Temple CST 2100   Modeling & Simulation in Science and Technology   Spring 2016
Problem Set 8
(Out Thu 04/07/2016, Due Thu 04/14/2016)

Problem 8

Conduct the following modifications to the Matlab file `temple_abm_swarming_birds.m` from the course website `http://math.temple.edu/~seibold/teaching/2016_2100/` .

(a) Add a zone of attraction to the swarming model, so that there is repulsion for distances less than 1/3, alignment for distances between 1/3 and 2/3, and attraction for a distances between 2/3 and 1. Submit (i.e., email to the course instructor and TA) your code under the filename `yourfamilyname_problem8a.m` . Compare the modified model (with attraction) to the model without attraction, describe the differences, and explain why they happen.

(b) Change the boundary conditions away from fixed walls to the domain being periodic. Note that you must treat the agent interactions correctly in this periodic setting, i.e., an agent to the right of the domain may be affected by an agent to the left of the domain. Submit your code (without attraction) under the filename `yourfamilyname_problem8b.m` .

(c) Change your code from part (b) to have a zone of attraction, as in part (a). Submit this code under the filename `yourfamilyname_problem8c.m` . Now, using the codes from parts (b) and (c), run representative simulations that investigate whether the presence of a zone of attraction makes is more likely (or less likely) for all agents to form a single swarm. Explain your observations and interpret them.

(d) Based on your code from part (a) [i.e., with walls], modify the agent laws so that agents who are within a distance 1 to a wall know about the presence of the wall and adjust their behavior accordingly (i.e., they turn to avoid the wall). This can be thought of as the leading birds acting as leaders who conduct obstacle avoidance. Submit this code under the filename `yourfamilyname_problem8d.m` .