Narrative tools to improve Collaborative Sense-Making

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Abstract

Narration is a usual mode of sense-making in the new, ambiguous or equivocal situations. Here we characterize the role of narration in situations of comprehension and collective problem solving. Then we present an approach of modeling of narrative knowledge and the associated tool - HyperStoria- which makes it possible to assist a group in the acquisition and the modeling of narratives charts starting from graphs of goals and events.

Keywords : collaborative sense-making, narrative knowledge, augmenting team sense-making, knowledge sharing, representational coherence.

1   Introduction

In Artificial Intelligence, stories were mainly studied in the fields of comprehension and the treatment of natural language but seldom in finalized activities like the problem solving or the interpretation of information for decision. Research is more concerned with written rather than on oral narration in situation. Lastly, the models rather approach narrative like a text (product) than like an act of communication (process). The structure of the texts was thus modelled using varied formalisms: scripts for Schank and Abelson [17], story grammar for Mandler and Johnson [12], scheme for Rumelhart and Norman [16], graph for Lehnert [11], modality for Meehan [13], causal links for Trabasso and Sperry [19], or textual processing for Kintch and Van Dijk [20].

Recent contributions result in reevaluating narration and its contribution in the fields of the CSCW and knowledge management. Boland [3] described a narrative groupware making it possible to improve the sharing of knowledge within the various communities of an organization. Orr [14] shows the crucial ole of the narration of stories in the creation of tacit knowledge of the repairers of photocopiers at Xerox, in situation of collective problem solving. The knowledge based system Eureka of Xerox henceforth makes it possible to capture and disseminate these stories exchanged during situations of diagnosis. Wenger

[22] conceptualizes the stories in shared repertories of the members of the communities of practice. Pentland [15] uses the narration in the analysis of process preliminary to the installation of workflow. Brown and Duguid [4] underline the role of the narration in the collective interpretation of problems, the sharing of information and the maintenance of technical expertise. Denning [7] develops the function of story telling for knowledge management: it makes it possible to improve the communication of new knowledge in large organizations strongly spread like World Bank. Gruen [8] proposes a method of development for the design of HMI and tools of CSCW based on the narration (scenario-based design). Cohen and Prusak [5] describe the role of narratives conversations in the formation of the social capital, necessary according to them for an effective sharing of knowledge. For all these authors, the modeling of the narratives constitute a central technique to capture and share the knowledge: the narratives models integrate contextual information better that purely conceptual or procedural methods.

Lastly, the field of the organizational studies (Czarniawsa [6], Kleiner and Roth [10]) currently resort to the narration in five principal forms: an object of study, a data source (collection of stories), a mode of intervention to capitalize knowledge, a grid of analysis of the organizations and finally a method of description/diffusion of the data of research (case studies).

This encourage us to propose new assumptions. Firstly, the narration is not a phenomenon restricted to language comprehension. A narration reports a sequence of past real events (stories) or to come (scenario), implying at least an agent. The narration is a finalised activity directed towards two types of tasks:

- Not focused activities of comprehension (situational awareness), which relate to interpretation by the agents of the cues that they select of their environment (comprehension of the environment);
- Focused activities of comprehension, within the framework of the problem solving, which relate to the construction of the representation of the task (comprehension of the problem or problem framing).

In the first case comprehension consists in, when it cannot be immediate (unexpected and surprising event), building in an ascending way a coherent representation of a semantically rich cues. The finality of the representation is marked weakly because the construction of coherent representations does not constitute necessarily a problem (in the sens of problem solving) and can be sufficed for itself. One will speak in this case about "sense-making" (Weick [21]). When a frame of the situation exists, the method of comprehension will be more downward. In the case of problem solving, on the other hand, the activities of comprehension relate to tasks raising typically coming from problems of structures induction of (error or breakdown diagnosis, identification of concepts). Comprehension is strongly finalized since it is a question for example of proposing a correction, as in the general case posed by a problem of diagnosis in the sens of KADS.

Secondly, the narratives are abundant and accessible material in the organizations and it is thus necessary to privilege in priority the oral, authentic and daily expressions of these narrations. The oral narration indeed plays a significant role in many daily activities (recrutment, report of incidents, on-the-job training, experience sharing between experts, transmission of instructions, social life at work, communication).

Thirdly, we approach story like an act of communication (process) while seeking however, from the point of view of knowledge engineering, to modelize knowledge which results from it. The purpose of the modeling of narratives knowledge is to help teams to carry out the tasks of interpretation of weak cues and definition of the problems, while facilitating the training of these communities of practice.

Lastly, we privilege collective interactions, on the basis of the assumption that, contrary to the monologic postulate, the co-operation narrator/interlocutor is essential to the production of stories and, beyond, those of the members of the communities of practice.

However, the collective dimension of the narration is not limited to the specific interactions and in face-to-face interaction. On the one hand, the narratives interactions can be interpreted like networks of conversations, more or less recurring, related to operational processes of the organization (strategy, design, production, maintenance, sale, purchases...) as to less structured processes (informal exchanges between experts within communities of practice).
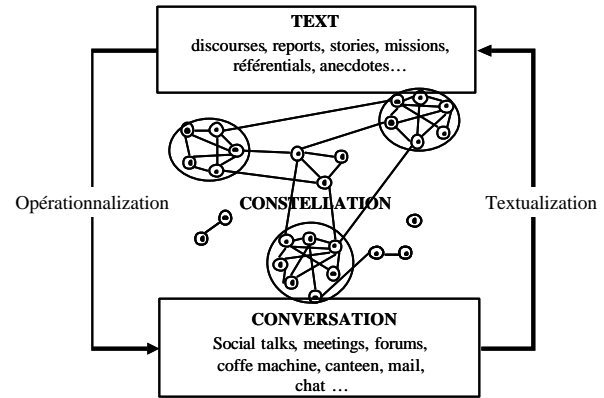

FIG. 1 - *Conversations, texts and narratives constellations*

In addition, it is necessary to integrate the phenomenon of the narrative reiteration in the conversations for resolution because the characteristic of the narrations is to be able to be reproduced ad infinitum (retellings) and to generate new stories in reaction to this first story. In the organizations, narratives constellations form dynamic and organized entities which can be analyzed thanks to the techniques of analysis of network (story network analysis). It is by iteration and progressive selection (abstraction / generalization) that some of these fragments end up forming stabilized texts in the organization (textualization), which provide in their turn a whole of frameworks (concretization /specification) to the daily activities (operationnalization)

2 Sense making and negotiation of meaning

The narrations support collective attribution of meaning to singular events and wich are difficult to interpret according to logical and factual methods. The stories feed the interpretation of information in a group and are used as a basis for collective problem solving. The narrative structuring makes it possible to gradually put in coherence information, to guide the process of resolution and to organize the reasoning and knowledge which results from it.

The relationship between narration, sense-making and negotiation of meaning is frequently underlined (Weick [21], Wenger [22]). Interpretation and the subjective implication are central dimensions of the narration in the organization. The narration makes it possible to allot meaning to cues, events or situations which are difficult to interpret (ambiguity) or for which there exists several competitor or contradictory frameworks of interpretation (equivocality). Zack [23] estimates that knowledge management makes it possible to better manage what the or-

ganization knows already but that it does not make it possible to approach what the company is unaware of. Organizational ignorance results in four problems of knowledge:

- uncertainty: not to have enough information,

- complexity: to have to process more data than one can manage or include/understand,

- ambiguity: not to have a conceptual framework to interpret information,

- equivocality: to have several contradictory conceptual frameworks.

The data processing is associated the management of complexity or uncertainty (convergent problems concerning specific, precise, quantifiable, logics of arguments which can be submitted to empirical investigation). O the other hand, the treatment of knowledge is associated to situations of resolution which require interpretation, creation, sharing and negotiation of the meaning. The problems of cognitive treatment of ambiguity and equivocity are divergent problems which are not easy to quantify and measure and which seems not to admit only one solution. In the same way, complexity requires a restriction of factual information whereas the equivocity calls the restriction from the various interpretative points of view. Conversely, uncertainty requires the additional acquisition of information while ambiguity asks for the acquisition of new frameworks of interpretation. Today, data processing offer effective solutions to manage uncertainty and complexity. It is on the other hand rather not very effective to assist the treatment of ambiguity and the equivocity.

Narration is precisely a current response to the treatment of ambiguity and equivocity. It is generally started by a cue or an event considered surprising, which does not relate to the framework of interpretation of the agents. The narrations produce "naive explanations" which result from causal attributions. The theory of attribution makes the assumption that any individual tries to give sens to the context in which it is located. In front of a strange, unusual or extraordinary event, the agent seeks to include/understand this event, to interpret it and to allot to him causes (cognitive dimension). By allotting causes to the events which surround him, the individual has the feeling to improve its comprehension and to increase its control on the situation to act (behavioral dimension). The narrations aim at collectively increase the control of the causal structure of our environment : physical, informational, cognitive and relational, in particular in situations of equivocality and ambiguity.

3   Narrative knowledge modeling

Based on the specification described above, we propose a story modeling. In this project our aim is to provide a simple -simple but structured and consensual- representation of knowledge concerning objects, agents and events. Methodology consist in enriching this structure by opposing different views of agents involved in the situation. By this way a negotiation around the narrative of the story is engaged in order to reach a consensual model. From this first analysis we can provide other views about this story in order to remove ambiguity and equivocities which are causes of problems of misunderstanding, individual or collective. Each representation uses a simple formalism which have a non-ambiguous semantic. Two cases of use can be viewed :

- the story understanding, in order to clarify it and attempt to reach a state of better coherency between agents' representations of a same situation of work ;

- the story understanding, in order to assist problem solving. For instance, one case deals with analysis of the situation of crisis when it's not necessary to react immediately. One can also consider problems of planning when situations analysis are made on qualitative criteria and consequently should make appear important differences between views of agents.

At this stage of development of the methodology, the knowledge engineer is in charged of elaborating the model of story subsequently to the activity. Concerning problemsolving we assume such structural description of story could be interesting in order to support the sense emergence thanks to a shared representation of knowledge brought by the narrative. The model presented in this section is a first theoretical release coming from our hypotheses regarding the macro-structure of a story. This first release deals with only one kind of narrative which comprise only one narrator and one interlocutor standing for an assistant to the narrative. The conceptual model of narrative can be break down in three main components as shown in figure 2.
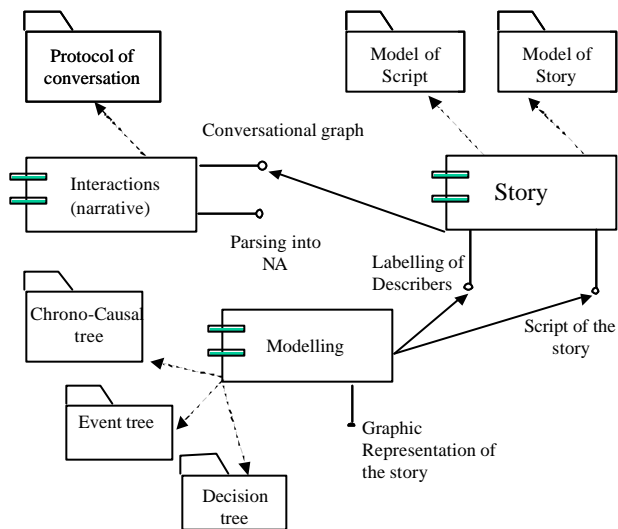
FIG 2 : *the modular architecture of HyperStoria*

FIG 3 : *the components of the model of the narrative*

Each of this component uses different structured representations of the story : a model of conversational interactions, a model of script [17], a general model of story and others graphical representations as a causal tree, a decision tree and an event tree.

3.1 The components of the model

Related works about story modeling reveals a convergent tendencies to distinguish a sequential structure comprising four main frames (more or less one) which can be described as fo llows :

- description of the situation, called the Situation part ;

- description of events which make intrigue, we called it the "Complication" part ;

- the development of the story, we called it the Resolution part, about what some others models differed. Several releases add sub-components in order to make appear questions and argumentation ;

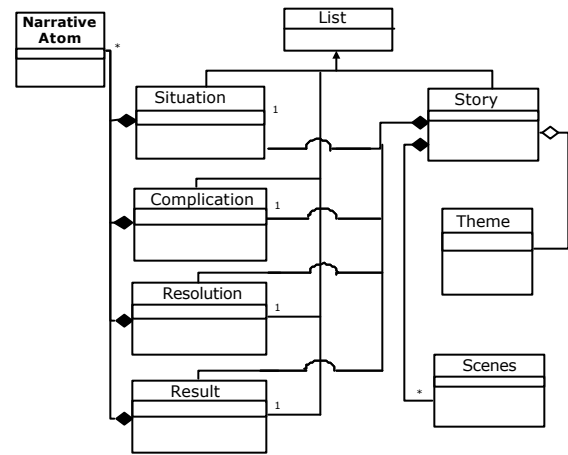- the result which closes the story, called the Result.

Each of these components is a list of Narrative Atoms (NA) coming from analysis of the narrative broken down in simple assertions. This model provides others information about the story and first of all is the theme. The theme is the justification of the narrative. This mo del also represent the scenes (as script [17]) which put forward knowledge about agents, goals, links between these scenes during which agents will try to achieve their goal.

3.2 HyperStoria

HyperStoria is the name of the prototype software intended to support story analysis, representations sharing and sense emergence within all of the phases till the elaboration of the causal and decision trees.

HyperStoria is based on a Web interface driven by a PHP parser for story's data processing. These representations are organized and saved in XML format. As an indication, figure 4 below show a screenshot of two of functional components : NA labeling and the representation of *script*. This former is dynamically generated from labeled atoms in form of Scalable Vector Graphics (SVG).
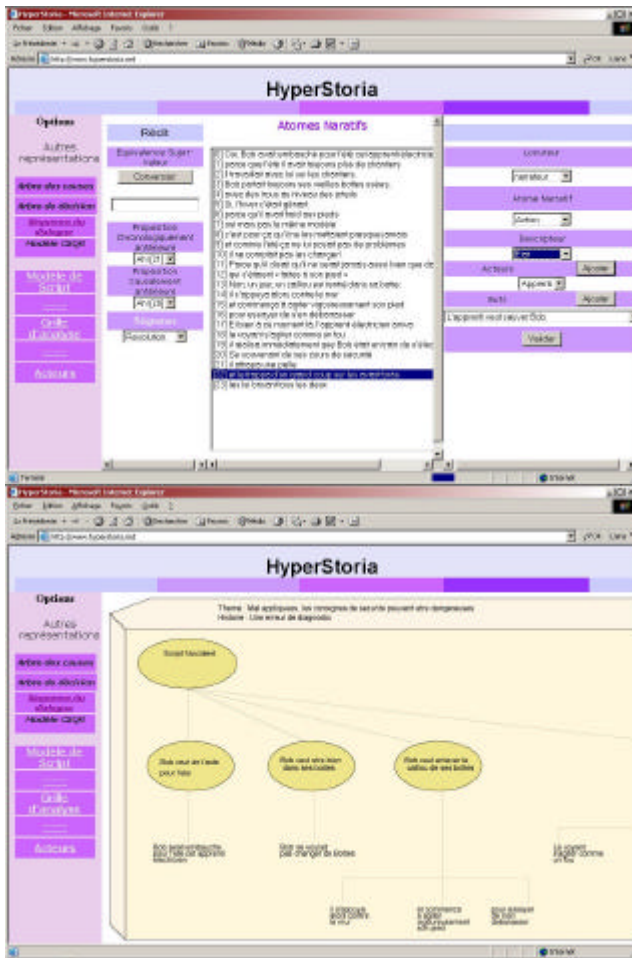
FIG 4 : *interface of NA labeling and graph of the script*

4 Conclusion

Although the narrative can be considered as a major process for sense generation, it has not been yet used in Knowledge Engineering as a mean of negotiation of meaning for providing a shared representation on a situation of work.

Our work aims to show how, in the core of the analysis phase preceding the diagnostic, the negotiation of a shared representation of the situation from multiple narratives of a same story could be an effective way in order to improve a decision based on the analysis of this situation.

Prompted by existing and convergent models, we propose a model of representation for the narrative. Finally, HyperStoria provides a collaborative tool to confront, exchange and share these models of narrative on a same situation and reach a consensual representation.

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