ABSTRACT

We present a model of distributed computerized system that must allow simultaneous exchanges of knowledge and opinions on common decision making between many users, on a situation to be structured, by taking into account message enunciation pragmatics. The system has an inner interpretative loop, transforming itself in adaptive system. Its architecture is founded on organizations of dynamic agents.

1. INTRODUCTION

We are interested in computerized systems dedicated to the management of emergency situations. These are multiusers systems where different knowledge, facts, opinions, judgments are exchanged between distant operators through high speed networks. So, many points of view are expressed about the moving situation, representing the perceptions of the different actors. The tremendous amount of messages is no longer adequate with centralized systems based on a given hierarchical structure [LAG 90].
As such, we are interested in the exchanged knowledge between users that have to solve a common problem. The Distributed System architecture we propose should allow the expression of two knowledge categories. A classical architecture will allow the access and the exchange of factual—objective—data about the situation through the handling of various databases. The other, containing the previous, must allow the expression of the perception of the phenomenon by the decision makers (later referred as actors), that is, their subjective appreciation of the situation. The system must allow multiple simultaneous accesses facilitating the decision making at various responsibility levels, that is, including the actors’ intentions and that of groups of actors. It must then know the different types of exchanged knowledge and behave like a decisional entity able to unravel, from exchanged knowledge between actors, the global representation that can be reasonably conceived on the emergency situation.

Thus, we are in the context of the so-called complex Distributed System [CAR 97], i.e. management of situations whose evolution is not well planned beforehand and whose component representing the current state is to be constructed, augmented and dynamically modified during the use of the system. In order to represent the link between the phenomenon to be studied, structured, managed by actors and the system which informs and provides help to the decision making on the phenomenon and the knowledge on what the different actors have, we insert in the Distributed System an interpretation system on the knowledge and judgments about the situation as perceived by the different actors. Then, the resulting system is an adaptive system.

2. SETTING THE SEEDS

Traditionally, the problems treated in Artificial Intelligence lead to a dichotomy between domain knowledge and the rules that are supposed to operate on them. According to this approach, the systems is considered as a general problem solver that provides objective results from clearly identified data. The problem domain is well structured and data allow to choose a case that will be subsequently studied.

In emergency situations management, the initial situation is not structured. The incoming data, considered as inaccurate and fuzzy, issued by potentially unreliable sources, will lead to some kind of structuration of the problem domain. But since actors that provided data belong to different institutions, are geographically widespread, are in emergency situations and have a very partial view of the situation, the information they exchange on the network concerning the situation are very dependent on the emission context, that is, they are encapsulated in their necessary pragmatics [C&D 97].

2.1. The Case of a Single User

When a single user communicates with a system, he uses it like mere factual knowledge database. Knowledge, whatever its form, is represented in the system with symbolic structures. Inference mechanisms raise some of these and the user understands, with no help what the system displays on the screen after computation, by interpreting those signs. We are typically in the case of the de Saussure or Frege’s dyadic semiotic where knowledge is represented in a system, by experts, and is symbolically treated by this system and eventually returned to a human that will use it. The symbols refer to what they signify [EVE 90]. For the system, knowledge is nothing but a set of symbols and for the user, these symbols denote with no ambiguity objects of the real world whose enunciating context is not present nor considered, usually, as necessary.