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Stationary solitons in the Box Ball System in Z

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The Ball Box System (BBS) is a cellular automaton introduced by Takahashi and Tattsuma in 1990 as a discrete analog of the KdV pde, a partial differential equation with many soliton solutions. In the BBS a box is placed at each integer number and can either be empty or contain a ball. A carrier with infinite capacity visit successively the boxes from left to right. The carrier picks balls from occupied boxes and leaves carried balls at empty sites. We discuss existence conditions and invariant states. The automaton has countable many conserved quantities which travel at different speeds (solitons). We show that the product measure at any density less than $1/2$ is invariant. Furthermore we describe independence properties of the spatially mixing invariant measures and speed interaction of the solitons. Work in collaboration with Chi Nguyen, Leonardo Rolla and Minmin Wang.