Dynamic neuronet
autonomous data-processing slot-machine

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Abstract. The neuron set model based on dynamic neurons is under discussion. The “self-organizing memory” presented by circulating impulses is the principally new net feature. Such a “memory” is supposed to cause “intellectual” behavior of data-processing slot machine.

As a rule the slot machine is referred to as a self-operating process unit. The series of data-processing slot machines processing information with the end point in management signal are intellectually characterized by the grade of independent operating that is the level of “data-processing autonomy”.

In this connection the new quality of the “artificial intellect” obtained by slot machines is supposed to be provided using “non-linear dynamic” neuron with impulse resonation for any external factor.

The software “AINA_256” is the marvelous test alternative containing artificial neuronet (ANN) of 256 similar dynamic neurons.

The ANN modeling program (“AINA_256”) algorithm is an “endless cycle” gradually providing the following patterned time-equivalent operations:

- Calculation of immediate meaning of the inlet signal for every neuron that comprises the sum of outlet signals belonging to the neighboring neurons and the correspondent contact intensities.
- Calculation of the outlet signal (potential) difference for every neuron in accordance with the immediate meaning of an inlet signal and the current state (potential) of the given neuron.
- Calculation of increase in contact intensities connecting the neurons and providing the ANN structure correspondent to current state (potential) of neurons connected.

The “AINA_256” program provides the possibility of generating various ANN (conditionally named) and unlimited independent modeling bearing all the information on the current neuron potential state and contact intensity for every ANN.

The “AINA_256” programmes the primarily state of every newly generated ANN by means of primarily contact structure (chosen by the operator) and zero neuron potentials. The outlet neuron impulses appears right after external impact net neuron (inlet impulse) imitating receptors’ signals and provides the “AINA_256” net activity.

The reflection of the current “AINA_256” net state is displayed as follows:

The very ANN structure display (neurons and their correlation) regarding the each neuron inlet signal induced by colored frame alongside with each neuron current potential (outlet impulse) induced by small inner colored square. Signals’ negative meanings are colored in deep blue and the positive ones are colored in red.

The diagram for the summary inlet and outlet signals’ intensity for three ANN neuron groups (48 upper ones are “receptors”, 160 front ones are “memory” and 48 ground ones are “effectors”). This image could be switched to display the inlet and outlet signal for the any ANN neuron.

The display of a relative face imitating the “antroph-amorphous” behavior.

Face element management (eyes, mouth, speech, attitude) depends on inlet and outlet signals of the earlier mentioned neuron groups conditionally referred to as “receptors”, “memory” and “effectors”.

The program speed allows on-line interaction with 3-5 “AINA_256” ANNs using 400 megahertz Pentium-2.

Figure 1. “AINA_256” ANN display.

The main results derived from the first test research of a dynamic neuronet “AINA_256” are as follows:
Use of dynamic neuron to build ANN endows the latter with the principally new quality – “memory” – presented by net circulating impulses. Such spatial and time spread activity on one head reflects all the sensor history of the given slot-machine, and on the other hand generates the behavior stereotypes of the given slot-machine via “effector” neurons. And finally this very activity that is the current neuron potential allocation, is a dynamic comparable pattern where all the further perception of the data-processing machine.

The net structure is not less important to provide memory. Two types of structures should be distinguished – “the chain” and “the ring”. The first structure hasn’t got the exit-entrance feed-back , and the other one has got such.

So in terms of operation the “chain” nets could have temporary (short-term) memory the “capacity” and the “life-time” of which is limited by the successively conjunct ANN neuron “chain” length.

“The ring” feed-back structures creates prerequisites for unlimited “capacity” and “life-time” memory for undefined signals to be implemented in data-process machines. Thus process installations obtain the new feature residing in the possibility to accumulate the memory “content” given its fixed “physical capacity”.

Phase relations. Like any other dynamic system, such spatial-time circulating power spread “memory” is featured by phase relations between various neuron-resource signals. Given other equal terms the availability of phase relations leads to ceaseless “memory” self-transformations which could be interpreted by “external observer” as various “intellect” demonstrations – inner activity, memories, creative work etc.

And finally the matters that should be investigated to build dynamic neuronets with actual “artificial intellect”.

First of all goes the training mechanism. But for the fact that dynamic neuronet has already got its own ceaselessly accumulated and adapted dynamic pattern able to distinguish the undefined and earlier unknown samples this case focuses on the other training objectives:

- Creation of a “correct” form (dynamics) for every separate behavior (dynamic stereotype);
- Creation of a “correct” causal-investigatory impulse-reaction correlation that is “breeding” in adequate associations.

The sought training mechanism could be based both on traditional variation of neuron correlation and the variation of those neuron parameters that influence its outlet dynamics. During the training process the neuronet parameter shift criteria is supposed to have a feed-back character minimizing the “training” incentive impulse.

References