Formal Definitions and Quantitative Assessment for Natural Cognition ;
Power, Limits, and Evident Consequences

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When the goal was considered to possibly implement cognition in robots, the necessity appeared to formally define and quantitatively assess cognition.

After some research, this condition could effectively be met, and in particular, on one hand, several scientific publications have been made, and on the other hand, several of our prototypes have been successfully engaged, at international level, in autonomous and cooperative robot competitions (re. Eurobot and Robocup @ Home).

Some major conclusions could be drawn.

The first quantitative outcome is that cognition, and in particular rationality, only address infinitesimal aspects of reality, necessarily relying on more or less explicit, finite-sized models.

The second conclusion is that what definitely matters for possible success is less an impossible, exhaustive exploration of reality, than the careful selection of a specific goal.

Accordingly, the quality of a model that is crucial is *not* to be true or complete versus reality ; but *rather* to be good, i.e. allowing to ultimately reach the selected goal (let's say here « c-good »). (Many synonyms, more or less close, could also be used here, sharing the same essential notion of being a model, i.e. a simple, purpose-oriented representation of some domains of reality).

The model for cognitive sciences that we have proposed (« MCS » cognition theory) introduces a « cognitive agent » regardless of scale and nature of implementation medium.

In MCS cogntion theory, cognitive properties can be defined and quantitatively estimated as well for the typical case of a singular agent, as eventually also for cases of different scope: any subunit, elementary component of the latter singular agent; or reciprocally, any possible (« macro/meta »,) integral structure of multiple such agents.

This also means that MSC can be applied in just the same way for an electronic gate, a digital circuit, a computer or a network, as for neurons, brains, humans, or a group (re. family, society, association, H-R team, etc.). Idem for cognitive processes : e.g. thinking, group deliberation, digital computation, or network-based operation (e.g. search).

Applying our conclusions about cognition to our own cognitive endeavors, we are led to clearly state two of our selected goals, which may be shared by many : to develop robots capable of cooperating with humans at home ; and, much more generally, to contribute to the well-being of mankind.

In the perspective of the goals just mentionned, we have found the MCS cognition theory to be the best ; at least, it is the best synthesis of what is known today, from our perspective and contexts.

How good is MCS theory, when focusing on the case of 2nd International Conference on Natural Cognition, and specifically, possibly choosing rationality versus its rivals ?

What is clear from MCS perspective is that rationality develops on infinitesimal aspects of reality ; in that sense, it is weak and can hardly claim for exclusivity in a decision process. The ultimate criterion, according to MCS, is the ability to support in reaching the goal ; in this sense rationality very often proves « c-good » ; but, again, it must also modestly accept that its rivals, e.g. « guts », or « chance », sometimes perform better.

Inspired by the consideration of nature, as this conference elects, the role of cognition (brain) is also reframed here in the context of action (muscle) and emotions (heart); laws of logic, laws of nature, laws of values.

Another cognition-related challenge worth mentionning, if place allows, would be the one of coordination in a group ; which in particular requires a common culture ; which is particularly hard to establish as (like all models) that common culture also necessarily relies on infinitesimal aspects of reality and requires autonomous adherence of members to a common goal.
