

Appendix

Parameter Tables

Parameters of the .neu files. The indentation follows the branch structure of the data tree. Folders are in **bold** font, sheets, where values can be changed are in normal font. Default values (taken from experimental findings described in the literature) are in ■ lists.

Param.neu

Param.neu	
circuit	
(deprecated)	
net	
contains information about the types and numbers of neurons generated, and a parameter to influence the number of synapses	
dist_synapse	below this threshold distance (μm) between axons and dendrites synapses will be set ■ 2.5
nL23pyramidal	number of L2/3 pyramidal cells in the network
nL4stellate	number of L4 stellate cells in the network
nL5Apyramidal	number of L5A pyramidal cells in the network
nL5Bpyramidal	number of L5B pyramidal cells in the network
nstarpyramidal	number of L4 starpyramidal cells in the network
neuron	
contains information about the appearance of a single cell. Parameters of all neuron parts, including axon, dendrites, soma and synapses, as well as the deviation from the “abstract base neuron” and the numbers of dendrites can be changed	
axon	contains length, radius and branching parameters of the axon
■ len_param	length parameter of the axon (multiplied with soma radius)
■ z	base length in z direction in μm ■ 375 (L4 stellate) / soma radius ■ 400 (L2/3 pyramidal, L4 star) / soma radius

Param.neu	
	<ul style="list-style-type: none"> ■ 500 (L5 pyramidal) / soma radius
<ul style="list-style-type: none"> ■ nbranch 	number of branches of the axonal tree <ul style="list-style-type: none"> ■ 12 (L2/3 pyramidal) ■ 26 (L4 stellate) ■ 24 (all other types)
<ul style="list-style-type: none"> ■ nparts 	number of segments for the primary trunk of the axon <ul style="list-style-type: none"> ■ 90 (L4 stellate) ■ 100 (all other types)
<ul style="list-style-type: none"> ■ rad 	base radius (context-sensitive parameter)
<ul style="list-style-type: none"> ■ max 	maximum base radius in μm <ul style="list-style-type: none"> ■ 0.5
<ul style="list-style-type: none"> ■ min 	minimum base.radius in μm <ul style="list-style-type: none"> ■ 0.1
dendrite	contains settings for the dendritic tree
<ul style="list-style-type: none"> ■ gen_0 	first dendritic generation of the dendritic tree
<ul style="list-style-type: none"> ■ branch_angle 	base angle between two branches at a branching point in degree
<ul style="list-style-type: none"> ■ max 	maximal branching angle <ul style="list-style-type: none"> ■ 60.0
<ul style="list-style-type: none"> ■ min 	minimal branching angle <ul style="list-style-type: none"> ■ 30.0
<ul style="list-style-type: none"> ■ len_param 	geometric length vector in multiples of the soma radius...
<ul style="list-style-type: none"> ■ x 	...in x-direction <ul style="list-style-type: none"> ■ 20.0
<ul style="list-style-type: none"> ■ y 	...in y-direction <ul style="list-style-type: none"> ■ 0.0
<ul style="list-style-type: none"> ■ z 	...in z-direction <ul style="list-style-type: none"> ■ 0.0
<ul style="list-style-type: none"> ■ nbranch_param 	number of branches

Param.neu	
■ nbranch_density	density of compartments (number per μm) ■ 0.25
■ siblings	subsequent generations of the dendritic tree ...
■ siblings...	... and their parameters
■ rad	■ base radius of the dendrite in μm (context-sensitive)
■ max	maximum radius ■ basal ■ 0.5 (L4 star) ■ 1.5 (all other types) ■ apical ■ 0 (L4 stellate) ■ 2.5 (L4 star) ■ 1.5 (all other types)
■ min	minimum radius ■ basal ■ 0.5 (L4 stellate) ■ 0.25 (all other types) ■ apical ■ 0 (L4 stellate) ■ 0.5 (L4 star) ■ 0.25 (all other types)
deviation	contains parameters to control the deviation from the base neuron; i.e. the appearance of the realization of this neuron
■ x	deviation in x-direction ■ 1.0
■ y	deviation in y-direction ■ 1.0
■ z	deviation in z-direction ■ 1.0

Param.neu	
napiden	number of apical dendrites ■ 0
nden	total number of primary dendrites (basal and apical) ■ 11
siblings	contains parameters for the cells of the subsequent generations of this neuron
■ L4stellate	siblings, which are L4 stellate neurons
■ axon	contains length, radius and branching parameters of the axon
■ len_param	length parameter of the axon... (multiplied with soma radius)
■ z	...in z direction ■ 75.0
■ nbranch	number of branches of the axonal tree ■ 26.0
■ nparts	number of segments for the primary trunk of the axon ■ 90
■ rad	base radius of the axon in μm
■ max	maximum radius ■ 0.5
■ min	minimum radius ■ 0.1
■ dendrite	contains settings for the dendritic tree
■ gen_0	first dendritic generation of the dendritic tree
■ branch_angle	base angle between two branches at a branching point in degree
■ max	maximum branch angle ■ 60.0
■ min	minimum branch angle ■ 30.0

Param.neu	
■ len_param	length parameter of the dendrite... (multiplied with soma radius)
■ x	...in x-direction ■ 15.0
■ y	...in y-direction ■ 0.0
■ z	...in z-direction ■ 0.0
■ nbranch_param	number of branches of the dendrite ■ 4
■ nparts_density	density of compartments, number per μm ■ 0.25
■ siblings	subsequent generations of the dendritic tree...
■ siblings	...and their parameters
■ rad	radius of the dendrite in μm (context-sensitive parameter)
■ max	maximum radius ■ 1.5
■ min	minimum radius ■ 0.5
■ deviation	contains parameters to control the deviation from the base neuron; i.e. the appearance of the realization of this neuron...
■ x	...in x-direction ■ 0.5
■ y	...in y-direction ■ 0.5
■ z	...in z-direction ■ 0.5
■ napiden	number of apical dendrites ■ 0

Param.neu	
■ nden	total number of primary dendrites (basal and apical) ■ 7
■ soma	soma parameters
■ rad	radius of the soma in μm ■ 5.0
■ synapse	synapse parameters
■ rad	radius of the synapse in μm ■ 1.0
■ pyramidal	siblings, which are pyramidal neurons
■ axon	contains length, radius and branching parameters of the axon
■ len_param	length parameter of the axon... (multiplied with soma radius)
■ z	...in z-direction ■ 80.0
■ nbranch	number of branches of the axonal tree ■ 12.0
■ nparts	number of segments for the primary trunk of the axon ■ 100
■ rad	base radius of the axon in μm
■ max	maximum radius ■ 0.5
■ min	minimum radius ■ 0.1
■ dendrite	parameters for the dendrites
■ apical	parameters for the apical dendrites
■ gen_0	first dendritic generation of the dendritic tree
■ branch_angle	base angle between two branches at a branching point in degree

Param.neu	
■ max	maximum angle ■ 5.0
■ min	minimum angle ■ 1.0
■ len_param	length parameter of the dendrite... (multiplied with soma radius)
■ x	...in x-direction ■ 0.0
■ y	...in y-direction ■ 0.0
■ z	...in z-direction ■ 180.0
■ nbranch_param	number of branches ■ 4
■ nparts_density	density of compartments (number per μm) ■ 0.25
■ siblings	subsequent generations...
■ siblings...	...and their parameters
■ noblique	number of oblique dendrites ■ 2
■ oblique	parameters of oblique dendrites
■ gen_0	first dendritic generation of the dendritic tree
■ branch_angle	base angle between two branches at a branching point in degree
■ max	maximum angle ■ 95.0
■ min	minimum angle ■ 85.0
■ len_param	length parameter of the dendrite (multiplied with soma radius)
■ x	...in x-direction

Param.neu	
	<ul style="list-style-type: none"> ■ 12.0
<ul style="list-style-type: none"> ■ y 	...in y-direction <ul style="list-style-type: none"> ■ 0.0
<ul style="list-style-type: none"> ■ z 	...in z-direction <ul style="list-style-type: none"> ■ 0.0
<ul style="list-style-type: none"> ■ nbranch_param 	number of branches <ul style="list-style-type: none"> ■ 3
<ul style="list-style-type: none"> ■ nparts_density 	density of compartments (number per μm) <ul style="list-style-type: none"> ■ 0.25
<ul style="list-style-type: none"> ■ siblings 	subsequent generations...
<ul style="list-style-type: none"> ■ siblings... 	...and their parameters
<ul style="list-style-type: none"> ■ rad 	base radius of the oblique dendrites
<ul style="list-style-type: none"> ■ max 	maximum radius <ul style="list-style-type: none"> ■ 1.5
<ul style="list-style-type: none"> ■ min 	minimum radius <ul style="list-style-type: none"> ■ 0.25
<ul style="list-style-type: none"> ■ basal 	parameters of the basal dendrites
<ul style="list-style-type: none"> ■ gen_0 	parameters of the first dendritic generation
<ul style="list-style-type: none"> ■ branch_angle 	base angle between two branches at a branching point in degree
<ul style="list-style-type: none"> ■ max 	maximum angle <ul style="list-style-type: none"> ■ 60.0
<ul style="list-style-type: none"> ■ min 	minimum radius <ul style="list-style-type: none"> ■ 30.0
<ul style="list-style-type: none"> ■ len_param 	length parameter of the dendrite (multiplied with soma radius)
<ul style="list-style-type: none"> ■ x 	...in x-direction <ul style="list-style-type: none"> ■ 20.0
<ul style="list-style-type: none"> ■ y 	...in y-direction <ul style="list-style-type: none"> ■ 0.0

Param.neu	
■ z	...in z-direction ■ 0.0
■ nbranch_param	number of branches ■ 3
■ nparts_density	density of compartments (number per μm) ■ 0.25
■ siblings	subsequent generations...
■ siblings...	...and their parameters
■ rad	base radius of the basal dendrites in μm
■ max	maximum radius ■ 1.5
■ min	minimum radius ■ 0.25
■ deviation	contains parameters to control the deviation from the base neuron; i.e. the appearance of the realization of this neuron
■ x	...in x-direction ■ 1.0
■ y	...in y-direction ■ 1.0
■ z	...in z-direction ■ 1.0
■ napiden	number of apical dendrites ■ 1
■ nden	number of primary dendrites (basal and apical) ■ 8
■ siblings	subsequent generations of the neuron
■ L23pyramidal...	subsequent generations, which are L2/3 pyramidal cells and their parameters

Param.neu	
■ L5pyramidal...	subsequent generations, which are L5 pyramidal cells and their parameters
■ soma	soma parameters
■ rad	base radius of the soma in μm ■ 5.0
■ synapse	synapse parameters
■ rad	base radius of the synapse in μm ■ 1.0
■ starpyramidal	siblings, which are starpyramidal cells and their parameters
soma	soma parameters
■ rad	base radius of the soma in μm ■ 5.0
synapse	synapse parameters
■ rad	base radius of the synapse in μm ■ 1.0

OutputOptions.neu

OutputOptions.neu	
output	
output files to be used with the visualization software OpenDX Dataexplorer and the simulation software NEURON	
DXfile	output files to be used with the OpenDX Dataexplorer
■ data_path	path to the NEUGEN directory, into which the DX output will be written. (Must be path to NEUGEN)
■ net	.net file, which contains info about the net as a whole
■ name	base name of the DX files without path
■ seperated	.dx files, which contain infos about the single parts of the net
■ name	base name of the seperated DX files without path
HOCfile	output files to be used with NEURON
■ name	base name of .hoc file (possibly with path)
■ netConEventsFilePostfix	if given, NetCon Events of the simulation will be written into a file with this postfix
■ voltageFilePostfix	if given, soma voltages of the simulation will be written in a file with this postfix
config_backup	configurations will be backuped, if a postfix is given
■ postfix	postfix for backup files
level	level of output information, if NeuGen is started from the shell ■ 0 (minimal amount of information) - 1 - 2 (maximal amount of information)

Interna.neu

Interna.neu	
env	
(deprecated)	
net	
contains the start value for the generator of random numbers used for the construction of the network and its parts.	
seed	start value for random number generators ■ 33
neuron	
contains additional information of the parameters of neuron parts	
axon	axon parameters
■ branch	branching parameters
■ angle	base angle at the axon branching points in degree
■ max	maximum angle ■ 60.0
■ min	minimum angle ■ 30.0
■ len_param	length parameters
■ x	base length in x-direction in μm ■ 10.0
■ y	base length in y-direction in μm ■ 10.0
seed	start value for the random number generator ■ 33
val	environment value ■ 0.7
vel	environment velocity ■ 1.0

Interna.neu	
dendrite	dendrite parameters
■ a	value of Rall's power ■ 1.5
■ branch	branch parameters of the dendrites
■ angle	branching angle of the dendrites in degree
■ max	maximum angle ■ 60.0
■ min	minimum angle ■ 30.0
■ c	threshold of the radius of Rall's power rule ■ 0.75
■ non_functional_synapses	parameters for the input synapses
■ simple_distr	parameters for the distribution of input synapses
■ density	density of input synapses (number per μm) ■ 0.01
■ soma_distance	distance of location of synapse to soma in μm
■ max	maximum distance ■ 400.0
■ min	minimum distance ■ 1.0
■ seed	start value for random number generator ■ 22.0
■ val	environment value ■ 0.5
■ vel	environment velocity ■ 1.0
seed	start value for random number generator ■ 36
siblings	parameters for subsequent generations
■ pyramidal...	parameters for pyramidal siblings

Interna.neu	
■ starpyramidal...	parameters for starpyramidal siblings
soma	soma parameters
■ val	environment value ■ 1.0
■ vel	environment velocity ■ 1.0
synapse	synapse parameters
■ val	environment value ■ 0.7
■ vel	environment velocity ■ 1.0
segment	
(deprecated)	