Fundamental physics issues of multilevel logic in developing a parallel processor. ANIRBAN BANDYOPADHYAY, ICYS, KAZUSHI MIKI, NIMS, ICYS AND NANOARCHITECTURE GROUP COLLABORATION — In the last century, On and Off physical switches, were equated with two decisions 0 and 1 to express every information in terms of binary digits and physically realize it in terms of switches connected in a circuit. Apart from memory-density increase significantly, more possible choices in particular space enables pattern-logic a reality, and manipulation of pattern would allow controlling logic, generating a new kind of processor. Neumann's computer is based on sequential logic, processing bits one by one. But as pattern-logic is generated on a surface, viewing whole pattern at a time is a truly parallel processing. Following Neumann's and Shannons fundamental thermodynamical approaches we have built compatible model based on series of single molecule based multibit logic systems of 4-12 bits in an UHV-STM. On their monolayer multilevel communication and pattern formation is experimentally verified. Furthermore, the developed intelligent monolayer is trained by Artificial Neural Network. Therefore fundamental weak interactions for the building of truly parallel processor are explored here physically and theoretically.

Anirban Bandyopadhyay

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