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Elements for a Formal Model of Intentional Systems

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Abstract

This paper introduces elementary concepts needed to define a formal, computationally oriented, model for *intentional systems*. First, the paper briefly reviews the central concept of *intentionality*, to contextualize the work. Then, it characterizes the main types of *intentional acts*, defines the concepts of *intentional process* and *intentional system*, and gives the basis of the formal model of such systems. Next in a brief case study, a formal model for a sample *constative* intentional system is presented and discussed. Following, the features that are still lacking to achieve a full-fledged formal model of intentional systems are indicated. Finally, the relationship between the formal model of intentional systems introduced here and the usual semantical models for formal languages is discussed.

Keywords: Phenomenology, intentionality, intentional processes, intentional systems, formal semantics.

1 Introduction

Phenomenology [10] is the area of Philosophy that studies the structure of *experience* and the *acts of consciousness*, reflexive or not, that constitute it.

The characteristic feature of an act of consciousness is its *intentionality*, that is, its directedness toward an object. Acts of consciousness are, thus, *intentional acts*. Temporal sequences of intentional acts constitute what may be called *intentional processes*. We call *intentional system* any system that performs an intentional process.

In this paper, we introduce elements for a formal model of intentional systems which is computationally oriented, meaning that it is conceived having its computa-

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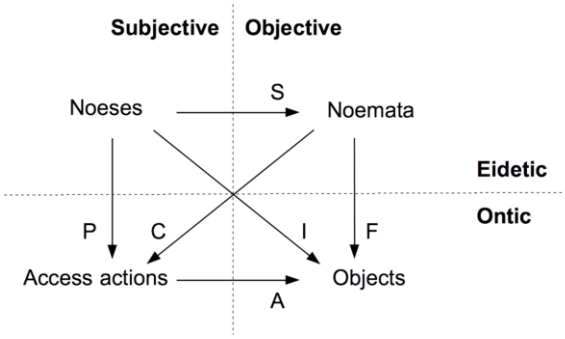

Fig. 1. The Husserlian square.

tional realization, through agent technologies, in multiagent systems [11]. We base the work on Edmund Husserl's analysis of intentional acts [6].

The paper is structured as follows. In Sect. 2, we review the concepts of *intentional act* and *intentional process*, the main background concepts of the work. In Sect. 3 we introduce the formal concept of *intentional system*, on the basis of which we realize the formal modeling of intentional processes. Sect. 4 presents a simple case study, giving a concrete example of the applicability of the ideas presented here. Sect. 5 is the Conclusion, where some related works and some general issues are discussed.

2 Intentional Acts and Intentional Processes

2.1 Husserl's Concept of Intentional Act

The way we construe in formal, computationally oriented, terms Husserl's analysis of intentional acts [6] is illustrated in Fig. 1, where we picture, in what we call the *Husserlian square*, four constituents of intentional acts. They are[3]:

- *Objects*: the set of things and facts in the world toward which intentional acts may be directed; formally denoted by **Objs**.
- *Access actions*: the effective actions[4] through which the objects may be accessed, as such actions occur in the *intentional systems* that realize the intentional acts; formally denoted by **AActs**.
- *Noeses*: the set of ideated essences of access actions, as each such essence (*noesis*) is grasped phenomenologically[5]; formally denoted by **Noes**.
- *Noemata*: the set of ideated essences of objects and facts, as each such essence (*noema*) is grasped phenomenologically; formally denoted by **Nmts**.

The relationships between the various constituents of the intentional acts are:

[3] Note how the Husserlian square subsumes, through its *subjective* × *objective*, and *eidetic* × *ontic* categorization, the distinction between the *epistemic* and the *ontological* senses of the *subjective* × *objective* distinction, extensively elaborated by Searle in, e.g., [9].

[4] "Effective" in the computational sense, i.e., endowed with only finitary features, restricting their applicability to (parts of) objects that can be accessed in finite time.

[5] The *phenomenological method* of grasping objects and mental actions is *observational*, aiming at the *description* of the manifest aspects of the phenomena of consciousness that it studies [6].

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