

CoCoRo: A swarm of self-aware underwater robots

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The EU-funded project CoCoRo studies a heterogeneous swarm of AUVs used for monitoring and search purposes. The swarm consists of a 'base station' (global information source), a self-aware 'ground-swarm' performing focal tasks and a 'relay-swarm' establishing a communication link. Hardware development will adopt ad-hoc technologies in order to fabricate several autonomous underwater vehicles (AUVs) able to swim in 3D and to explore complex environments with flexibility, autonomy and reliability.

A redundant set of proprioceptive and exteroceptive sensors (blue light, pressure waves, coupled electrostatic oscillators) allows swarm communication and exploration. Self-awareness are emergent results of bio-inspired mechanisms derived from fish, honeybees, immune-systems and neurons. Information is processed at low levels on a local basis generating collective-level memory and cognition.

The CoCoRo platform contains a fault tolerant hardware abstraction layer and middleware which affords important levels of fault identification and recovery. A novel aspect will be a bio-inspired operating system that – as default behaviour – allows the swarm to shoal and maintain coherence.

Collective discrimination of environmental properties will be processed on an individual or on a collective level given the cognitive capabilities of the AUVs. Collective self-recognition will be experimented by bio-inspired experiments allowing the quantification of collective cognition.

CoCoRo is planned to be an underwater swarm that mixes bio-inspired motion principles with biology-derived collective cognition mechanisms in a blended manner. This way a novel robotic system will be designed that is highly scalable, very reliable and – in parallel – very flexible concerning its behavioral potential.