Chiroptera-Inspired Robotic CEphaloid: a Novel Tool for Experiments in Synthetic Biology

Period:

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Partners:

Universiteit Antwerpen
Universität Erlangen-Nürnberg
Katholieke Universiteit Leuven
Bath University
University of Edinburgh
Universität Tübingen
Project Goals

• to reproduce, at a functional level, the echolocation system of bats, i.e. to construct a bionic bat head
• to use this bionic bat head to gain more insight into neural encoding of sensory data in an active sensing context
Challenges: Bionic bat head

• transducers & efficient drivers for emission/reception of ultrasonic sound waves
• neuromimetic hardware to realise realtime signal processing
• beamforming shapes to model the bat's mouth/nose & pinnae
• ‘micro’-mechanical system for pinna/emitter movement & shape control
Challenges: Realistic Biosonar Tasks

- classifying natural landmarks based on spike coding of the relevant echo features
- make use of head configuration and body movement to facilitate extraction of echo features
- navigation in natural environments
Expected achievements

• advanced bionic bat head supporting:
  – Large bandwidth signals
  – Real-time spectral analysis of echo signal
  – Active sensing

• improved understanding of biosonar:
  – Acoustical signal processing
  – Neural coding of echo features
  – Neural signal processing
Future FET actions

What is Space, that a Man May Know It, and a Man, that He May Know Space?
(paraphrasing Warren S. McCulloch)

• perception of space
• representation of space
• interaction with space