Abstract

This work presents biologically motivated neural network model which works as an auto-associative memory. Architecture of the presented model is similar to the architecture of the Hopfield network which might be similar to some parts of the hippocampal network area CA3 (Cornu Amonis). Patterns learned and retrieved are not static but they are periodically repeating sequences of sparse synchronous activities. Patterns were stored to the network using the modified Hebb rule adjusted to store cyclic sequences. Capacity of the model is analyzed together with the numerical simulations. The model is further extended with short term potentiation (STP), which is forming the essential part of the successful pattern recall process. The memory capacity of the extended version of the model is highly increased. The joint version of the model combining both approaches is discussed. The model might be able to retrieve the pattern in short time interval without STP (fast patterns) or in a longer time period utilizing STP (slow patterns). We know from our everyday life that some patterns could be recalled promptly and some may need much longer time to reveal.

Keywords

auto-associative neural network, Hebbian learning, neural coding, memory, pattern recognition, short-term potentiation