Irreversibilty and transience in a model of many sokobans and boxes on a line

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We consider a simple model of many sokobans and boxes on a finite line. The sokobans do a random walk to neighboring empty sites. If the site is occupied by a box, but the next site is empty, the sokoban can push push the box to the empty site, and move to the now emptied site. This model shows irreversibility, as if two adjacent sites are both occupied by boxes, these boxes can not be moved at any later time. The long time steady state is strongly non-ergodic, and the system gets trapped, and can make transitions within a very small subset of states. We characterize this decomposition of phase space into disconnected sectors, and also study the hierarchical structure of transient states, where states at a level, can either move amongst themselves, or go to states at a lower level. We use generating function techniques to determine exactly the number of disconnected components, the number of configurations in a component, the number of transient configurations at different heights, and the sector-decomposition of recurrent states in this model.