapting the existing network to ongoing operational conditions, especially in bottle neck conditions. In this research, to minimise travel time losses, speed limits are optimised to adapt the traffic network to its specific operational conditions in real-time. To do so, an intelligent agent is developed (see Figure 1) to estimate the traffic in part of the M50 motorway in Dublin, and is given the capability to learn and change the operational scenarios of the motorway that allow it to perform online management of its speeds. Results, tested in SUMO, indicate that the intelligent agent can reduce the travel-time at peak congestion by a maximum of 60% in average travel times for a period of 10 minutes, but that it has an overall significant benefit to alleviate congestion in the M50 section of interest during peak times (see Figure 2).

