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Empirical Analysis of Two-Leader Car-Following Behavior

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Abstract

Several researchers have proposed that drivers do not just respond to the vehicle directly ahead, but also to the second, and even the third, fourth or fifth vehicle ahead. Little empiri-cal evidence for this hypothesis has however been presented so far.

We provide empirical evidence showing that drivers are not only reacting on the vehicle di-rectly ahead, but also the 'second leader'. This is achieved by analyzing vehicle trajectory data collected by observing a motorway traffic flow from a helicopter. These microscopic data enable estimation of individual car-following models.

The extent to which this multi-anticipatory behaviour occurs turns out to be considerable: on average, the sensitivity with respect to stimuli coming from the second vehicle is half the sen-sitivity of the first vehicle ahead. For some vehicle triples, even higher sensitivities to the be-haviour of the second leader than to the behaviour of the first have been observed. The esti-mation results show large differences in car-following behaviour between the different driv-ers. These differences can in part be explained by the vehicle-type composition of the consid-ered vehicle triples. Trucks drivers show different behaviour than person-car drivers; drivers following a truck show dissimilar car-following behaviour than drivers following a person-car.

Although not being a benchmarking study aimed at providing the best model of car-following behaviour, the research presented in this article shows that including multiple leaders can improve modelling of driving behaviour considerably.