

PhD PROPOSAL **Morpho-Swarm Robotics**

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Summary

In swarm robotics, the demonstration of collective behaviors is essentially based on software programming of robot behaviors, the physical specificities of robots being considered as constraints. However, recent works in physics, in the field of active matter (self-propelled particle system) show that self organization at large scale can emerge from the simplest physical steric interactions amongst the particles, coupled to the directional motion of the particles, without requesting any form of computational capacity.

Our goal is to achieve collective decision making in swarm robotics, using both morphological interactions and logical computation, based on this simple idea that embodiment is critical and useful for programming self-organizing collective systems.

The PhD research will be the follow up of a 2-year postdoc program, during which we achieved the design of a new kind of swarm robotics set-up. The goal of the PhD research plan will be to obtain specific educated collective behaviors: starting from the spontaneous phase obtained from the purely physical interaction of the robots and applying minimal control from embodied capabilities on each robot, we will induce collective behavior, which we will refer to as operational phases. Optimization of such behavior will allow for the realization of complex collective tasks

The project is a nice mix of experiments, numerics and theory.