Economics and Game Theory
Negotiation with Incomplete Information about Worth: Strict versus Tolerant Mechanisms

Gilad Zlotkin and Jeffrey S. Rosenschein

1 Center of Coordination Science, Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA 02139 USA
2 Computer Science Department, Hebrew University, Givat Ram, Jerusalem, Israel

Abstract. Research in Distributed Artificial Intelligence (DAI) has for years been concerned with mechanisms of negotiation. In previous work, we considered situations where agents' goals were private information [12, 14, 15]. In order to carry out the negotiation, the agents were to declare, in a -1-phase, their goals. We then analyzed what goal declaration strategies the agents might adopt to increase their utility.

In this paper, we consider an inverted situation, where the agents' goals (and therefore stand-alone costs) are common knowledge, but where the worth they attach to their goals is private information. The agents declare, in a -1-phase, their worths, which are then used as a baseline to the utility calculation (and thus affect the negotiation outcome). We are concerned with analyzing what worth declaration strategies the agents might adopt to increase their utility.

We introduce two mechanisms, one “strict,” the other “tolerant,” and analyze their affects on the stability and efficiency of negotiation outcomes. The strict mechanism turns out to be more stable, while the tolerant mechanism is more efficient.

1 Introduction

Negotiation has been a subject of central interest in Distributed Artificial Intelligence (DAI). The word has been used in a variety of ways, though in general it refers to communication processes that further coordination [9, 7, 5, 4]. These negotiating procedures have included the exchange of Partial Global Plans [1], the communication of information intended to alter other agents' goals [10, 11], and the use of incremental suggestions leading to joint plans of action [3].

In previous work [12, 13, 14], we have considered various negotiation protocols in different domains, and examined their properties. Agents were assumed to have a goal that specified a set of acceptable final states. These agents then enter into an iterative process of offers and counter-offers, exploring the possibility of achieving their goals at lower cost, and/or resolving conflicts between their goals.

One useful technique that we have explored has been the redefinition of utility for the purpose of allowing cooperative agreements in a wide range of encounters. To that end, we introduced the notion of worth in [13], which captured the importance to an agent of achieving a given goal. A useful way of redefining