A Note on Entangled Processing in Tracts of Axons

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Abstract

In this note the authors put forward a proposal that binding in particular and more generally consciousness, whether nervous system-wide, organism-wide, or wider still, may be identified with entanglement between the ions flowing in different axons.

In [1], the authors showed a mechanism by which universal quantum computation could occur in the brain. They left open the question of entanglement during such quantum computation and information processing. Here, we bring attention to the fact that given two quantum systems, they can be entangled by certain unitary gates that act on the overall system. For example, the CNOT gate often serves this purpose in the circuit-model of quantum computation.

Due to their long wavelength, metric perturbations can carry out these joint operations on multiple tracts. These entangling perturbations would act at the beginning of an action potential cycle, say on synchronized axons. The entangled state would evolve and decohere independently but correlatedly in the separated axons, and ultimately classical information could be broadcast and interleaved via the electric fields that are concomitant with the motional states and charges of the ion collections, carrying quantum information.

In future work, following the development in [2], we will extend that analysis to the case of entangling metric perturbations on *multiple* axons. Since quantum entanglement is a type of very strong correlation, this view could explain the binding of percepts in visual consciousness for example and have implications for cross-modal integration [3] as well.

References

[1] Aman Chawla and Salvatore Domenic Morgera. Mechanism of universal quantum computation in the brain. 12(02):468–474.

[2] Aman Chawla. Towards the exact quantum computation sequence in axon tracts.

[3] Ladan Shams, Sunao Iwaki, Aman Chawla, and Joydeep Bhattacharya. Early modulation of visual cortex by sound: An MEG study. *Neuroscience Letters*, 378(2):76–81, 2005.