

"Controlling a swarm of robots after deployment is difficult due to the unpredictable and emergent behavior of swarm algorithms. Past work has focused on influencing the swarm via pre-selected, static leaders—swarm members that the operator directly controls. This paper investigates the use of dynamically selected leaders that are directly controlled by the human operator to guide the rest of the swarm, which is operating under a flocking-style algorithm. The goal of the operator is to move the swarm to goal regions that arise dynamically in the environment. We experimentally investigated (a) the effect of density of leaders on the ease of human control and system performance, and (b) how restriction of information communicated to the human operator affects the ability to guide the swarm to goal regions. The density of leaders is computed based on an extension of the random competition clustering (RCC) algorithm used in wireless sensor networks to select cluster heads. Our results show that, while there was a large drop in the number of goals reached when moving away from the highest leader density, this effect disappears when moving to even lower densities. Furthermore, we found that performance was just as good when the information returned to the operator was restricted, showing that operators can still navigate a swarm even when they have imperfect information."