Complex spatiotemporal behavior in driven asymmetrically coupled nonlinear elements:traffic jam formation on a ring

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Asymmetrically coupled nonlinear elements are abundant in Nature. Examples are traffic flow on road networks, rings of coupled biological oscillators, electronic circuits *etc*. These nonlinear systems can exhibit spatial homogeneous, periodic, or localized structures with nontrivial dynamical behavior.

Traffic flow can be considered as a particular example of collective non-equilibrium behavior of many-particle systems and that many collective phenomena such as non-equilibrium phase transitions, dynamical bifurcations, pattern formations are inherent features of traffic flow models. The collective character of traffic flow is due to vehicle-vehicle correlation effects originated from interaction of drivers to avoid colliding with other moving vehicles and pedestrians.

In this talk a follow-the-leader model of traffic flow on a closed loop is considered. In the framework of the extended optimal velocity model where a driver takes into account both the following car as well as the preceding car periodic domain wall solutions which describe the formation of traffic congestion patterns are found and their stability is discussed.

A relation between the follow-the-leader model of traffic flow and the asymmetric Ginzburg-Landau equation model is considered and the problem of the traffic jam control will be discussed.