# IMAGE ANALYSIS TOOLS IN AN INTEGRATED DEVELOPMENT ENVIRONMENT FOR ECOLOGICAL MODELING AND FOR DIFFERENT SCALES

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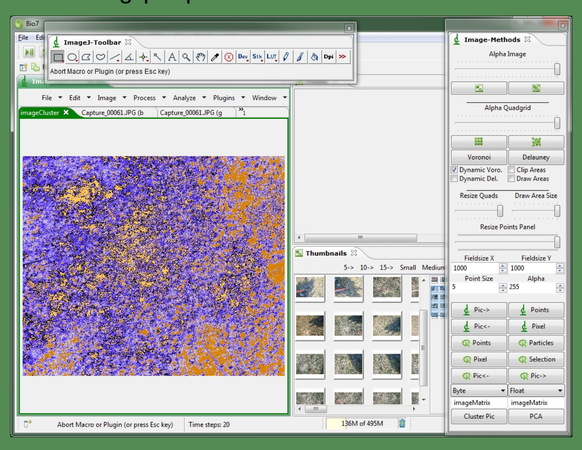
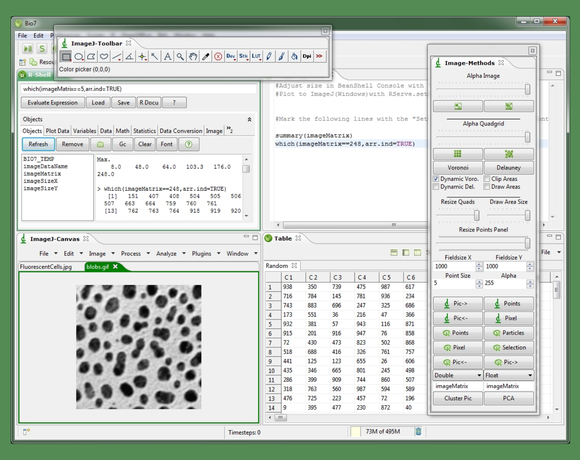
## Image Analysis

Image Analysis is a fundamental part to observe patterns and processes behind the patterns. Bio7 addresses this with a direct integration of scientific image analysis tool ImageJ. As an Eclipse Rich-Client-Platform Bio7 embeds the ImageJ interface as special displays (views) in a highly customizable graphical user interface. Instead of windows images are opened and displayed in a tabbed interface arranged in the Bio7 ImageJ display.
In Bio7 the analysis capabilities of ImageJ can be used to detect patterns in images of ecological systems and generate valuable data for e.g. modelling purposes.



## ImageJ and R

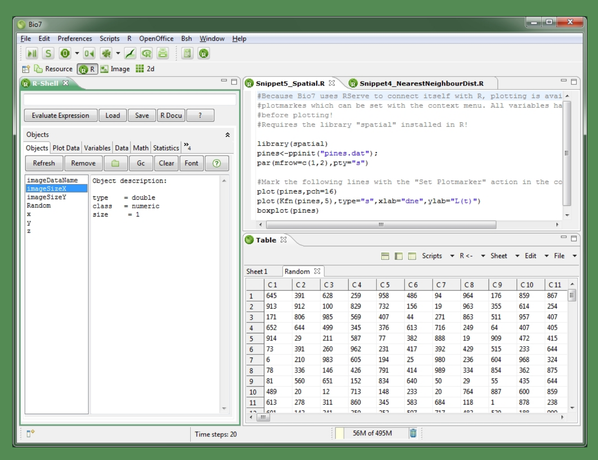
Bio7 is one of the first applications containing special methods to effectively transfer image data and ROI data (as matrices or vectors) from ImageJ directly into R (without producing intermediate files).
Vice versa vector or matrix data created in R can be transferred back efficiently to ImageJ for the creation and analysis of images (e.g., Float, RGB and Greyscale images). With both interfaces and the easy to use data exchange available in Bio7 complex analysis tasks can be executed easily also useful for disciplines beyond ecological modelling.



## Statistical Analysis

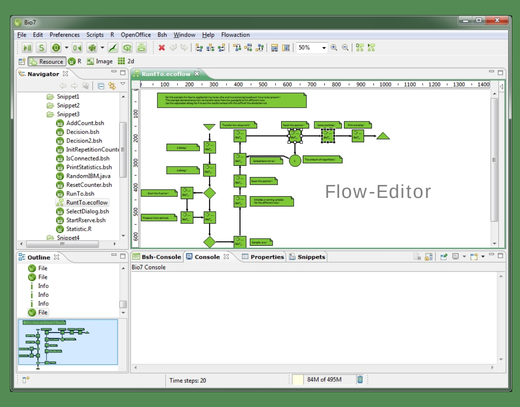
Bio7 contains a full graphical user interface to the R application.
The interface consists of an R shell for the evaluation of R commands and a spreadsheet to import or export data from and to R.
In addition Bio7 contains an R editor for the evaluation of R scripts.

For the connection between Java and R a server application (Rserve) is used which could also be connected to a remote server instance.



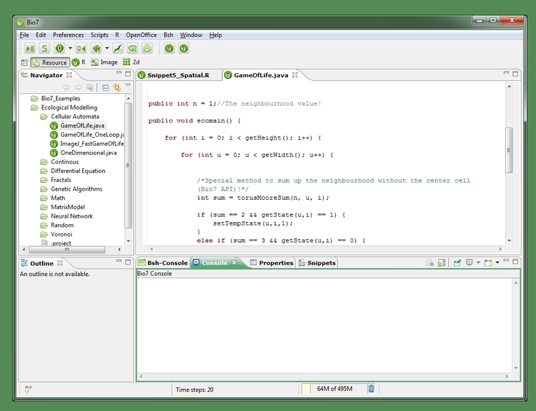
## Sensitivity Analysis

Ecosystems are highly dynamic in their aboveground and belowground processes. To test hypotheses on system functioning it is often required to run simulations under different conditions and compare the results with the real system.The Flow-Editor in Bio7 is capable to handle this required flexibility to analyse a huge space of different situations and possibilities. All programmed methods and statistical analysis files which are required can be dragged into the Flowchart-Editor. Because of the possibility of creating loops and decisions in between a flow of files hundreds or thousends situations with different parameters can be analysed by statistical well proofed methods ("R") and summarized.



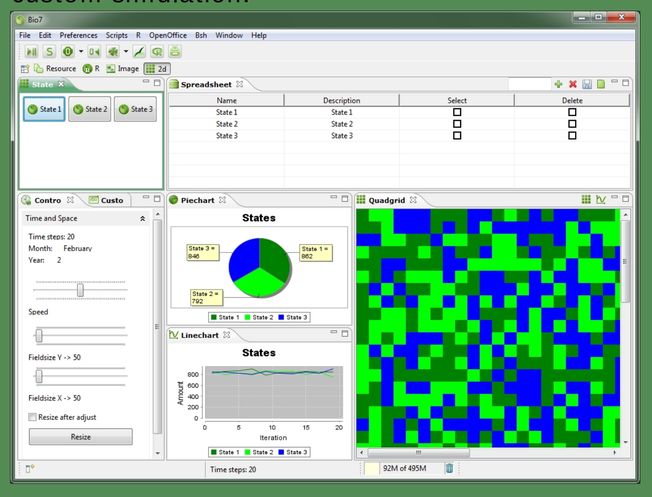

## Programming Editors

Bio7 contains several editors for the programming and scripting languages Java, R and BeanShell (Groovy). Custom code can be compiled or interpreted dynamically with the available editor actions.
The editors are opened by default in the "Resource" perspective which in addition contains e.g. a console for compilation errors and a file organisat display.



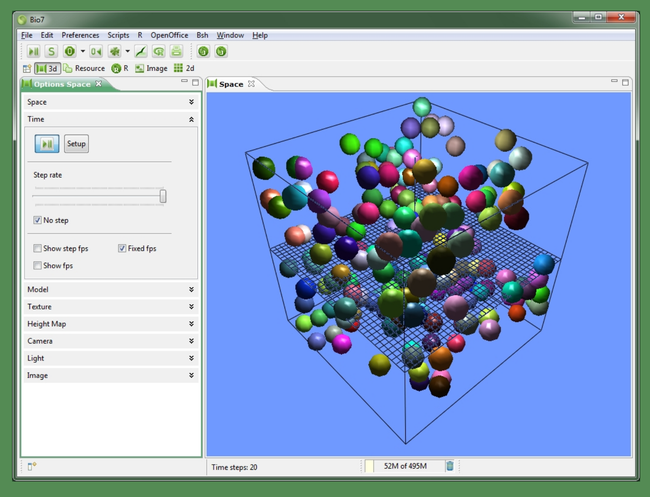
## Discrete Simulations

Bio7 is an integrated development environment with a strong support for spatially explicit models. After activation in the "Spreadsheet" every cell in the visualization represents an individual state.
Each state can be programmatically accessed for a custom simulation.



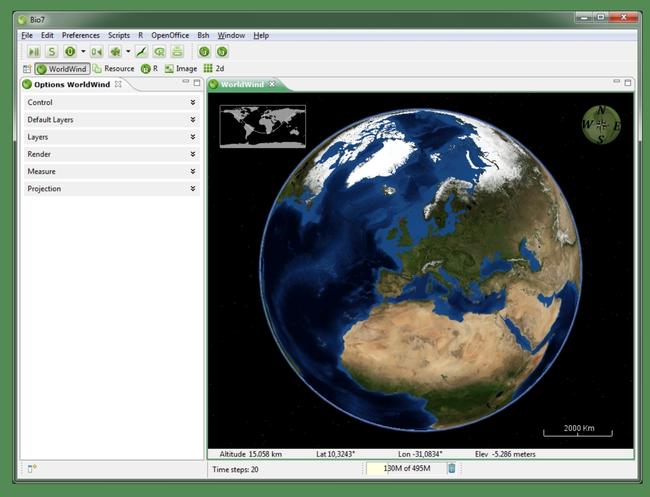
## 3D Visualization

In a 3d perspective Java OpenGL models can be displayed for the visualization of 3d-models. The models can be dynamically compiled with the embedded Java compiler executed and displayed in a special panel (view) of Bio7.



## 3D Globe

In a special perspective of Bio7 a 3D-globe is available. Custom simulation models (created with the Java editor) can be visualized dynamically and georeferenced on the virtual globe.



Website: http://bio7.org