BIOANT
A Biologically Plausible Connectionist Approach to an Insect Simulation

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ABSTRACT

The system BIOANT is designed to demonstrate the use of a biologically plausible artificial neural network in a system that simulates a home insect.

The insect chosen for simulation was the so-called "ghost ant" (*tapinoma melanocephalum*), which may be found easily in Brazil and throughout the world. The species was studied and a number of features (body structure and behavior patterns) were extracted in order to simulate them by means of a computational system prepared to run on personal computer platforms.

Special emphasis was given to the use of a biologically plausible artificial neural network as the control instance of each ant. The network was designed according to the following principles [5]:

- Biological Realism
- Distributed Representations
- Inhibitory Competition
- Bidirectional Activation Propagation
- Error-driven Learning
- Hebbian Learning

Furthermore, BIOANT employs the biologically plausible GeneRec algorithm [4]. The net controls all actions and processes of the insect by means of sensors, which capture external information like vision of objects, touch signals, different smells etc., as well as internal information like digestion. It has actuators for simulating legs, antennas, mandibles etc. (see diagram 1).

The ant will be inserted in a synthetic virtual reality environment, consisting of different sources of food, other ants for the simulation of social behavior as well as enemies, which are implemented using a symbolic approach.

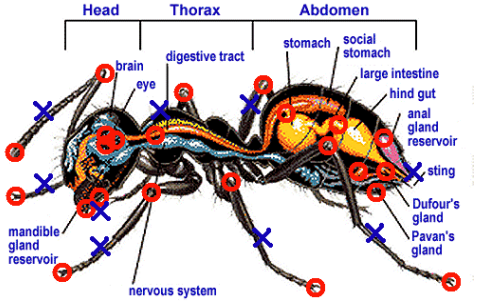

Diagram 1: General layout of sensors (marked "O") and actuators (marked "X") across the ant. [6]

The main intention of the project is to contribute to what is understood as "the artificial evolution", i.e. the evolution of artificial life systems in analogy to the way natural evolution always followed - mainly starting with simple organisms and reusing the acquired knowledge for more advanced systems [1].

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