

Caroline Semmling and Heinrich Wansing

FROM *BDI* AND *stit* TO *bdi-stit* LOGIC*

Abstract. Since it is desirable to be able to talk about rational agents forming attitudes toward their concrete agency, we suggest an introduction of doxastic, volitional, and intentional modalities into the multi-agent logic of *deliberatively seeing to it that, dstit* logic. These modalities are borrowed from the well-known *BDI* (belief-desire-intention) logic. We change the semantics of the belief and desire operators from a relational one to a monotonic neighbourhood semantic in order to handle ascriptions of conflicting but not inconsistent beliefs and desires as being satisfiable. The proposed *bdi-stit* logic is defined with respect to branching time frames, and it is shown that this logic is a generalization of a *bdi* logic based on branching time possible worlds frames (but without temporal operators) and *dstit* logic. The new *bdi-stit* logic generalizes *bdi* and *dstit* logic in the sense that for any model of *bdi* or *dstit* logic, there is an equivalent *bdi-stit* model.

Keywords: modal logic of agency, deliberative stit logic, *BDI* logic, beliefs, desires, intensions, neighbourhood semantics, branching time structures.

1. Introduction

The temporal logics *BDI* and *BDI** of beliefs, desires, and intentions, developed by Rao and Georgeff [9] are among the most prominent and widely applied formalizations of rational agents, see also [20]. In this paper, we shall introduce a modal logic of beliefs, desires, intentions, and agency. Supplementing the *BDI* vocabulary by a modal operator for agency is a very

*We dedicate this paper to the memory of Alexander Vladimirovich Kuznetsov (1926–1984).