How Virtual Narratives Can Improve Patient-Doctor Communication

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Abstract
Interactive Media can be efficient tools to support patient-doctor communication, yet their development costs make them available for use in institutional communication only. We suggest that Interactive Narratives, whose content is generative by nature, can address this issue by helping to visualise specific data. Using interactive narrative technologies that we have developed over the past 10 years, we introduce two example applications. One consists in customising interactive narrative directly from free text patient education documents. The other is to visualise patient’s experience in a narrative format from patient’s questionnaire.

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Interactive Narrative, Narrative Medicine, Serious Games

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General Terms
Algorithms, Human Factors
Introduction

Over the past years, there has been a growing interest in the use of 3D interactive systems in Medicine, including for patient education [5], somehow capturing the fact that games were becoming a mainstream medium. The appeal of such systems is both their narrative element, which provides an overarching logic for the often unfamiliar actions taking place, and their simulation element that allows exploration of situations and places. However, the production costs of such systems remain a limiting factor, as well as the difficulty to personalise their scenarios, which is a consequence of the procedural coding of the knowledge underpinning these applications. By contrast, Interactive Storytelling techniques [1] implement dynamic behaviour generation which supports a more declarative approach, possibly addressing this bottleneck. What makes Interactive Narrative a candidate technology to improve patient-doctor communication is precisely its generative component, which can be parameterised using situation-specific data.

In this paper, we introduce two examples of the use of virtual narratives, one for each dimension of patient-doctor communication. The first one revisits patient education by facilitating the development of Interactive Narratives from patient education documents (Figures 2 and 3). The second one follows the development of narrative medicine [3] and allows the physician to reflect on the patient’s perception of her own experience (Figure 1). It should be noted that both applications are asynchronous in terms of patient-doctor communication, in the sense that they are not intended to be used as part of either consultation, diagnosis or follow-up, i.e. situations where both actors are present. Instead, they confer to each party an ability to experiment with essential knowledge pertaining to this communication situation.

Interactive Narratives in Medicine

One of the original motivations of Interactive Storytelling was to include a more principled narrative component in virtual environments, for entertainment applications but also training and simulation. If contrasted with computer games (serious or not) Interactive Narratives rely on an implicit plot representation, which supports the generation of multiple narrative variants depending on initial conditions, or user interactions during the unfolding of the narrative. A typical Interactive Storytelling system comprises a set of action representations and a narrative generation system, for instance a Planning system that organises these actions in a sequence to fulfill a particular task. This AI component is embedded in a visualisation engine in which each action can be staged using appropriate characters’ motion, camera placement, and basic physics. This virtual environment remains fully interactive (unlike an animation) and the user can explore it through navigation and interaction with objects. User interaction helps explore the knowledge content of the environment, from the discovery of pre-requisites and ordering constraints to “what-if” attitudes and the explorations of the consequences of some attitudes. Over the past years, we have developed a virtual hospital with its cast (using the Unreal\textsuperscript{®} Development Kit, UDK, a state-of-the-art game engine) to support multiple experiments in interactive storytelling, from entertainment applications (medical dramas) to narrative medicine [2]. We describe ongoing work in the use of this
environment to explore patient-doctor communication use cases.

**Visual narratives for patient education**

Patient education plays an essential role in the management of chronic disease, as well as the optimal preparation to a whole range of therapeutic interventions. It should be ideally coordinated between physicians, relevant medical societies and governmental agencies. Information documents are an essential part of such communication, as the bandwidth of face-to-face communication is intrinsically limited, and it is essential for such information to be persistent and support situation preparation and rehearsal.

Patient education documents have been revisited since the adoption of evidence-based approaches. In some cases, their production now adopts the same model used for the development of clinical guidelines with expert and reading groups involving expert physicians and patients’ representatives. However, addressing the full spectrum of patients’ literacy remains a challenge, and even with careful consideration patient documents may not be devoid of specialised terms and concepts [6]. As part of the MUSE project (an FP7 Open FET project) we are investigating how to instantiate a baseline narrative directly from patient education documents. The application scenario is based on bariatric surgery and the resulting interactive narrative enables the patient to understand the various steps of the procedure, not least in terms of eligibility and preparation. The interactive narrative confers the ability to rehearse hospital visits and understand the multiple steps and the role of the multidisciplinary team (Figures 2 and 3).

**Visual narratives for Patient Experience feedback**

There are multiple dimensions to patient-doctor communication, which range historically from the unbiased description of symptoms to more recent participatory aspects. Another important dimension hitherto underestimated is an expression of the patient’s own experience, which in some cases also constitutes a backchannel for the overall clinical care.

The growing interest in narrative medicine [3] responds to a need for physicians to be equipped with an epistemic framework into which to integrate patient’s experience. Such a framework should ideally achieve a balance between empathy and the need to preserve an objective attitude towards the overall situation. Not all physicians can develop a narrative competence on their own and some could even be intimidated by the literary aspects involved. Since narrative medicine has already made use of visual supports such as feature films, our proposal is to endow the interactive narrative with dramatic elements that would convey a feeling for the user experience. The underlying idea is to generate a virtual narrative from patient feedback questionnaires, while bringing to light the affective perception of the patient (from the subjective perception of time to relational aspects). In previous work, we have developed techniques to render the same actions under different dramatic intensity, through the attitude of characters as well as staging effects [4]. This makes it possible to envision a mapping from patient questionnaires’ results to the parameters of the virtual narrative. The virtual narrative would constitute a visualisation of the patient’s experience directly accessible to the physician, which she will be able to contrast to her own impression of the patient’s response. This form of mediation may improve
attitudes while avoiding direct confrontation or recrimination.

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References

Authors’ Background
Marc Cavazza is Professor and Assistant Dean for Research in the School of Computing at Teesside University. His group has been active in Interactive Storytelling for over 12 years and has developed several specific approaches and techniques (character-based storytelling, state constraints…) with numerous prototypes demonstrated at major conferences (AAMAS, ICAPS, ACM Multimedia, ACM IUI). He was the coordinator of the FP7 Network of Excellence on Interactive Storytelling. He holds an MD and a PhD (both from University Paris 7), and attended the Narrative Medicine workshop at Columbia University in 2011. His current interest is in medical applications of Interactive Narrative techniques.

Gersende Georg is a project manager at the Clinical Guidelines Unit, HAS (the French National Authority for Health), since 2007 and at the Accreditation Healthcare Organizations Unit since October 2008. She holds a PhD in Medical Informatics and Public Health from the University of Paris 6. Her research investigates the computerization of clinical guidelines throughout their entire workflow, from authoring to consultation and the generation of knowledge bases for decision support systems, focusing on the information extraction from medical documents. She has worked recently on a new hypertext format for direct access to Guidelines’ contents based on a limitation of navigation “depth” (reco2clics) and also for new media facilitating the understanding of the content of documents such as patient documents as well as clinical guidelines.