

Model of ants carrying a cargo

Collectively carrying a large load requires a high degree of coordination and is, in fact, extremely rare outside humans and ants. We present an experimentally motivated theoretical model of ants carrying a cargo. The model takes into account stochastic attachments and detachments as well as decision making based only on mechanical information carried through the load. The model results reproduce experimentally observed features. We find the system is poised at a transition region between random walk and ballistic motion, which is near optimal in terms of the response to a new informed ant. Experiments using a range of load sizes and obstacle negotiation support our theoretical predictions. Our findings suggest that efficient group level processes can arise from transient amplification of individual-based knowledge with no explicit communication between agents.