New system architectures for non Si-CMOS

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ABSTRACT

The semiconductor industry has been following Moore's law for over 30 years. However, it is facing some significant challenges, including power density, design complexity, probabilistic design, performance overkill, and density overkill. And the industry is now studying nano-electronics as an approach that will allow us to extend Moore's law beyond the end of traditional CMOS scaling. However, molecular scale circuits do not solve many of the problems facing the industry and, in fact, seriously aggravate several of them.

And, in spite of all this processing speed and cheap computing power, we still have not solved the hardest problems in computing, making computers more intelligent, i.e., where they can interact with the real world as effortlessly as animals do. Neither Artificial Intelligence, Artificial Neural Networks, nor Fuzzy Logic have enabled solutions, and there are few new ideas.

Solving all of these problems will require new computational models and new architectures. Motivated by the fact that biological systems have successfully dealt with similar issues, a number of researchers are beginning to look at biological models, primarily those from computational and systems neuroscience, and cognitive science, for inspiration for new chip architectures that are a better match to the molecular scale electronics.