## 8.3: Monte Carlo localization

Simulate a moving agent that locates itself on a squared board (like the one on the right) using *continuous-space* particle filter.

a) Main rules:
- An agent moves on the board with constant speed v and direction (angle) φ and records the color of the board at its current point at regular intervals. Agent does not control its movement.
- The possible values of v are limited so that the distance moved between two measurements is less than a side of a grid square.
- At the edges (walls) agent is elastically "reflected" so that the incidence and reflection angles θ are equal.
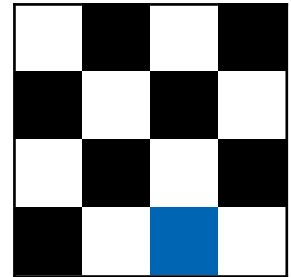
Ensure that the agent localizes successfully.

b) What happens if the limit for v is lifted? Find out and describe different speed regimes.

c) What happens if v and θ are randomly perturbed at the moment of collision? (In physics, inelastic collisions with a wall are usually treated as energy-absorbing, but you're free to try out a "helpful" or even non-Newtonian wall here as well.) How long it takes for the agent to re-localize?

d) Visualize agent's movement on the board and its prediction of the current position.