A Concept of a Cognitive System of Motivation (COSMO)

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Introduction

Motivational concepts, such as approach and avoidance goals, have an increasing impact on cognitive models (Markman et al., 2005). In this paper a concept of a cognitive system of motivation (COSMO) is presented that focuses on goal striving by calculating an optimal investment of resources. As a basis a mathematical model of interaction between agents and environments was developed. The intention is to design a general cognitive system that can be used for a wide range of environments serving as an operator for more specific cognitive systems. A second aim is to predict motivational mechanisms by concentrating on characteristics of biological agents.

General mathematical model of interaction

Goals can be arranged as complex goal systems where subgoals are set to pursue the main goals (Kruglanski, 2002). As biological agents act in real environments the interaction between environments and agent is essential for effective goal setting. The diversity of environmental components is a challenge for a cognitive system as it must handle a spectrum of different components and tasks. Evolutionary psychologists argue that the ability to efficiently handle diverse tasks is strictly limited by evolutionary history (Smith et al., 2001). In the presented approach requirements for cognitive systems are reduced by focusing on general characteristics of diverse components rather than their differences: states of environmental components are characterized by numerical values, agents are able to change these state by investing resources and environments are highly cross-linked systems. A general mathematical model of interaction between an agent and environments was constructed. Environmental components are merged into fields. Resource investment of an agent changes the numeric value of a field and due to cross-linking also the total network of fields. The internal information about these states is considered as mediating states (Markman & Dietrich, 2000). In this model the action of an agent is defined as the investment of resources into a field.

Optimizing investment of resources

In the presented cognitive system the superior goal is the maximization of the numerical value of a primary field by an optimal investment of resources into other fields (Fig. 1). Other more specific cognitive systems can be interpreted as fields so that these systems can be used for optimization by allocating resources to them. Because biological agents have only limited information about complex environments the focus of this cognitive system is on optimization approaches with a rather low demand for precise information. Following the paradigm "motivation as cognition" (Kruglanski, 2002) this action controlling system can be considered as a cognitive system of motivation (COSMO), optimization calculations as motivational mechanisms and the results as motivation. By doing so components of COSMO show high similarities to a wide range of concepts of motivation psychology.

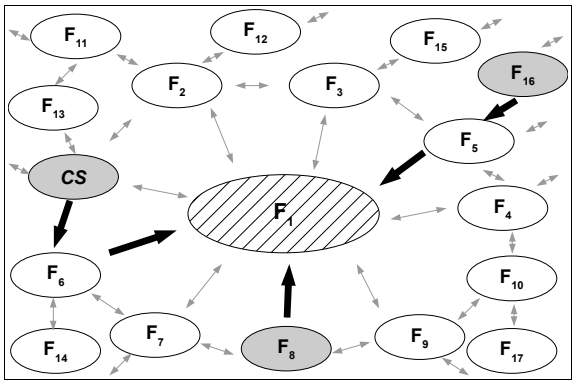

Figure 1: Working principle of COSMO. For maximization of the value of the primary field (F_1) COSMO allocates resources into cross-linked fields (grey ovals) or other cognitive systems (CS). Strong cross-links are marked as black arrows, weak ones as grey arrows.

References

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