

EECE7065 — Project Report 1

Wayne Stegner Zuguang Liu Siddharth Barve

Our project is studying the penguin colony's social thermoregulation as an emergent swarm behavior. Our progress thus far include relevant literature review, preliminary design simulation, making decisions as well as constructing the base framework for the final design. Through literature study, we have learned some general biological facts about the penguin colony, but have not found similar research that addresses the self-emergent aspect of the behavior. After implementing a preliminary design based on general thermodynamic rules, we were able to observe huddling behavior in the penguins to regulate body temperature in the cold environment. However, we found that implementing features, such as collision detection and a better heat transfer model, on a continuous space is quite challenging. Thus, we decided to discretely place penguin entities in a discrete grid of tessellating shapes, starting with square as a solution easiest to implement. We then started to build the environment framework for this solution. Our future plan is to enhance the framework we have established as well as specify different policies for the penguin agents. Eventually, we will put together the final design and hopefully be able to simulate the colony to be as realistic as possible. Some specific areas we hope to investigate in the swarm behavior include the effect of different decision making models, the effect of taking away certain senses, the radius of the senses, environmental changes, and the ability to evolve the decision models.