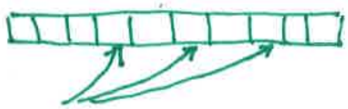
Initialization:



put car on
with probability P_{car}

$P_{car} \approx c = \frac{N}{L}$ ← # of cars ← lattice length

PCAR ROADLENGTH

A. The Nagel-Schreckenberg model of highway traffic:

In the NaSch model, the speed V of each vehicle can take one of the $V_{max}+1$ allowed *integer* values $V = 0, 1, ..., V_{max}$. Suppose, X_n and V_n denote the position and speed, respectively, of the n-th vehicle. Then, $d_n = X_{n+1} - X_n$, is the gap in between the n-th vehicle and the vehicle in front of it at time t. At each time step $t \to t+1$, the arrangement of the N vehicles on a finite lattice of length L is updated *in parallel* according to the following "rules":

$V_{new} = \min(v_{old}+1, v_{max}, d-1)$

Step 1: Acceleration. If, $V_n < V_{max}$, the speed of the n-th vehicle is increased by one, but V_n remains unaltered if $V_n = V_{max}$, i.e., $V_n \to min(V_n+1, V_{max})$.
Step 2: Deceleration (due to other vehicles). If $d_n \leq V_n$, the speed of the n-th vehicle is reduced to $d_n - 1$, i.e., $V_n \to min(V_n, d_n - 1)$.

$V_{new} \xrightarrow{\text{if } V_{new} > 0} V_{new} - 1$
with proba Pdec

Step 3: Randomization. If $V_n > 0$, the speed of the n-th vehicle is decreased randomly by unity with probability p but V_n does not change if $V_n = 0$, i.e., $V_n \to max(V_n - 1, 0)$ with probability p.

$X_{new} = X_{old} + V_{new}$

Step 4: Vehicle movement. Each vehicle is moved forward so that $X_n \to X_n + V_n$.

PDEC