Chapter 6

Conclusion

This research addresses the problem of optimal coalition structure in distributed environment, where communication among agents is sporadic. There are two research contribution of this project:

1. we have developed the principle to efficiently partition the search space among agents. Our principle is not just a simple division of coalitions among agents and let them search for optimal coalition structure. This partitioning approach balances between the workload among agents and the quality of the final solution.

2. we have enhanced the capability of the value-oriented algorithm for optimal coalition structure. The existing algorithm follows the depth first search, i.e. it branches its search at the lower nodes when it finds that there are no ways to improve. We apply the breadth-first search strategy to reduce the termination time.

We experimented our algorithm by mean of simulation, i.e. each agent run on a single computer. Since we want to minimize communication among agents, we assume the extreme case where the agents could not or would exchange the information about the progress of their search only once at the end of their individual search, which are logically indifferent. As in the literature, we consider the data distribution of i) STD, ii)IND, iii) DCD, iv) CCD, v) CVD, vi) RDD vii) NMD and viii) UNI. We carried out our experiments against 28 and 29 agents

The results show that in STD distribution, the it is hard for the algorithm to prune the search space and took more time to terminate. However, the optimal time is relatively quick, i.e. less than 20 seconds. In IND distribution, the termination times of all settings are shorter than that of IND with an ascending trend from f0.1 towards f1.0 in both 28 and 29 agents. The algorithm can prune slightly better than in STD. The optimal time is also small, i.e. less than 22 seconds in the worst case. In DCD distribution, the termination times are very similar to that of STD both in vertical view of data distribution and in 28 and 29 agents. Furthermore, the times the algorithm took to reach optimality also have similar pattern to that of STD in all vertical view of data distribution of both 28 and 29 agents. This tells us that the behavior of the algorithm in STD and DCD is similar. In CCD distribution, the termination times are again similar to that of STD and DCD in all settings. The times the algorithm took to reach optimality are also similar to the pattern of STD and DCD. However, there are some differences in details. The behavior of the algorithm in CCD is similar to its behavior in both STD and DCD. In CVD distribution, the behavior with respect to the termination time of the algorithm has slightly different pattern to that of STD, DCD and CVD. With respect to optimal time, the behavior of the algorithm in CVD is similar to that of the algorithm in IND. In RDD, NMD and UNI, the behavior of the algorithm follow a consistent pattern in all f0.1, f0.5 and f1.0. In general, these RDD, NMD and UNI share some similarity in their data distribution.