Self Learning and Similarity Recognition
by Highly Parallel Working Simplest Nodes

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Abstract: At Johannes Kepler University a neural-net-similar associative model has been
developed. The basic model consists of very simple nodes with just two attributes, a binary
stamp and a ternary charge. The connections between the nodes do not have any additional
information such as weights. Nevertheless it was possible to construct a system consisting
of such elementary components which is able to perform parallel and serial association.
Moreover, it is a self learning system which needs no explicit training phase.

Since the beginning of this research about 30 years ago the model has been enhanced into
several directions. One major improvement was the change from ternary respectively binary
to real charge and stamp values. Thus, quite good similarity recognition could be achieved
without losing the self learning capability. The introduction of regular network architectures
eliminated one of the main handicaps which had been the growth of the network at each
learned pattern.

The recent research result was the so called selective association. By adopting charge
and stamp value calculation within a node the network showed a behavior in which in
undetermined cases (i.e. when two or more learned patterns have the same similarity to
the actual network input) the similarity recognition chooses the best known pattern. That
means the pattern which has been presented more often will be recognized better. The main
idea was to interpret a node stamp value as a weight which corresponds to the frequency of
the pattern to which this particular node belongs. After this all other dynamic aspects were
adjusted to that principle.

In this contribution first the basic model - it was called Neunet - will be introduced.
After a brief overview of the major developments and an integration of Neunet into the
context of other actual neural network and associative memory approaches the presentation
will focus on selective association. The algorithm itself, the calculations of charge- and
stamp-adjustment in nodes and, test results will be presented in detail. As such networks
can become quite large also parallel and high performance computing aspects are relevant
and will be discussed.

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