

# Evaluating the Benefits of Speed Harmonization with Lane Specific Speed Limits on a Motorway

Kevin Abraham Jacob, Master of Science in Computer Science  
University of Dublin, Trinity College, 2022

Supervisor: Vinny Cahill

Urban motorways are plagued by issues of congestion, reckless driving and accidents. A common cause to this is the uncoordinated acceleration and deceleration of car. To address this problem, this project proposes a strategy to use a constant speed for all vehicles and distribute these vehicles across the available lanes based on the speed they are travelling at. Through this model, the aim is to achieve a lower travel time on motorways and enable automobiles to travel at the maximum speed defined for the motorway while avoiding congestion.

The project analyses the potential of a lane specific- speed harmonised driving model. The system designed in this dissertation evaluates two scenarios. The first is a setup where Human Driven Vehicles are notified by a central control unit about the permissible speed ranges for each lane. The second uses Connected Autonomous Vehicles that communicate with a central controller and vehicles are assigned speeds, based on which they move to the designated lane. The baseline model used, is developed by Guériaux and Dusparic (2020) and results from the simulations are compared to the baseline to evaluate its potential in a real world implementation.

In a three lane motorway, the Slow lane has a max speed of 50km/h, the Mid lane has a speed of 80km/h and the Fast lane has a speed of 100km/h. As the lane attains maximum capacity, the next lane's speed cap is increased and new vehicles join the lane. Through this process, all the vehicles on a highway travel at a speed close to the maximum speed limit. SUMO (Simulation of Urban MObility) is a tool used to run the simulations.

The experiments carried out yield the following results- average travel time is reduced by 21%. The average speed of vehicles is 80% of the maximum speed limit. Finally the effects of the model create a traffic flow pattern that promotes coordination between vehicles by lowering the number of lane changes by eliminating overtaking.