AGI components for enterprise management systems

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Abstract. As a continuation of previous work, a functional architecture of a full-fledged AGI is proposed for working in an enterprise management system. Since the creation of such an AGI will require more than one decade, an approach is proposed that allows combining individual more ready-made blocks from a full-fledged AGI with traditional enterprise management systems. Such systems including one or two AGI blocks and Consciousness are called Lean AGI. For these systems, it is possible to use not full Consciousness, but some its limited industry-specific edition, located in the interval between the minimal and full Consciousness. Such editions are called Lean Consciousness. In the paper, the cases for the possible use of Lean AGI as part of enterprise management systems are shown. For one of these cases, the Lean AGI architecture based on the Goal analytics block is proposed for working on top of traditional enterprise management applications.

Keywords: AGI, Consciousness, Lean AGI, Lean Consciousness, Cognitive Architecture, Goal Analytics, Enterprise Management Applications.

In a review [1], 84 cognitive architectures were considered, among which a small group of architectures was singled out, the development of which was aimed to create a General Artificial Intelligence (AGI): Soar [2], ACT-R [3], NARS [4], LIDA [5], SiMA (formerly ARS) [6], Sigma [7] and CogPrime [8-10]. The recently proposed ICOM [11,12] and the architecture developed by Michael S. P. Miller [13-15] can be added to this list.

For at least one of the listed architectures, an attempt is made to use the created AGI at the top level of company management over ERP systems [16]. Such a solution corresponds to the highest stage of business intelligence tools' development [17] and promises very good prospects. However, time constraints must be considered. Experts expect the completion of the creation of AGI only in the 2040s [18]. Therefore, it seems appropriate, without waiting for the emergence of a full-fledged AGI, to consider the possibility of using its individual components in combination with traditional applications that are parts of corporate management systems.

In order to be able to use individual AGI components, it is necessary to have a relatively complete architecture from which you can select the necessary components. The architecture from [19], in which a set of expansions were made, was used as the basis for such an AGI architecture. Characteristic features of the architecture from [19]:

- the existence of two relatively independent but interconnected components – Consciousness and Subconsciousness which has the ability to solve a wide range of identical tasks;
- Consciousness uses metagraph conscious memory [20] and solves all tasks using inference mechanisms (such as, for example, are proposed in [21]) or probabilistic inference mechanisms described in [22];
- Subconsciousness uses metagraph unconscious memory [20] and various models of narrow AI for decision making. The choice of models is made by meta-learning mechanisms.

The extensions made to increase the intelligence of the architecture:

- the composition of the functional blocks Consciousness and Subconsciousness is supplemented by the components of Time Analytics and Spatial Analytics;
- Social Analytics, Ethical Analytics and Worldview Analytics blocks are included in Consciousness without adding them to Subconsciousness.

The resulted AGI architecture is shown in Fig. 1.

It can be hoped that agents with the architecture shown in Fig. 1, in the future after long-term learning, will be comparable to the AGI or will approach to their capabilities. However, even now, without waiting for the appearance of fully functional agents, we propose using separate blocks from the proposed architecture in combination with limited consciousness. For example:

- a bunch of time-spatial analytics blocks could be used in supply chain planning;
- Attention analytics and Abstraction analytics blocks could be used in processing incoming streams of text information;
- the Goal analytics block could be used in conjunction with various enterprise applications (ERP, EAM, CRM, SCM, CPM, etc.) for planning target values of upper-level indicators.

A key solution for all of these cases is to build a limited artificial consciousness. To date, many methods have been proposed for implementing Consciousness in AI in the form of a computable procedure, for example [23-26]. Additionally, about 10 different models of Consciousness can be found in early reviews [27,28]. When constructing limited artificial consciousness, it is important that consciousness be limited by specific knowledge from the subject area, necessary for solving specific problems and not include unnecessary extraneous knowledge. The work [29], which proposed an architecture that supports the minimal machine consciousness, allows us to hope for the possibility of constructing the necessary simplified versions of Consciousness which we will name Lean Consciousness.

Of the three listed cases for using individual AGI blocks, the most promising is the third, which uses a Goal Analytics. The choice of the goal of the next action is a classic problem of cognitive architectures. In one way or another, the problem of choosing the next step is solved in each architecture. But the operations with goals are most fully developed in specialized architectures, such as MIDCA [30-32], GRIM [33.34] and earlier ARTUE [35.36]. In addition, a number of methods for working with goals were developed outside of cognitive architectures in various control systems for autonomous devices (autonomous robots and autonomous systems moving in various environments - on the ground, on water, in the air, in space), for example, [37,38].

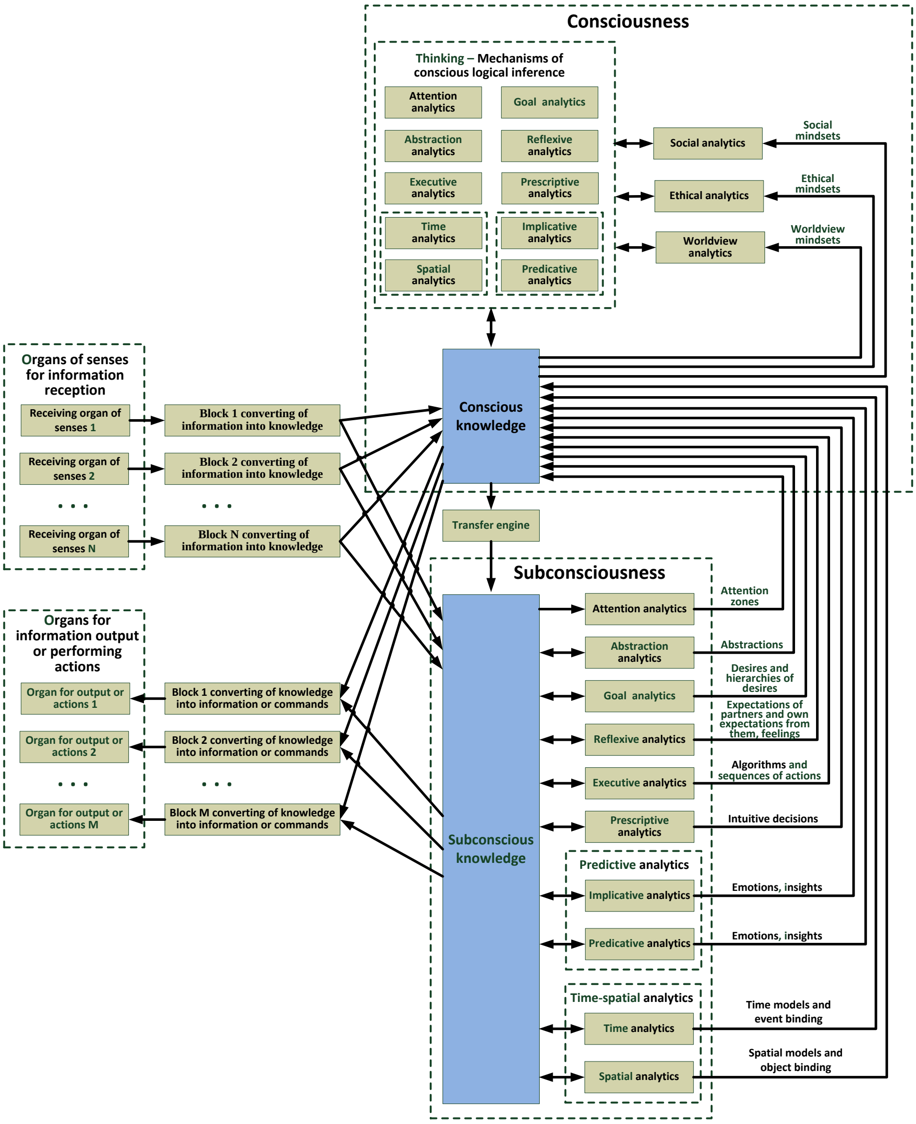

Fig. 1. Proposed full-fledged AGI architecture.

The architecture that allows combining the AGI components (the Consciousness and the Goal Analytics block) with the applications of the enterprise management system, is shown in Fig. 2. In order for the integrated solution to be self-sufficient, it must include a Data Collection block on the state of the external environment in which the enterprise operates (products, markets, including the personnel market and the banking services market, territorial conditions, government agencies, regulators, customers, competitors etc.). Such a block will be equivalent to the sense organs in the architecture of a full-fledged AGI, shown in Fig. 1. And within the framework of the same analogy, a controller will be needed that transforms the information collected into knowledge. In order for the created Lean AGI can evaluate its position in the external environment and plan actions in it, the system will need a block of analytics on the external environment.

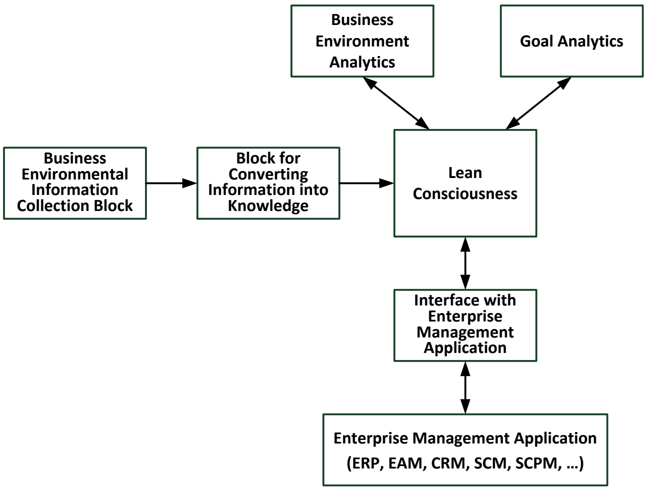

Fig. 2. An example of Lean AGI for integrating Goal Analytics with traditional Enterprise Management applications.

The proposed architecture is aimed at improving the quality of management decisions made at the enterprise and automating the process of making such decisions. This should lead to an improvement in the economic performance of the enterprise.

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