

FILTERING - ANEALING A TWO STEP PROCESS HYPOTHESE FOR SLEEP INFORMATION MANAGEMENT

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The Hebb rule, related to the synapse associative learning can be rephrased in a two parts rule as (1-2):

1. If two neurons on either side of a synapse (connection) are activated simultaneously (i.e. synchronously), the strength of that synapse is selectively increased.
2. If two neurons on either side of a synapse are activated asynchronously, that synapse is selectively weakened or eliminated.

During Slow Wave Sleep, the intra-hemispheric coherence of delta activity is increased relatively to the sleep stage (3). Phase ratio is described between centro-frontal and occipital EEG activity (4). High EEG coherence and phase ratio between EEG derivation let us propound than a forget function (characterized by the lowering of synapse weight) is associated to Slow Wave Sleep. This "forgetting function" acting as an Information Low Pass Filter i.e filtering all the weight information memorised during wake.

Simulated Annealing (5) is a process currently used for formal neural network learning optimisation. This process optimize the energy associated to the learned patterns. Denoyer & al (6) demonstrate a quick elevation (0,8°C) of cerebral temperature associated with REM Sleep followed by a slow descent. It is also known than neuronal activity is linked to temperature by Q_{10} factor. This direct link between temperature and neuronal activity let us propose than an annealing process is associated to Rem Sleep. Consequence of annealing is oversight and optimisation of knowledge.

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Hebb rule, Neural Network, Slow Wave Sleep, REM Sleep, Annealing, Filtering, Oversight, Memory, Temperature.