Abstract

The goal of standardisation in open agent systems is to facilitate interoperability between heterogeneous agents. This has been the motivation for developing a standard Agent Communication Language (ACL). Experience has shown that developers will adopt their own solutions when the standard ACL does not fit their needs, resulting in a dialect which is not understood in open systems. We contend that there is a need for a standard way of specifying semantics rather than a standard ACL. Our solution is to develop a specification language for ACLs which will allow developers to create their own languages in a standard way.

In particular this thesis describes:

- A computational model for multi-agent systems which can represent the observable social states of the system including the mental attitudes expressed through communication.

- An agent communication framework which allows agent communication to be given a high level declarative semantics which is grounded in the computational model and hence verifiable in open systems.

- A specification language for ACLs which allows an ACL to be written and given a semantics in terms of observable social states.

- The use of an existing model checking algorithm to verify compliance with an ACL and to verify properties of protocols.

- The application of the theory developed to some common scenarios; in particular, to verify game theoretic properties for a protocol.

The type of ACL specification language presented here could form the basis of a standard, leading to interoperability in open systems. By providing a standard mapping between an ACL specification and the semantics it defines for an ACL, we make it possible for designers (or ultimately agents themselves) to share their specifications and to understand foreign ACLs.