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neuroConstruct: a software tool for constructing biologically realistic neural network simulations in 3D

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The 3D structure and interconnectivity of many brain regions (e.g. the cerebellum) is believed to be an essential determinant of their behaviour. To effectively model such networks and to compare the population behaviour with imaging data, it is important to create model networks in 3D. We have developed a software application, neuroConstruct, which facilitates the development of such networks in 3D. Cell models can be created based on imported neuronal morphology files, e.g. Neurolucida, and appropriate channel and synaptic mechanisms can be added. Cells can be positioned in 3D to mimic the observed arrangement in tissue samples. Connections between cells can be generated and the network structure analysed. The application can generate code for execution in either NEURON or GENESIS. Simulation results are stored, and the network behaviour can be visualised and analysed with neuroConstruct. It is intended that this software will facilitate the interchange of neuronal models and make them more accessible to both experimental and computational neuroscientists.

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Where applicable, the authors confirm that the experiments described here conform with the Physiological Society ethical requirements.