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Impact of safety assistance driving systems on oscillation magnitude, fuel consumption and emission in a car platoon

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Abstract: This paper has studied the impact of safety assistance driving systems (SADS) on the oscillation magnitude, the fuel consumption and emission of a car platoon, in which the car-following dynamics are depicted by an improved two-dimensional intelligent driver model. It is shown that while the simple one-regime SADS is able to suppress the oscillation magnitude, the fuel consumption and emission increase. This is due to many small high frequency oscillations of velocities. We have proposed a two-regime SADS, in which "very dangerous" regime and "not so dangerous" regime have been classified. Simulation shows that with the introduction of the two-regime SADS, both the fuel consumption and emission decrease, since the deceleration of vehicles is pretty gentle. We further showed that performance of the multi-regime SADS is the same as that of the two-regime SADS in terms of the fuel consumption and emission.