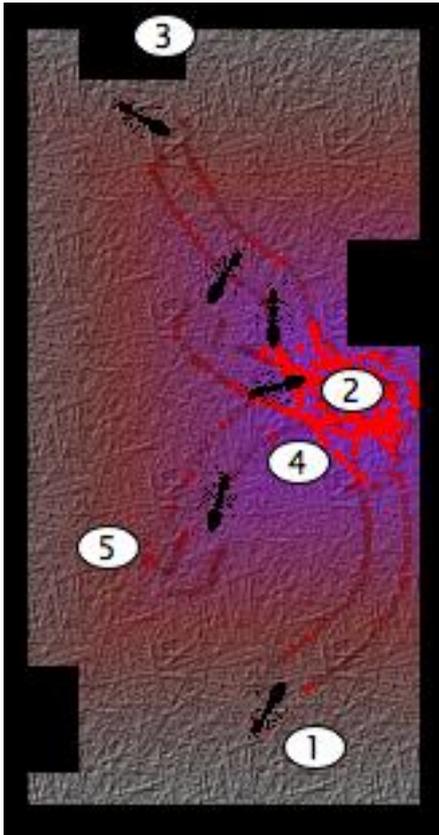


Ants

The model of ants is an example of a structure solely made of several identical cells - [Digital Biological Neurons \(DBN\)](#). Our aim is to show, how DBN laws can result in a desirable and complex behavior of an organism.

To make things simple, the DBN is restricted to two laws only: Fire law and Mediator law. We created the network of DBN by hand and therefore the Receptor and Synaptic laws take no effect.



As the name 'Ants' suggests real ants inspired us. We have chosen the following five characteristics of a real ant we want to simulate:

1. The ant is able to walk in an area depending on environment
2. The ant is able to release odor into the environment and make a path
3. The ant is able to avoid collisions with other ants or an unfriendly environment
4. The ant is able to follow some already existing path
5. The ant is able to turn and go back

You could object, that ant's behavior is more complex, or that there are other more sophisticated models of an ant. Our response is:

- The aim is not to simulate ants in very detail; our aim is to show, what DBN laws are capable of. The goal still lies in the simulation of mental process.
- So far what we have found, this is the only simulation of an ant performed on cellular level.
- The possibilities of DBN laws are not limited to those five aspects of an ant. If somebody gives it an effort, we do not see any limitation for future extensions of the model by more features.

The latest implementation of the ant called Thrakia consists of eleven Digital Biological Neurons, which are communicating using five mediators. The ant gets all what it needs from the environment by left and right tentacle. The tentacle provides information of intensity and types of the odors on the way. When the ant wants to move, it produces signals telling it's right and left legs to move forward or backward. The type and intensity of the signal is also used to release odors into the surrounding world.

If you follow [this link](#), a new window opens with couple Thrakia ants. After you start the real time simulation, you can observe the ants as well as their odors. You can also try to drag'n'drop an ant if you want to put it into a new place. When you make your observations, we would like to make emphasis on differences between simulation on cellular level and a simulation on level of a whole organism. The explanation should give you an insight, why we decided to create the DBN first (point 3 from The approach) instead of direct simulation of a mind. Going deeper and behind the scenes surprisingly makes things easier (eleven neurons only), but more importantly you get an unified model, which allows to describe more aspects at once.

For those interested in the subject, there is a set of pages dedicated solely to the [Ants project](#) and simulation related questions.

We have received many requests to see the implementation of DBN. We are very pleased by the attention given to our project and we offer java source code of the Thrakia ant. The code should give you an idea how simple the laws are.

File name	Contains
AcceptMediators	java interface of a DBC, which can accept mediators
FireLaw	implementation of the Fire law
MediatorLaw	implementation of the Mediator law
Neuron	implementation of Neuron
Odor	implementation of odors in the surrounding world
OutputDBC	implementation of the ant's output cell
Synapse	implementation of Synapse
Tentacle	implementation of the ant's input cell
ThrakiaAnt	connection between network and surrounding world
ThrakiaNetwork	interconnection of DBN
TimeAware	scheduling of neurons for real time simulation
ZygothicGraph	implementation of genetic information