

Visualizing Space-Based Interactions Among Distributed Agents: Environmental Planning at the Inner-City Scale*

D. Borri and D. Camarda

Dipartimento di Architettura e Urbanistica, Politecnico di Bari,
via Orabona 4, 70125 Bari, Italy
Tel.: +080.5963347; Fax: +080.5963348
d.camarda@poliba.it

Abstract. Since from the 1980s, computer science and artificial intelligence have focused on environmental planning, with high interest in analysing real and virtual cognitive agents at work. This is true for procedures, long-range planning, operational planning, as well as factors and scenarios of future events, future risks, multi-agent organisation, and resource-based planning.

This long-range, large-scale, strategy-driven interest has generally prevented short-term planning, low-scale and detailed planning from being explored with an intelligent-planning approach. This paper shows a case of small-scale inner-city planning for environmental and development issues in an urban context, with a sustainably sound approach.

In this concern, a system architecture has been set up, to support the interaction of local social, economic, financial agents by a web-based geographic interface able to visualize, share, channel substantial information in the planning process with a space-based approach. The details of setup methodologies and results are analyzed, trying to find potentials and critical characters of a georeferenced cooperative work, particularly attentive to the role of space-based cognitions and discourses in multi-agent interactions.

1 Introduction

Looking at *problem-solving* and *problem-setting* issues, cognitive science has recently generated an innovative need of non-expert knowledge, to integrate traditional expert knowledge in the quest for situational solutions and representations. At the foundations of such emerging need was the awareness of a greater generality, complexity, ductility of common knowledge toward general cognition tasks.

Integrated groups of expert and non-expert *knowledge workers* have then appeared in the typical interactive arenas of multi-agent cognitive processes of strategic planning -for example largely in planning non-immediate futures. In this expansion of cognitive agents' sphere, experts remained in one side and non-experts on the other side -the second ones being mere providers of cognitions whose processing and use is delegated to others. However, just the widening of strategic planning experiences has

* Within a joint study and research work, part 1 was written by D.Borri, parts 2, 3, 4 were written by D.Camarda.

highlighted the limits of a narrow distinction between expert and common cognitive agents. On the contrary, the efficacy of fully integrated spheres of cognitive agents has been pointed out [15].

Levels and natures of agents' social affiliations are only partially explorable. Thus, knowledge generated and processed in *forums* is never 'native' but partially 'transformed' and framed within social structures that knowledge itself produces and by which is produced. 'Contingent' transformations of cognitions induced by agents entering -often unexpectedly- into *forums* are linked to the tendency of those agents' cognitions to adapt, positively or negatively, to autochthonous agents' cognitions and expectations. This tendency is even explainable through the need of cognitive environments and 'intelligent' cognitors to adapt their cognitions, so as to activate various and significant interactions without a blocked confrontation [7].

Therefore, given the above mentioned aporias linked to the social and political frameworks of forum cognitions, why forums are regarded as useful for complex problems? More 'isolated' cognitions than the ones generated in forums, for example expert ones, are more 'native'? We could reply by confirming the usefulness of cognitive spheres integrated with expert and non-expert knowledge. Or we could even postulate the impossibility of an isolated elitarian cognitor [10]. Dealing with cognition spaces clearly requires peculiar architectures. They are open, interworking, wide rooms, large enough to contain the possible maximum number of agents concurring to forums in 'realistic' conditions of 'concurrence' [5][14].

Such forums are equipped with wide and rapidly and easily accessible (multi-indexed) memories, with the possibility of accessing exogenous or endogenous *frames* to continuously contextualize and clarify cognitive processes [6]. Previous experiences of our research group show the initial greater (e.g., temporal) efficiency of wide groups of agents interacting implicitly (by automated routines) in comparison with agents interacting explicitly by continuous external mediation, and meanwhile the greater efficacy implicitly interacting agents in the final stages of the process [13].

Starting from these reflections, the paper tries to explore issues and problems with particular reference to the city of Cerignola in southern Italy, whose municipality has set up a participatory process to draw a inner-city regeneration plan. After the present introduction, the second chapter describes the architecture of the planning process, arguing on the methodologies of building up the multi-agent system and its operational structure. The third chapter focuses on results of the interaction process, following particularly the effects in terms of the efficacy of space-based representation, in relation to the dynamics of cognitive and substantial contents. Brief final considerations end up the paper.

2 Methodology and Process Architecture

The context of study is Cerignola, a 60000 residents city of Apulia, in southern Italy (fig.1).

The planning process was organized in the articulated NW quadrant of the urban area, starting just adjacent to the inner core and extending till the border of an important highway road (fig. 4). The quadrant is full of decaying physical as well socio-economical characters, ranging from old buildings and neighbourhoods to