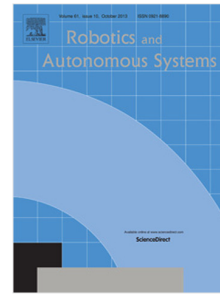


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Reprint of “Cognition, cognitics, and team action—Overview, foundations, and five theses for a better world”

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Cognition, Cognitics, and Team Action – Overview, Foundations, and Five Theses for a Better World

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Abstract— Consider now a shift of attention onto cognition. Novel definitions and metrics have been made, and it is time to reap the benefits, and to boost the development of intelligent autonomous systems. Mankind has gained a decisive advantage, in the race for survival and in the perspective of enjoyable lives, when cognitive abilities, i.e. cognition, appeared and started to develop in humans. Now cognition appears also as a crucial faculty to harness, i.e. to implement on machines; this is the field of cognitics. What is learnt about cognition for the purpose of machines, by a mirror effect, also affects the way we may recognize the role of cognition for ourselves, as humans. What is cognition? How does it relate to classical concepts, which appear much less well defined than expected? A summary of critical answers to these questions is sketched below. Then five theses about cognition are summarized: cognition to know the real world, to explore and perceive, to model; cognition for defining alternative worlds and possible futures, visions, and anticausality; cognition for effective control; cognitics for a large scale, technical deployment of cognition; and social cognitics, a foundation for team action and increased momentum for change. The five theses can be seen both as paths towards better insights in human and social nature and also as a roadmap for simultaneous and iterative processes capable to freely foster a better future for individuals and society. The paper finally includes as well an overview of MCS cognition theory, with some additional contributions, notably relating to foundations and time derivative aspects.

Keywords—cognition; modeling and vision; anticausality and freedom; cognitics; team action; learning

I. INTRODUCTION

Obviously humans have gained an amount of power to change things in the world that is enormous, larger than ever before demonstrated by biological beings, reaching the limits where major traditional, natural equilibriums and assets on Planet Earth can be affected: climate, resources, pollution, as well as order.

It is striking to notice that humans have made a critical difference in evolution, relatively to other biological entities, with the relative size of their brains (e.g. [1]).

The key ability that brain supports is cognition; ultimately, this is the faculty to take the good decisions, to deliver the right information. And as a result of the huge effect of cognition as mentioned above, it is crucial today 1. to better study how it develops, and possibly 2. to technically increase its deployment. In particular, such a strategy should prove notably useful for robotics and autonomous systems.

Cognition has allowed humans to unfold as they did. In recent millennia, centuries, and in fact, in large proportions, especially in recent years, cognition has allowed the fantastic development of science and technology that everyone can witness. Notice that robotics field researchers may find a special interest in the sequel as the focus of cognition adopted here includes the higher brain functionality of all living things acting in natural environments, and does not restrict the attention only to some domains, even as important as e.g. motion, already vital also for non-human biological agents.

Of utmost importance, on the limits of the cognitive world, information is really the closest notion that has been clearly defined and given a metric system, with the well-known [bit] unit. This was a prerequisite for the mastery of communications and coding.

It is strange to notice though, that cognition did not yet really reflect on itself, with a degree of attention similar to what has been directed toward human environment and applications!

The present paper, on the contrary, focuses on the concept of cognition, develops five theses about it, and brings new contributions. The main goal is to call for due attention onto the domain of cognition, and incidentally also to support related proposals (e.g. within IAS [2, 3], and elsewhere, in particular [4]), that have not been exploited enough yet, in regard of potential benefits for humans: 1. better insights in human and social nature, as well as 2. a roadmap for simultaneous and iterative processes capable to freely fostering a better future for individuals and society. In this sense, the current version updates and expands the paper published in Italy in 2014 [5], especially in the part relating to the presentation of key elements of cognition and especially in their foundations, namely reality, modeling, information,

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