Abstract:

Formal semantic approaches to the analysis of questions (cf. Groenendijk and Stokhof, 1997, for an overview) have traditionally focused on ‘yes’/’no’ questions and ‘wh’-questions involving ‘who’/’what’/’which’ (with possible extensions to ‘when’ and ‘where’) leaving ‘how’-questions aside. Both for theoretical and for practical reasons, an account of the latter is of major importance. Especially in dialogue system applications, ‘how’-questions play an important role, whether we are concerned with retailing, route planning or financial advice.

From a descriptive point of view, it is necessary to distinguish two major classes of ‘how’-questions, those involving *gradation* (e.g., “How cold is it?”), with the ‘how’-word usually restricted with an adverbial, cf. Asher and Lascarides, 1998) and *unrestricted*, *transition/act* ‘how’-questions (e.g., “How do I get to the central station?”). In our present contribution, we focus mainly on the second type.

We adopt the claim of Groenendijk and Stokhof (1984) and following work, that the semantics of questions should be given in terms of their answerhood conditions. We show, however, that ‘how’-questions cannot be reduced to fact questions. In order to extend the existing model, we consider the *planning as model checking* formalism provided by Giunchiglia and Traverso (1999). In their approach, plans correspond to transition paths in Kripke structures, and testing properties of plans corresponds to checking the truth of modal formulae in the Kripke structure. The advantages of this approach are that (a) it leads to a clear, simple and intuitive perspective on the problem of planning, and (b) it allows for the use of existing, efficient implementations of model checking algorithms that have been developed for process verification (cf. Clarke, Grumberg and Long, 1994).

Nevertheless, natural language data prove to be richer than those accounted for by the AI framework. We address theoretical issues involving *neccessary preconditions*, *intentions of the participants* and *anaphoric reference*. Finally, we indicate how our treatment of ‘how’-questions can be implemented, allowing for the use of existing model checking tools.