

# An Analysis of Emergent Taxis in a Wireless Connected Swarm of Mobile Robots

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**Abstract**—In swarm robotic systems emergent swarm properties are particularly difficult to analyse and model. This paper describes a simple but effective algorithm for emergent swarm taxis (swarm motion toward a beacon) in a 2D or 3D wireless connected swarm of minimalist mobile robots. The paper then undertakes a deep analysis of the swarm taxis by identifying both first and second order micro-level robot interactions and quantifying the contribution of each such interaction to the macro-level swarm behaviour. From the analysis we develop a simple quantitative model that is able to predict swarm velocity with reasonable accuracy. Although the analysis is specific to the swarm algorithm in question, we believe that the methodology presented has generic value to swarm modellers.