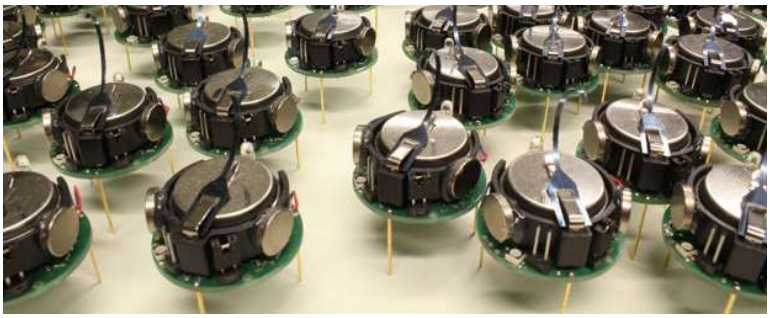
UNIVERSITÄT ZU LÜBECK
INSTITUT FÜR TECHNISCHE INFORMATIK

Master / Bachelor Thesis

Human-in-the-loop Collection Decision Making

Inspired by social insects, a group of simple robots can work together to collectively decide on a property without having any global information. This behavior is called, swarm intelligence that demonstrates high fault tolerance which is essential for critical real-world applications. To this date, swarms are not capable of autonomously performing complex tasks (e.g., disaster management) due to their limited capabilities including situation awareness and collective decision making. Humans, however, are capable of making prompt decisions. Pairing the capabilities of humans and swarms will allow the system to be resilient as well as reliable.



Scope of the project

In this project, the student will have access to 100 tiny robots (3.3 cm in diameter) called "Kilobots". An overhead projector will provide a range of light distribution for the robots to perceive and the robots will use the light distribution to decide about the brightness of the environment. Meanwhile, a connection device called, overhead controller can be used to send extra information to the robots that might be supporting the swarm's current decision or contradict it.

Topic 1: Controllability of Collective Decision Making

In this topic, the student will find a collective decision making strategy where a human operator can intervene in the decisions using an overhead controller and (s)he will show that the swarm follows the lead of the human operator and the human-swarm system collectively can find out about the property of the environment.

Topic 2: Multiple Operators for Human-swarm Interaction

In this project, the student will use two communication unit (i.e., overhead controllers) to send supporting or contradicting commands to the swarm. For example, the swarm decides that the environment is bright. Operator 1 supports this decision while operator 2 disagrees. The student will build a collective decision-making strategy that supports multiple human operators and allows them to influence the swarm and the robots will listen to the one with confidence value.

For more information, please contact me (javad.ghofrani@uni-luebeck.de)