Computation Niche model simulation code

List of Functions

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Function Name	Used In CN – computation niche novel – unconstrained multi-state computation niche	Description
calcInputDistributionv5.m	CN, novel	Determine the cumulative input received at a automata's incoming edges
checkDuplicates.m	novel	Sometimes the minimisation algorithm can leave duplicate transitions in a finite state automata. This simply removes any duplicate transitions.
checkInteraction.m	novel	Check whether the interaction of two automata generates a valid automaton
checkIsomorphic.m	novel	Check that a newly produced automata is isomorphic
checkLanguageCoverage.m	novel	Checks that a newly produced automata (T_c) can read the same language as the T_a automata that produced it.
checkMachineDim.m	novel	Count the number of states in an automata (machine)
checkNullTypes.m	novel	Housekeeping function
checkStronglyConnected.m	novel	Checks that an automata is strongly connected (part of validating that it is an epsilon-machine)
checkUnifilarity.m	novel	Checks that an automata is unifilar i.e. there are no duplicate transitions per state of an automata
checkWaitingList.m	novel	Part of the Hopcroft minimisation algorithm implementation in MATLAB
compareLists.m	novel	Used by the 'findLists.m' function.
composeMachinesRevised.m	CN, novel	Performs composition of two automata.
convertL2D.m	CN, novel	Converts an automata list to a digraph. The digraph is used to calculate the structural complexity of an automata.
convertList2Y.m	CN, novel	Converts an automata description from the list format (e.g. [1 1 1]) to an outgoing probability distribution (e.g. [1 0])
convertPartition2List.m	novel	Part of the Hopcroft minimisation algorithm. Converts partitioned equivalence classes to conventional automata representation as a list.
convertPopCell2Matrix.m	novel	Converts the 'popDynamics' cell array to a $\|T\| \times Z$ matrix where Z is the number of iterations of the simulation

createSigmaSet.m	CN, novel	Creates four binary vectors each of length |T|. Each vector represents a symbol pair '0|0','0|1','1|0','1|1' and each entry in the vector with a '1' represents that the automata type Ti has a transition of that type.
findList.m	CN, novel	Searches the list of all automata types (T) currently in the population. Returns a '0' if not found, or '1' otherwise.
findPartitionSet.m	novel	Part of the Hopcroft minimisation algorithm.
getNextState.m	novel	Called by the stateTransition.m function.
initCNv2.m	CN, novel	Initialise the membrane network.
initialiseCY.m	CN, novel	Initialise the output range of each membrane automata.
inverseList.m	novel	Part of the Hopcroft minimisation algorithm.
minList.m	novel	The Hopcroft minimisation algorithm that also incorporates the necessary validation checks to ensure that the resulting, minimal automaton is an epsilon-machine.
nkCheck.m	novel	Part of the tests for a valid epsilon-machine.
performCompositionRevised.m	novel	Performs the interaction of two automata and the subsequent minimisation of the resultant automata.
produceMachinev5_unconstrained.m	novel	Produce machines without any constraint. Used by the open-ended multi-state population simulations.
produceMachinev5.m	CN, novel	Produce machines but do not allow new automata types to be introduced.
pruneTc.m	novel	Remove unreachable states from a newly produced automata.
rebuildCNv5.m	novel	Re-construct the membrane network as a new automata type has been generated.
reLabel.m	novel	The minimisation algorithm can remove transitions and states and so the remaining states/transitions need to be relabelled.
seedAutomata.mat	CN, novel	The MATLAB data file containing the interaction network for the seed population.
setActive.m	CN, novel	Determine which membrane automata are activated on this time-step.
stateTransition.m	CN, novel	As a multi-state membrane automata is activated it transitions to a different state.
updateCNv5_unconstrained.m	novel	Update the membrane network e.g. add new membrane automata nodes, update edge weightings
updateCNv5.m	CN, novel	Update the membrane network e.g. update edge weightings only