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STDP based HAMX behavior in response to homogeneous and heterogeneous categories

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Objectives:

Biological evidences show that different objects are processed and recognized with different time course in visual pathway from the retina to the inferotemporal cortex (IT) [1]. Complexity, play an important role in determining the performance and speed of object recognition. [2, 3]. Developing a computational model for object recognition with a more biological plausible structure in which it can be responsible for observed behaviors of primate and especially human can be beneficial to get a better understanding of visual system. Recently several models such as Neocognitron [4], Visnet [5] and HMAX [6] were introduced for this purpose. Among these models, HMAX can follow performance in some object recognition tasks [6]. Masquelier and his colleagues [7] show that using STDP learning concept with HMAX model can increase the compatibility of the model with visual cortex. Taking advantages of this model, we investigate the impact of target homogeneity in applied mechanism of ventral stream for different object categorizations.

Methods & Results:

It can be seen that in behavioral test the reaction time of subjects has direct correlation with homogeneity among target group [8]. In this study the HMAX model, using STDP as its learning mechanism [7] has been used as a basic computational model to perform an object recognition task. The model was applied to two different dataset; a homogenous and a heterogeneous one.

Our results show that the model with a predetermined complexity has higher performance for homogeneous dataset. In addition, in order to achieve a same level of performance for both dataset we should increase model complexity in heterogeneous dataset.

Conclusions:

It is well known that the time of computations increase for more complex structures. If we refer to this processing time as the reaction time in psychophysics tasks, results can be highly compatible with psychophysics' studies which show a higher response time for a more complex task.

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