

Flocking Swarm of Robots Using Artificial Innate Immune System

Authors : Muneeb Ahmad, Ali Raza

Abstract : A computational method inspired by the immune system (IS) is presented, leveraging its shared characteristics of robustness, fault tolerance, scalability, and adaptability with swarm intelligence. This method aims to showcase flocking behaviors in a swarm of robots (SR). The innate part of the IS offers a variety of reactive and probabilistic cell functions alongside its self-regulation mechanism which have been translated to enable swarming behaviors. Although, the research is specially focused on flocking behaviors in a variety of simulated environments using e-puck robots in a physics-based simulator (CoppeliaSim); the artificial innate immune system (AIIS) can exhibit other swarm behaviors as well. The effectiveness of the immuno-inspired approach has been established with extensive experimentations, for scalability and adaptability, using standard swarm benchmarks as well as the immunological regulatory functions (i.e., Dendritic Cells' Maturity and Inflammation). The AIIS-based approach has proved to be a scalable and adaptive solution for emulating the flocking behavior of SR.

Keywords : artificial innate immune system, flocking swarm, immune system, swarm intelligence

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