Model of inheritance of behaviour by memory-strings

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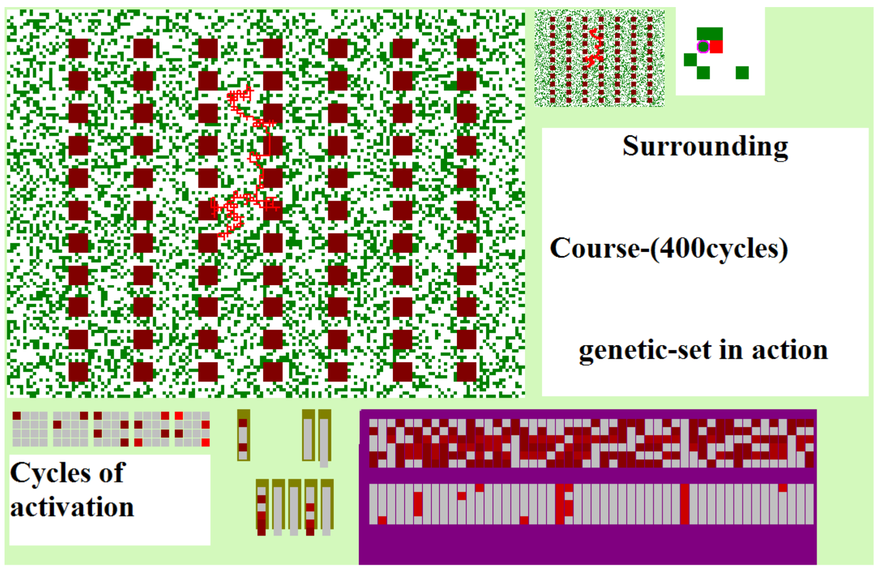
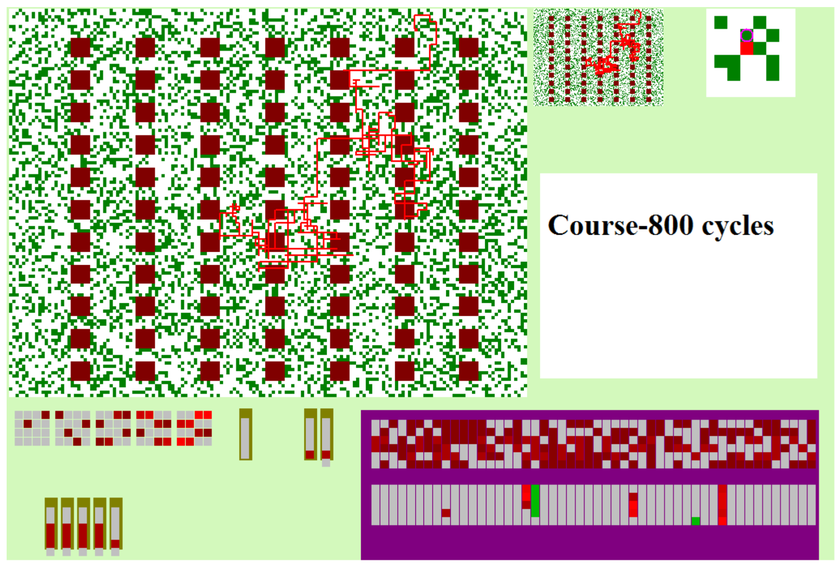
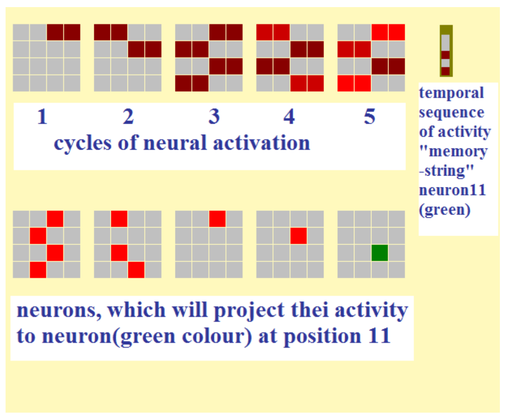
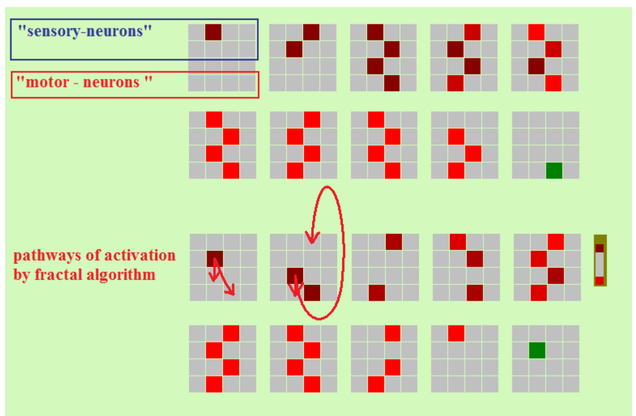


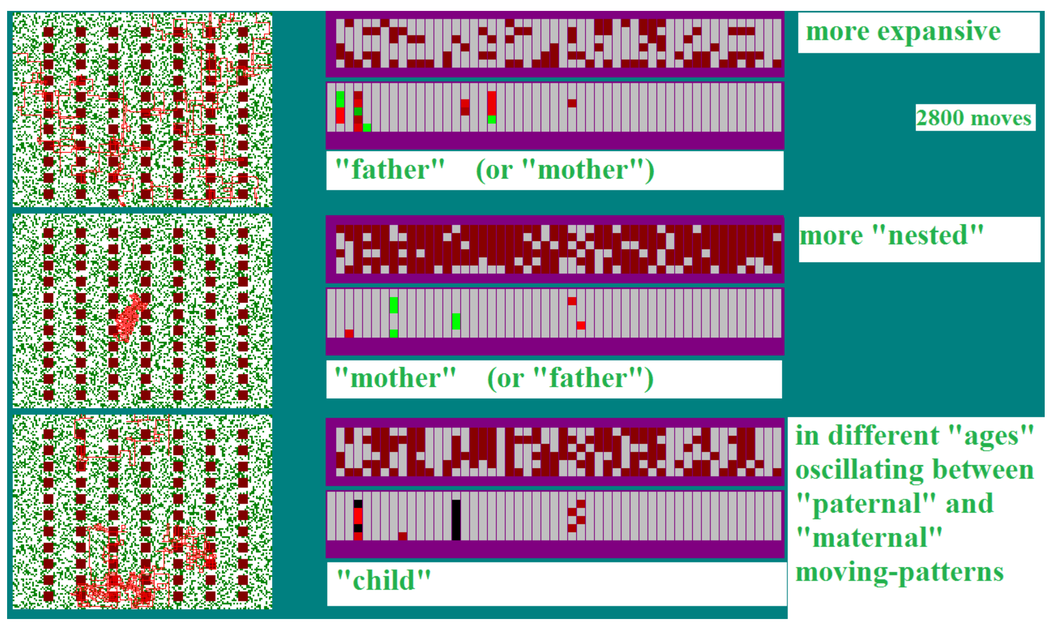


A small virtual „organism“ navigates through an environment with food(green) and enemies(maroon), its behaviour governed by genes and learning.

Memory-strings(„genes“) encode in this virtual model possible sequences of neural activity and work as hereditary „software“, inherited and mixed from generation to generation. „Sensory neurons“ will spread their activity to a fractal neural net. The „motoneurons“ will encode the sequence of activity, which will reach them, in a temporary memory-string. The „genetic apparatus“ of all motoneurons will compare the sequence of the specific actual temporary memory-string to that of the „basic triplets“ of all of its genes(„hybridisation“). An additional last random-position of the best matching gene will determine, whether the motoneuron will be active or not at this moment.

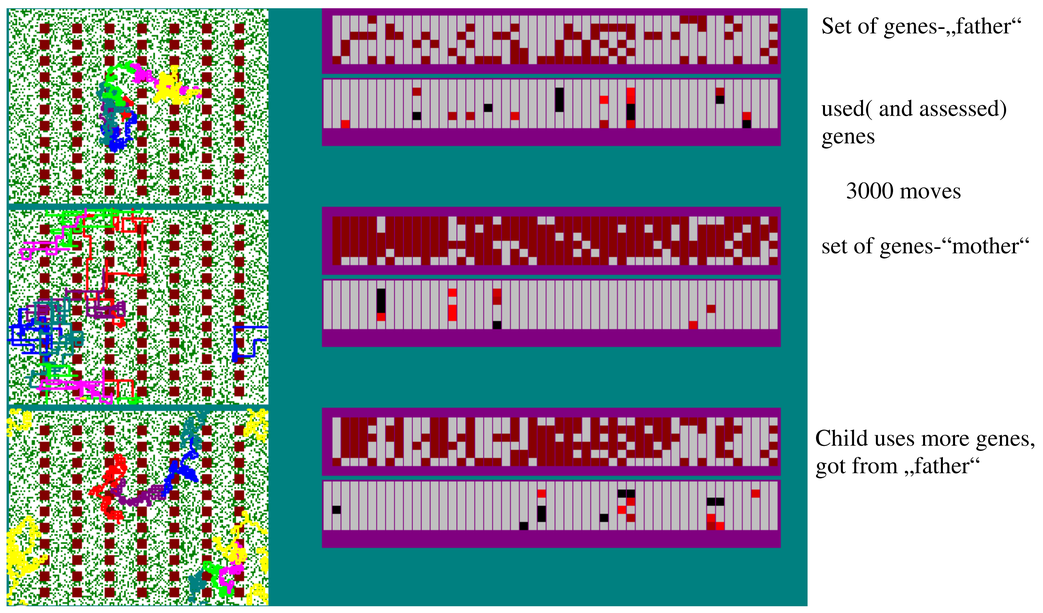




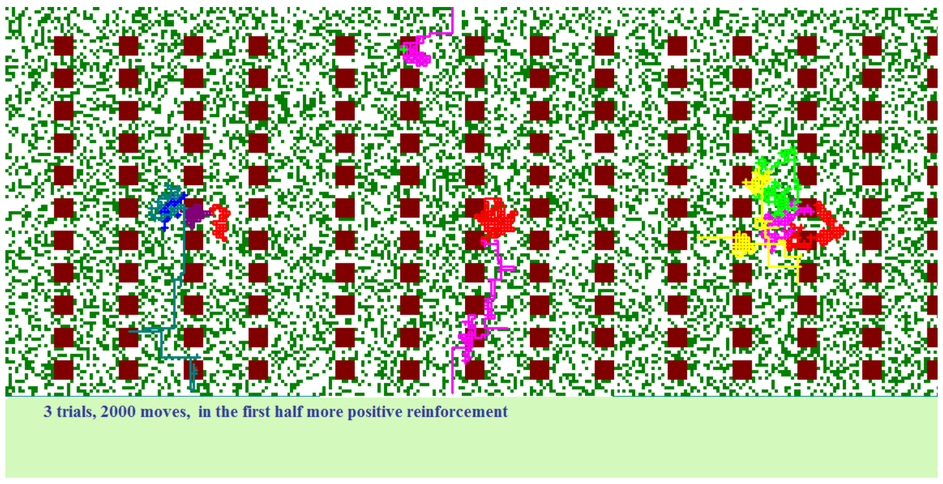


Fractal connectivity: Each of the 16 neurons will activate two neurons, one just descending vertically, the other determined by a simple fractal algorithm: Squaring the coordinates(x and y, each from 1 to 4), adding a constant vector(here vx = 3, vy = 0) and reprojecting the result onto the map(div mod). The connections are set to be symmetrical to the vertical midline. The resulting patterns of ativity are specific for each neuron, the connectivity with recurrent projection of the map to itself resembles to biolcogical neural nets.

Sets of genes may combine to form new genetic sets for descendent „organisms“, thus all elements of evolution by selection might be effective.



„Psychology“: Changing parameters of positive and negative reinforcement will cause a change in the pattern of motion(below).



Individual learning will partly determine the performance. It could be done either by marking the „genes“, depending on the effects of the moves, they will cause, or by multiplying useful, destroying disadvantageous strings.

Results: This very limited preliminary study shows, those models might enrich our concepts about heredity of behaviour.

T Kromer, „New Neural Nets“, Lecture Notes in Computer Science, 2001, Vol. 2206, 772-781
T Kromer, „Tomography in Fractal Neural Nets“, Lecture Notes in Computer Science, 2001, Vol. 2206, 917-923