Movements of People in Crowd

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Introduction

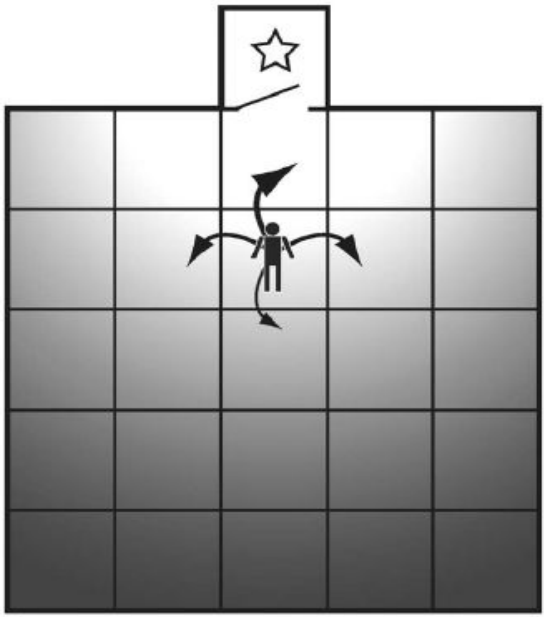
- Crowd situations are one of the few situations in which humans flock together.
- Interest in determining the basis of crowd effects, for example, in cases where large groups of people must move through a doorway, narrow hall or other restricted environment.

Kirchner's field model

- Rectangular grid
- Bosons
- Two individual factors: desire to move toward an exit and desire to follow others
- Two fields: static and dynamic field
- Probability- the score for each cell

The static field

- Gradient with high values near desirable areas
- Initialised at the beginning of the model run
- Does not change during the run

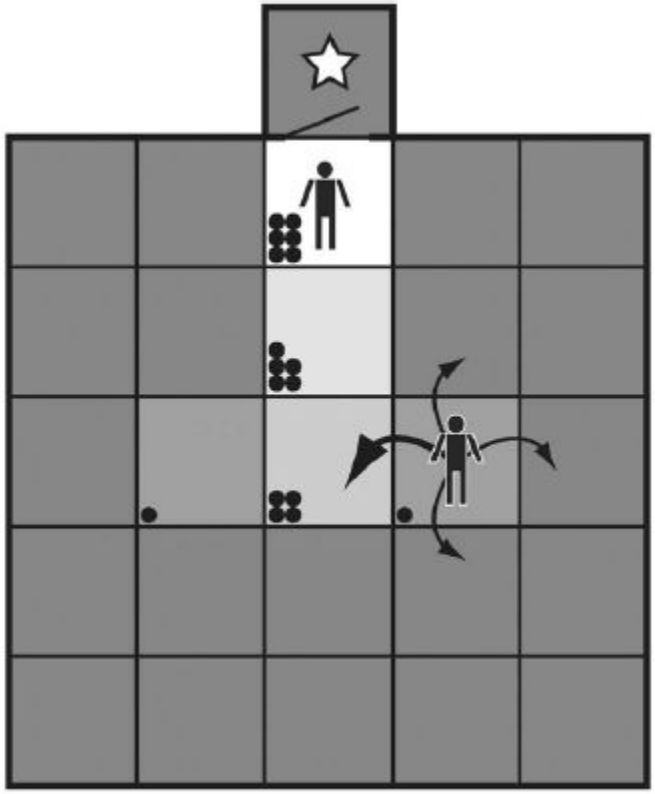


$$S_{ij} = \left[(a-i)^2 + (b-j)^2\right]^{1/2},$$

$$S_{ij} = \max_{ij}(S_{ij}) - S_{ij}.$$

The dynamic field

- Dynamic bosons
- Dij $\rightarrow$Dij+1
- Each boson decays with probability δ
- Those bosons which do not decay diffuse with probability α



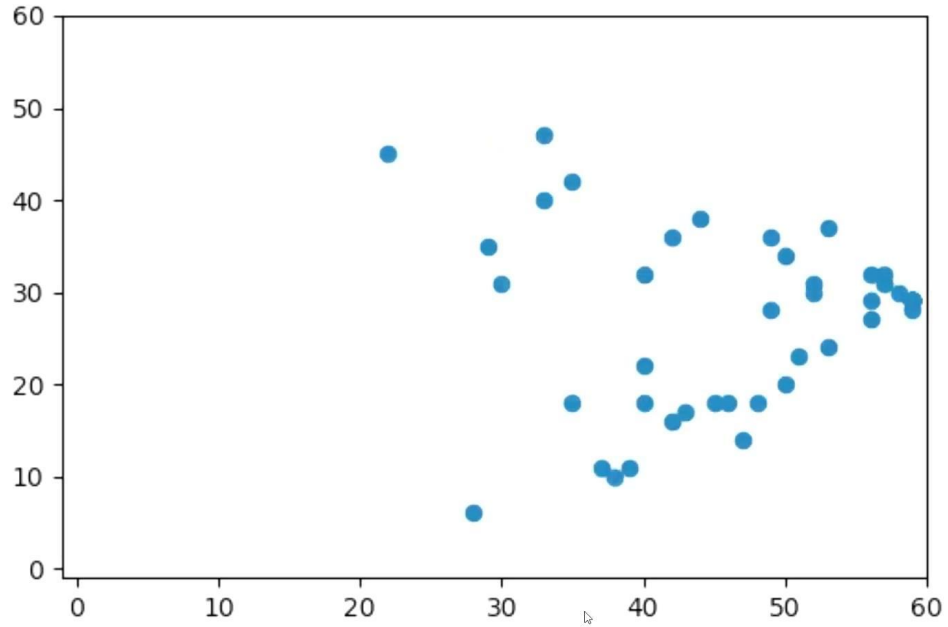
Probability

$$p_{ij} = N \exp(k_D D_{ij}) \exp(k_S S_{ij})(1 - n_{ij})\xi_{ij}$$

- p_{ij} - the probability that an agent will select a neighbouring cell (or its own cell) with coordinates (i, j)
- Dij and Sij - the value of the dynamic and static field
- nij - the occupation number (0 if unoccupied, 1 otherwise)
- ξij - the occupation number (0 for walls and occupied cells, 1 otherwise)
- N - the normalisation number

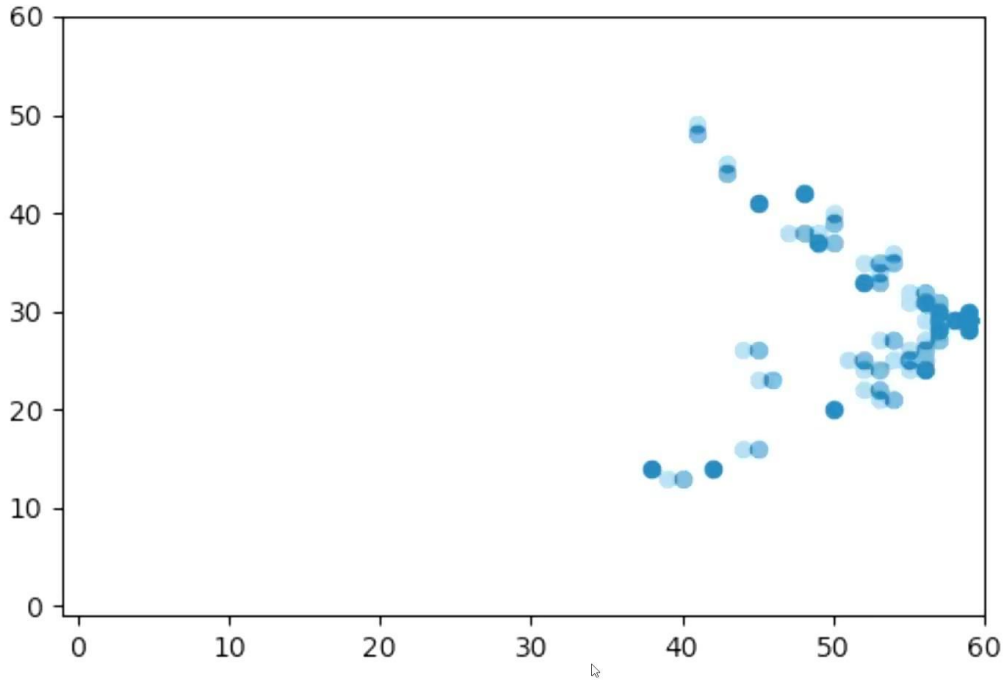
Ks=4 and KD=10

- Number of agents = 60
- 424 iterations



Ks=10 and K_D=4

- Number of agents = 60
- 118 iterations



Conclusion

- A problem with the Kirchner model is that it abstract physical force out of crowd model entirely.