Brief comments on:
Jürgen Schmidhuber's New Millennium AI and the Convergence of History: Update of 2012,

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Both Schmidhuber's Article and this commentary are published in

The Singularity Hypotheses: A Scientific and Philosophical Assessment
Eds. Amnon H. Eden, James H. Moor, Johnny H. Soraker and Eric Steinhart, pp 79--80.
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Table of contents and some online chapters

Schmidhuber's article is also online here:
https://docs.google.com/file/d/0BwK0OPe_m9QNbW4yUldmREx1VGs/edit?pli=1

I have problems both with the style and the content of this essay, though I have not tried to take in the full mathematical details, and may therefore have missed something.

I do not doubt that the combination of technical advances by the author and increases in computer power have made possible new impressive demonstrations including out-performing rival systems on various benchmark tests.

However, it is not clear to me that those tests have much to do with animal or human intelligence or that there is any reason to believe this work will help to bridge the enormous gaps between current machine competences and the competences of squirrels, nest-building birds, elephants, hunting mammals, apes, and human toddlers.

The style of the paper makes the claims hard to evaluate because it repeatedly says how good the systems are and reports that they outperform rivals, but does not help an outsider to get a feel for the nature of the tasks and the ability of the techniques to "scale out" into other tasks. In particular I have no interest in systems that do well at reading hand-written characters, since that is not a task for which there is any objective criterion of correctness, and all that training achieves is tracking human labellings, without giving any explanation as to why the human labels are correct. I would be really impressed, however, if the tests showed a robot assembling Meccano parts to form a model crane depicted in a picture, and related tests here (Sloman 2011a): http://www.cs.bham.ac.uk/research/projects/cosy/photos/crane/

Since claims are being made about how the techniques will lead beyond human competences in a few decades I would like to see sample cases where the techniques match mathematical, scientific, engineering, musical, toy puzzle solving, or linguistic performances that are regarded as highly commendable achievements of humans, e.g. outstanding school children or university students. (Newton, Einstein,

Mozart, etc. can come later.) Readers should see a detailed analysis of exactly how the machine works in those cases and if the claim is that it uses non-human mechanisms, ontologies, forms of representation, etc. then I would like to see those differences explained. Likewise if its internals are comparable to those of humans I would like to see at least discussions of the common details.

The core problem is how the goals of the research are formulated. Instead of a robot with multiple asynchronously operating sensors providing different sorts of information (e.g. visual, auditory, haptic, proprioceptive, vestibular), and a collection of motor control systems for producing movements of animal-like hands, legs, wings, mouths, tongues etc., the research addresses:

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... a learning robotic agent with a single life which consists of
discrete cycles or time steps t = 1, 2, . . . , T. Its total
lifetime T may or may not be known in advance. In what follows,the
value of any time-varying variable Q at time t (t(1 <= t <= T )) will be
denoted by Q(t), the ordered sequence of values Q(1), . . . , Q(t)
by Q(<= t), and the (possibly empty) sequence Q(1), . . . , Q(t - 1)
by Q(< t).

At any given t the robot receives a real-valued input vector x(t)
from the environment and executes a real-valued action y(t) which
may affect future inputs; at times t < T its goal is to maximize
future success or utility....
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As far as I am concerned that defines a particular sort of problem to do with data-mining in a discrete stream of input vectors, where the future components are influenced in some totally unexplained way by a sequence of output vectors.

I don't see how such a mathematical problem relates to a crane assembly problem where the perceived structure is constantly changing in complexity, with different types of relationships and properties of objects relevant at different stages, and actions of different sorts of complexity required, rather than a stream of output vectors (of fixed dimensionality?). I would certainly pay close attention if someone demonstrated advances in machine learning by addressing the toy crane problem, or the simpler problem described in (Sloman 2011d)
http://www.cs.bham.ac.uk/research/projects/cogaff/misc/simplicity-ontology.html

But so far none of the machine learning researchers I've pointed at these problems has come back with something to demonstrate. Perhaps the author and his colleagues are not interested in modelling or explaining human or animal intelligence, merely in demonstrating a functioning program that satisfies their definition of intelligence.

If they are interested in bridging the gap, then perhaps we should set up a meeting at which a collection of challenges is agreed between people NOT working on machine learning and those who are, and then later we can jointly assess progress. Some of the criteria I am interested in are spelled out in these documents: (Sloman 2011b, c).

http://www.cs.bham.ac.uk/research/projects/cogaff/misc/toddler-theorems.html
http://www.cs.bham.ac.uk/research/projects/cogaff/evo-creativity.pdf

Added Mar 2014:

http://www.cs.bham.ac.uk/research/projects/cogaff/misc/vision
A presentation of some hard, apparently unsolved, problems about natural vision and how to replicate the functions and the designs in AI/Robotic vision systems.

However, all research results must be published in universally accessible open access journals and web sites, and not restricted to members of wealthy institutions.

References

- Sloman, A. (2011a, Oct 23).
  Challenge for vision: Seeing a Toy Crane. Retrieved June 8, 2012, from
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- Sloman, A. (2011c, Oct 29).
  Meta-Morphogenesis and Toddler Theorems: Case Studies. Retrieved 8 June 2012, from
  http://www.cs.bham.ac.uk/research/projects/cogaff/misc/toddler-theorems.html

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  Simplicity and Ontologies: The trade-off between simplicity of theories and sophistication of ontologies.
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NOTE:
As so often happens, the published version of my paper has errors because the copy-editor chose to "correct" things I had written without the courtesy of highlighting the changes, and I failed to detect them when proof reading, though I noticed them later, when it was too late to point them out.

See http://www.cs.bham.ac.uk/~axs/publishing.html

It is safest to ignore all printed versions of my papers and use only the online versions. Then at least you'll be confronted only with errors that are my fault.