Chapter 22
Incorporating the Negotiation Process in Urban Planning DSS

Imene Benatia  
University of Tebessa, Algeria

Mohamed Ridda Laouar  
University of Tebessa, Algeria

Sean B. Eom  
Southeast Missouri State University, USA

Hakim Bendjenna  
University of Tebessa, Algeria

ABSTRACT

Cooperation in multi-agent systems is necessary in order to perform complex tasks and lead Multi-agent System (MAS) towards its objective. Contract-Net Protocol (CNP) is one of the communication and coordination mechanisms used by multi-agent systems which prefer cooperation through interaction protocols. This paper proposes a new cooperation and negotiation protocol based on the principals of the Contact Net Protocol (CNP). The authors’ suggested negotiation protocol is used to solve one of the problems in the context of the city planning which is the problem of election of urban projects. Their proposed protocol is intended to the decision makers in order to help them resolve the problem of the evaluation and the selection of the best urban project without the need to be together in a decision urban room.

1. INTRODUCTION

Urban planning is a branch of architecture that focuses on organizing metropolitan areas. Made up of several different fields from engineering to social science, this practice was developed to correct problems caused by cities that expanded quickly without planning. At its core, city planning aims to provide a safe, organized, and enjoyable home and work life for residents of both new and established towns (Anonymous).

DOI: 10.4018/978-1-7998-0948-7.ch022

Copyright © 2020, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.
In the context of urban planning, each city tries to solve the problems in the different domains (habitat, transportation, economy, sociology, etc.) by proposing various urban projects to reach a sustainable development. The urban projects are often characterized by contradictory criteria (Schutte & Brits, 2012), as they represent a set of approaches to obtain an agreement between the different agents (decision makers).

To cope with the complexity of decision making by a multitude of decision makers, the concept of a decision room was developed in the field of management science (Van Loon & Bronkhorst, 2007). A decision room is a room were decision makers come together to discuss, define, and combine alternative decisions (Van Loon & Bronkhorst, 2007).

A multi-agent system (MAS) can defined to be a system comprised of multiple interacting intelligent agents (Nwana, 1996) in an environment. It can be used to solve troublesome issues and problems that are not possible for a private agent or a monolithic system to unravel. Multi-agent systems carry its surroundings and agents with and within it. Generally, multi-agent systems research refers to software system agents that are actively functioning in order to achieve the goals of a multi-agent system or their individual goals. However, in a multi-agent system, the agents could equally well be robots or human-beings. A multi-agent system may contain combined human-agent teams. (Kaur et al., 2013)

Multi-agent systems are applied in the real world to graphical applications like computer game and films. They are also used for coordinated defense systems. Other applications include logistics, graphics, Geographic Information System (GIS), disaster management, urban planning as well as in many other domains. (Kaur et al., 2013)

In Multi-agent systems, a single agent alone is not sufficient to solve any complex problem for which actually the MAS are designed, as it does not have sufficient resources, information, or competence. Therefore, in order to perform the tasks and achieve the goals of the system, an agent has to coordinate with rest of the agents of the system. Additionally, in order to ensure cooperation, agents must communicate with each in MAS by using various communicative protocols (Kaur et al., 2013). One of the best and oldest mechanisms used for negotiation and coordination is Contract Net Protocol (CNP) (Smith, 1980).

In our study we proposed an automated system of negotiation based on Contract Net Protocol for resolving the problem of evaluating and selecting the best urban project.

This article is structured as follows:

Section 1. A brief introduction
Section 2. A presentation of the problem and the description of our contribution.
Section 3. Related works.
Section 4. Suggested approach.
Section 5. A case study on housing development projects.
Section 6. Conclusion

2. PROBLEM AND CONTRIBUTION

The urban cities undergo many problems in various fields such as transport, habitat, trade, etc. Therefore, each city tries to solve them by proposing various urban projects. The posed problem exists because the urban projects are multi-criteria in nature (Schutte & Brits, 2012). This means that these projects have several criteria that are often conflicting in nature with varying degrees of importance. This generally involves several decision makers (ecologist, sociologist, economist, etc.) with contradictory interests.