Controlling traffic jams by time modulating the safety distance

Controlling traffic jams by time modulating the safety distance
The possibility of controlling traffic dynamics by applying high-frequency time modulation of traffic flow parameters is studied. It is shown that the region of the car density where the uniform (free) flow is unstable changes in the presence of time modulation compared with the unmodulated case. This region shrinks when the speed-up of cars does not exceed some critical value and expands in the opposite case. The flux of the time-modulated flow is an increasing function of the amplitude of the modulation for traffic flows whose density is larger than $1/h$ where $h$ is the safety distance in the nonmodulated case, while it is a decreasing function in the opposite case. In other words, the safety distance time modulation facilitates car propagation in the case when the mean distance between cars in the congestive traffic is less than $h$ and hinders it when the neighboring cars in the flow are well separated. A link between a microscopic description and the macroscopic fundamental diagram is established.

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