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Rudolf Kaehr

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Memristics: Why memristors won't change anything

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Disciplines

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Categories of the RK-Archive

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2.1. The claims

"Let's assume for the sake of dreaming memristors do prove out."
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"I don't know, but it's worth thinking about, especially if you want to ride the wave of the next decade's technological revolution (Bell's Law of Computer Classes). If you are looking to get ahead of the next revolution this just might be it. And as almost always revolutions are based on building a new material based on a fundamental discovery of how the world works. The memristor is such a material and discovery."

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"Yes, there's a lot of hype about memristors, but there also seems to be a lot of confidence memristors will be real viable products. But for now they don't exist." (Todd Hoff)

Strong support

That fact that DARPA is seriously engaged into memristive systems, at least with a similar engagement as they had been with the artificial neuroal network (ANN) movement, is a strong support to believe in the seriousness of the approach.

"The SyNAPSE Project - uses memristors in their goal of developing a petascale machine that requires no more than a kilowatt of power and two liters of space."

A similar important fact is given by the decision of HP's involvement, culminating, at the time, in the discovery/developement of multi-layered crossbar memristive systems.

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The neat hierarchy between computation and data remains untouched. What might be changed is something toally different from both: the *time* consumation in the data-transfer from storage to processor. That’s for sure a great achievement if it would happen the way it is sold to the belivers. It even would legitimate the propaganda of an energy saving *“Green Chip”* (Aachen/Jülich).

But again, the fundamental difference of computation (operator) and data (operands) is kept alive and is determining the rest of the game.

Therefore, if data are sitting on the top of a processor unit, and both hence, are as close together as possible, the dichotomy of *“logic and memory”* remains established and the hierarchical and static order untouched and ready for respective programming.

For people who don’t want change but only the merits that’s a perfect situation.

3. How to turn the hype into facts?

The best way to change the hype into facts is a double way. First, disseminate the hype. Not only on Facebook and Twitter, the name of the hype has to become ubiquitous. Second, do some serious research. Support research on all levels of accessibility. Tell the politicians that memristors are the Green Solution they are looking for.

Memristics, i.e. the study of memristive systems, is still confronted with two main conceptual and technical challenges. One seems to be well known, the other remains uncovered.

3.1. Problem of self-referentiality

What is well known, albeit not solved, and studied mainly in other disciplines, like logic or cybernetics, is the *problem of self-referentiality* of second-order concepts defining memristive systems.

Self-referentiality occurs in many forms, as circularity, chiasm, proemiality or simply as superposition of formulas of different kind, like linear and non-linear formulas, e.g for the interaction of 'logic and memory'. Logical, ontological but also technical problems of the interchangeability of the roles of a memristor as a memory or as a logic are not yet conceived properly.

The problem of self-referentiality is in fact a surface problem. Its deep-structure is heavily involved with the concept of semiotic, logical and ontological identity.

It seems that there are no working concepts in complex systems theory or in chaos theory, to deal with self-referentiality in a constructive and consistent way.

3.2. The localization problem

The second problem is more or less unknown to in the community of computer science and computer technology. It is the *problem of the localization of conceptual patterns.* This problem seems not to exist in the literature of computation and realization of computational devices. There are voices pointing to the fact that *"Simulations don't become realizations"* (Pattee) but that's all you get.

On the other side, Jianhua Yang from HP, makes it very clear: Until now, computers are *simulating* learning, it is the program that tells computers to learn, computers itself are not learning. With memristive technology things are radically different: It is the *computing matter,* the computer hardware, which is learning.

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I might dare to predict that there will be no such radical development as it was stipulated by Todd Hoff *"How will memristors change everything?*" if the two challenges are not brought to a working (re)solution.

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Further reading:

http://www.thinkartlab.com/pkl/lola/Memristics/Memristics:Memristors, again.pdf
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