CoCo Seminar Series Fall 2019

Repairing Broken Ecosystems with Autonomous Robot Swarms

Dr. Thomas Schmickl -- Professor of Zoology, Karl-Franzens-University, Graz, Austria

Wednesday December 4, 2019 11:00am-12:00pm

Engineering Building T-1 (Multipurpose Room)

Ecosystems are currently breaking down world-wide, especially insect species are dramatically disappearing. In order to protect our society, which depends on the ecosystems it is a part of, we have to prevent further decline of bio-diversity. However, damages are already present and crucial "key-stone species" are threatened. We studied the collective swarm-behavior of two highly threatened animal groups (honeybees and fish) and, as a proof-of-principle demonstration, we have designed two robot species that can infiltrate those ecosystems and even coordinate these very different animals with respect to each other. This way we have created, for the first time in history, a novel ecological link between them by embedding autonomous robots in a small living ecosystem. This was the first time that such an ecological link was mediated by autonomous robots, showing that this is a viable option to externally stabilize fragile, or even already broken, ecosystems. In recent research, I try to use robotic devices to turn whole honeybee colonies into bio-hybrid robotic systems to use them as a novel ecological agent.

Dr. Thomas Schmickl is full professor at the Department of Zoology at the Karl-Franzens-University, Graz, Austria, where he is also supervising the Artificial Life Lab, which he founded in 2007, after returning from a HHMI visiting professorship in the USA. In 2012, he was appointed the Basler Chair of Excellence at the East Tennessee State University (ETSU), Johnson City, TN, USA. Besides his research activities in the fields of Zoology, Biological/Ecological Modeling, Bio-inspired Robotics (Swarm Robotics, Modular Robotics, Neural Networks, Artificial Hormone Systems, Evolutionary Robotics) he teaches also ecological modeling and multi-agent simulations at the Department of Environmental System Sciences at the URBI faculty at Karl-Franzens-University Graz. He also taught as a lecturer in multi-agent modeling at the course of study "Industrial Simulation" at the University of Applied Sciences in St. Pölten, Austria for more than 10 years. He was/is partner in the international EU-funded projects I-SWARM, SYMBRION, REPLICATOR, FloraRobotica and he was/is leading scientist and consortium coordinator of the EU grants CoCoRo, ASSISIbf and subCULTron and HIVEOPOLIS. These projects all aimed at improving the current state-of-the-art in robotics to let them be more similar to animals (or other natural organisms) in order to be adaptive, resilient and flexible. In his recent projects, animals and plants became even parts of the robotic systems, in order to form bio-hybrid societies of natural organisms and robotic agents to achieve a novel, more powerful but also more sustainable symbiosis. Recently, he founded the COLIBRI initiative (Complexity of Life in Basic Research and Innovation) at the University of Graz, which is a network of approx. 20 full professors who research complexity sciences and join forces across various disciplines (Biology, Economics, Sociology, Psychology, Mathematics, Chemistry, etc.). He extended his research interest into socio-economic multi-agent modeling through the work in this initiative. For more information, contact Hiroki Sayama (sayama@binghamton.edu). coco.binghamton.edu