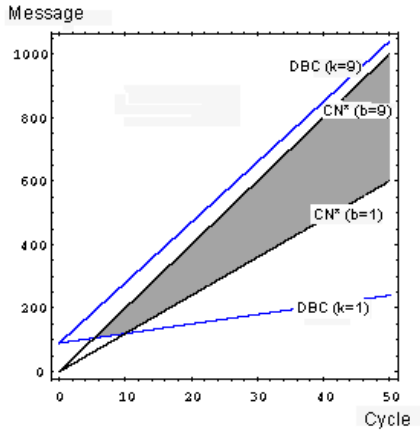
Dependence Based Coalitions and Contract Net: A Comparative Analysis (Extended Abstract)

Márcia Ito and and Jaime Simão Sichman

Intelligent Techniques Laboratory, University of São Paulo
av. Prof. Luciano Gualberto, 158, tv. 3, 05508-900, São Paulo, SP, Brazil
{ito,jaime}@pcs.usp.br

Among several models of dynamic organizations, one can find *Contract Net* [4] and *Dependence Based Coalitions* [3] models. In this work [2], we present a comparative analysis of these models. More precisely, we compare their global communication flow, by changing some parameters that have influence on the total number of exchanged messages. Our main goal is to be able to detect under which conditions one of the models is better than the other, concerning the parameters values.

The Dependence Based Coalitions model (DBC) [3] is based on Social Power Theory, using the core notion of *dependence relation* [1]. In this model, information about the others is acquired during an initial *presentation phase*, which is followed by several *resolution cycles*, when an *active agent* tries to achieve one of his goals. The Contract Net model (CN) [4] is based on the notion of *economic market*. We suppose that agents do not have any information about others (CN*). Therefore, unlike the DBC model, there is no presentation phase.



The main parameters that take part into the global communication flow in both models are the following: the total number of agents in the society (n), the total number of resolution cycles, i.e., the total number of goals to be achieved (g) and the number of possible partners (m). Considering the DBC model, another relevant parameter is the number of agents to whom coalition proposals are sent (k). As for the CN* model, a relevant parameter is the total number of agents that send proposals (b). Considering some simplifying hypothesis, the global communication flow of both models are respectively $S_{DBC} = n(n-1) + g(2k+1)$, where $0 < k \leq m$ and $S_{CN*} = g(n+b)$, where $0 < b \leq m$.

Generally speaking, we can conclude that given a number of agents n, there will always be a range for the values of k and b (dark area in the figure) where from some *critical cycle* on (i.e., intersection of the lines in the figure), the DBC model will have a smaller communication flow than the CN* model. The better situations correspond to those where the active agent's social reasoning mechanism is more accurate ($k \approx 1$).

1. CASTELFRANCHI, C.; MICELI, M.; CESTA, A. Dependence relations among autonomous agents. In: *Decentralized A.I. 3* Netherlands, Elsevier Science Publishers B.V., 1992, v.1, p. 215–227.
2. ITO, M. *Uma análise do fluxo de comunicação em organizações dinâmicas de agentes.* São Paulo, 1999. 141 p. MsC Disseratation — Escola Politécnica da Universidade de São Paulo.
3. SICHMAN, J. S. DEPINT: Dependence-based coalition formation in an open multi-agent scenario. *Journal of Artificial Societies and Social Simulation*, 1(2), 1998. <http://www.soc.surrey.ac.uk/JASSS/1/2/3.html>.
4. SMITH, R.G. The Contract Net Protocol: high-level communication and control in a distributed problem solver. *IEEE Transactions on Computers*, v.29, n.12, p. 1104–1113, 1980.