

C. Creative Creature Behaviour (CreBe) software guide

This is a short documentation on how to setup and run the Creative Creature Behaviour (CreBe) software system. This includes installing the Java runtime environment, run the system and how to configure the various software parameters.

System requirements, setup and installation

The CreBe software is written in the Java programming language. In order to run this software, the Java Runtime Environment (JRE) or Java Development Kit (JDK) needs to be installed on the system. However, JDK is only needed if you intend to alter the source code and recompile the software. The JRE is sufficient for simply running the software.

The newest version of JRE and JDK can be downloaded from Oracle's website:

- JRE: <https://java.com/en/download/>
- JDK: <http://www.oracle.com/technetwork/java/javase/downloads/index.html>

It is recommended to always use the newest version of Java provided by Oracle.

Running the software

Once Java (either JRE or JDK) is installed on the host system, the CreBe software can be started by simply double-clicking the *CreativeBehaviour.jar* file. When run for the first time, five configuration files will be automatically generated and placed in the same folder as *CreativeBehaviour.jar*. These files contain all configuration for the software system, and are initialised to some standard configuration.

The software can also be started from command line, as

```
java -jar CreativeBehaviour.jar <params...>
```

Note that starting from command line require Java to reside in the system PATH-variable.

Possible parameters for the software are:

Parameter	Description
-debug	Start the system in debug mode (visible sensory ranges, brain-module input/output values etc.)
-headless	Start the system in headless mode, meaning no GUI will be shown. Creatures are automatically exported to disc. Suitable for servers where no graphics context is available.
-seed	Sets the seed of the random number generator. Same seed will always produce the same simulation results. Suitable for development and during debugging. Note that this parameter only works as intended in single thread operation.
-presentation	Presentation of one or more creatures. No simulation or evolution is performed. Specify creatures to present using -designed <txt_files> where txt_files are the list of manually defined creatures to present.

Figure 1 shows the main window of the application.

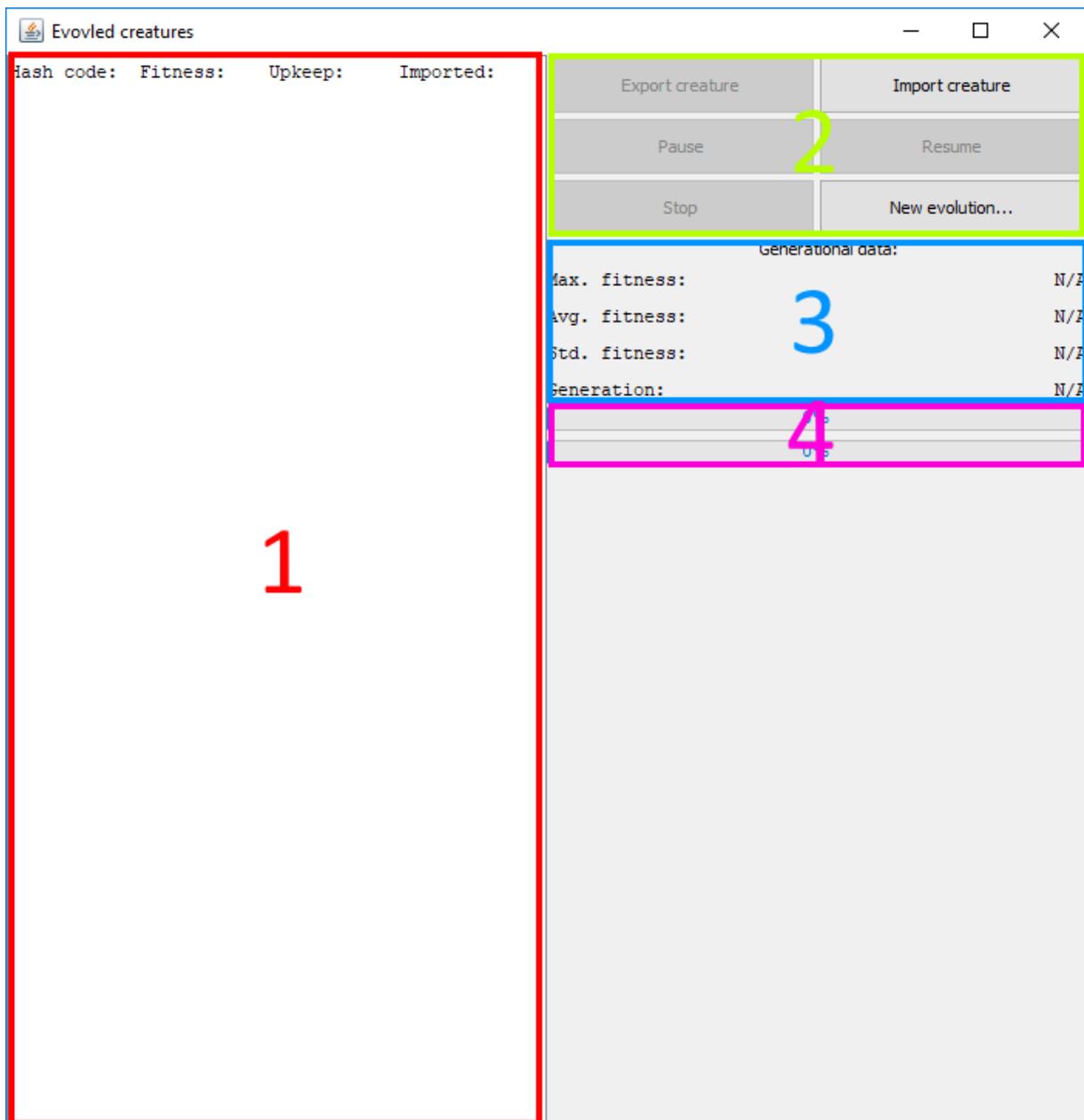


Figure 1: Screenshot of the main window. Consult the following table for a description of the various parts.

	Main window explanation
1	Evolved creatures window. When a new best creature is found, it is added to this list. Double click on an element in this list to run a simulation of that creature.
2	Control buttons. Export a creature to disk by selecting it from the creature list, then click the “Export creature” button. Start a new run by clicking “New evolution...”, which brings up the configuration window.
3	Live telemetry from the current evolution: maximum fitness, average fitness, fitness standard deviation and current generation.
4	Progress bars for the current evolution. The upper progress bar applies to the current run, the lower applies to the whole evolution.

System configuration

Clicking the “New evolution...” button brings up the configuration window, and the ability to start a new evolution. Some configuration options are not available in this user interface, and must be manually specified in the configuration files before the application is started.

The image shows a 'New evolution setup' dialog box with the following elements:

- Brain module:** CTRNN (dropdown menu)
- World scenario:** FOOD_WORLD (dropdown menu)
- Run mode:** Radio buttons for 'Designed' and 'Full' (selected)
- Behaviour EA:** Generations: 20, Population size: 20 (spinners)
- Physical evolution EA:** Generations: 20, Population size: 20 (spinners)
- Entity file:** Text input field with a 'Browse...' button
- Number of runs:** Spinner set to 1
- Options:**
 - Dump fitness data to disk
 - Use multiple threads
- Buttons:** Start, Cancel

Figure 2: Configuration window.

Configuration window explanation	
1	Brain module and world scenario selection.
2	Run mode. Designed: evolve behaviour only. Use a predefined set of entities for the creature. Full: evolve both behaviour and entities.
3	Population size and number of generations. Separate configuration for behaviour and physical evolution.
4	If run mode is set to “Designed”, select a text file containing the entity specification.
5	Number of runs to perform (repetitions).
6	“Dump fitness data to disk” will dump maximum, average and fitness standard deviation to log files. “Use multiple threads” will allow the system to utilize multiple processor cores.

In order to run a simulation of a creature, double click on some creature in the creature list. The simulation will begin automatically, using the world scenario that was used to evolve that particular creature. Figure 3 shows a simulation example.

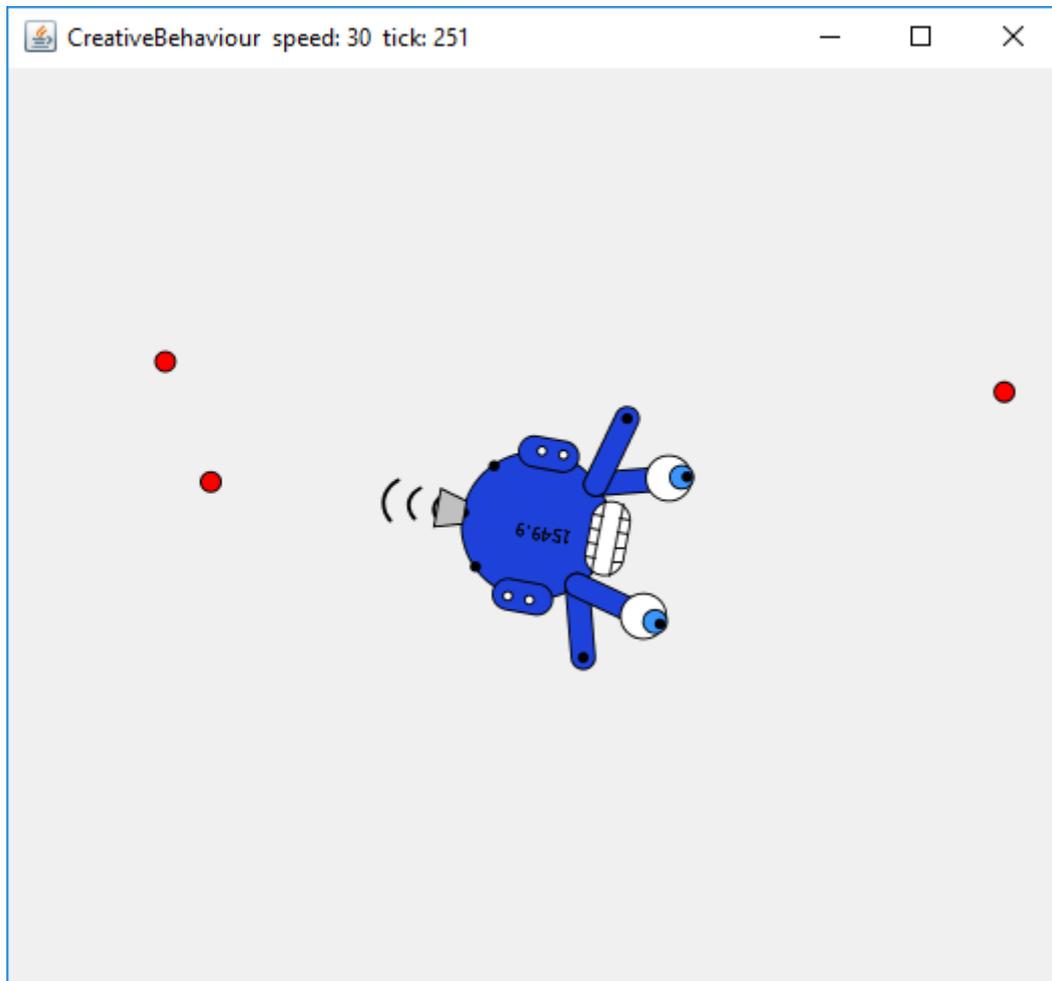


Figure 3: Simulation of a creature.

Control the simulation with the following keys:

Key	Description
D	Toggle debug information, such as sensor ranges, eye field-of-view, actuator activation values, etc.
V	Centre the camera and follow a creature. If multiple creatures are present in the world, repeatedly press to cycle through all creatures.
+	Speed up simulation.
-	Slow down simulation.
Drag with mouse	Look around the world (disabled if camera is centred on a creature).
Mouse scroll wheel	Zoom in and out.