Readings in Neroinformatics

Ephraim Seidenberg
10-931-798

Mead, Carver. 1990. Neuromorphic electronic systems. *Proceedings of the IEEE* 78(10). 1629–1636.

Abstract

Even the simplest animal brains are awesome computational instruments. Their elementary operations provide a rich set of powerful computational primitives. We can build devices that implement these primitives by the use of wafer-scale silicon fabrication, enabling us to build entire systems based on the organizing principles of the nervous system, many orders of magnitude more effective than what could be implemented up to the present time. To this end, we have to find a natural way to integrate computational primitives into an overall system-design strategy. Here I propose the term *neuromorphic systems* to generically refer to such systems and give an outline of the prerequisites and important principles as well as the currently available approaches. I argue that adaptive techniques are needed to correct for differences between nominally identical components, and that this adaptive capability leads naturally to systems that learn about their environment. I show that the representation of information by the relative values of analog signals creates the principle advantage and I maintain that the basic two-dimensional limitation of silicon technology is not a serious limitation in exploiting the potential of neuromorphic systems. With these notions I show the next steps in this development and indicate where it may lead in the long run.

206 words.