TEK9010 - Exam prep summary

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9: Swarm Robotics 1

What is swarm robotics?

There is no explicit definition of a *swarm* in literature. A swarm is defined via its behavior.

The *size of a swarm* is defined by what it is not: "not as large as to be dealt with statistical averages" and "not as small as to be dealt with as a few-body problem". The size of a swarm N is

$$10^2 < N << 10^23,$$

not Avagadro-large.

Swarm robotics is "the study of how a large number of relatively simple physically embodied agents can be designed such that a desired collective behavior emerges from local interactions among agents and between agents and the environment", according to Dorigo and Sahin. But! A swarm is not necessarily

There are some key features. The fact that local interactions between agents and the environment should be possible requires robots to have local sensing and probably also communication capabilities. In fact, (local) communication is considered a key feature of swarms.

Collaboration is required to go beyond a mere paralllisation in swarm a swarm system. We want to go beyond the performance of simple parallelisation. Think of some a clearning task with each robot cleaning a small assigned area.

Swarm performance.

Modelling swarms as a series of mappings.

When are rate equations appropriate?

The Langevin equation.

The Focker-Planck equation.