Dialogs taking into account Experience, Emotions and Personality

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Abstract. This paper describes the DEEP project (Dialogs taking into account Experience, Emotions and Personality, adapted to computer games), which started in June 2006. The aim of the project is to provide generic solutions for the integration of autonomous Non Player Characters (NPCs) in next-generation adventure games. DEEP NPCs, equipped with a personality and a believable emotional engine, will use context-based information from the game environment and the player behavior to provide entertaining, rich and relevant dialogs.

1 Introduction

In most computer games, and especially in solo adventure games, the quality of the player immersion is directly related to the design of a believable environment. One of the most important constituent of such an environment is its population, the Non-Player Characters (NPCs). Theses are currently designed through script-level programming. This technique can't afford the required variability, and can lead to boring, repetitive, or even contradictory NPCs behavior [9].

In this context, the aim of the DEEP project[1] is to provide generic solutions for the integration of realistic, autonomous, intelligent and emotional NPCs in next-generation adventure games. The project focuses on providing rich dialog between the player and NPCs. Our approach defines two fundamental research orientations which are usually seen as hard to conciliate in academic research : the narrative approach and the autonomous agents approach.

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The narrative approach relies on conceptualizing the player experience and history in the game and asserting the dialog always follows the narrative logic. The other research orientation relies on providing an autonomous NPC architecture which allows the design of a wide variety of personalities for virtual characters. Combining these two orientations is identified as the main issue of the project.

This paper describes the scientific challenges faced in the context of the DEEP project and the approaches adopted to solve them. The paper is organized as follows : section 2 defines the DEEP architecture, and section 3 and 4 focus respectively on the narrative model and NPC model. We conclude with a description of open issues.

2 DEEP Architecture

The purpose of the DEEP architecture is to provide NPC dialogs, which are more relevant considering the player experience, and richer through the definition of various NPC personalities and of an emotional model. The dialog engine uses the player and NPC models as a context base for selecting the most suitable dialog, according to the current situation. These models are dynamically updated using information gathered from the game environment. It provides the emotional state and the knowledge of each NPC, the player's context in the narrative and his expected knowledge.

The general architecture of DEEP is described by the figure 1 and relies on three main components: the **Drama Model** the **NPC Model**, and the **Game Controller**.

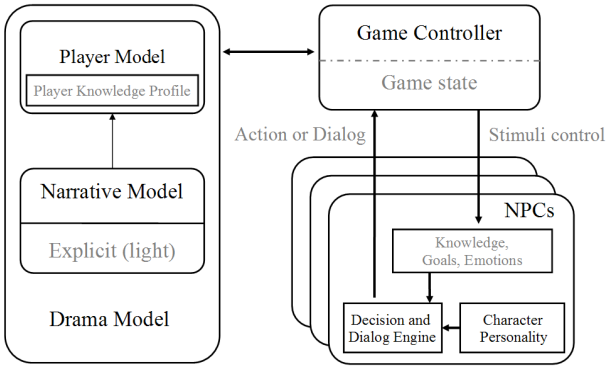

Fig. 1. General Architecture

The **Game Controller** is the game engine component which drives the entire DEEP dialog architecture as well as other aspects of the game-play. In particular,

it is incharge of the **Game State** management, which evolves according to the actions of the player or the NPC's behavior.

The **Player Model** is dynamically updated to reflect the player history in the game. It uses a light model of all the possible stories, defined during the game design, the **Narrative Model**.

The **Drama Model** results from the narrative approach. It is used by the Game Controller to update the game state, and, when necessary, to modify the NPCs' knowledge to induce specific behaviors needed for the narrative.

Events in the game are perceived as stimuli by the **NPC Model**. This model results from the autonomous NPC approach. It triggers a decision process in response to the stimuli, and takes into account NPCs' **Personality** and **Emotional** state .

The **Dialog Engine** focuses on providing communication capabilities to the DEEP NPCs. It communicates with the player while nuancing expressions and vocabulary according to each NPC personality and emotional state.

The following two sections gives a more detailed description of the respective responsibilities of the drama model and of the NPC architecture.

3 Drama Model

3.1 IA in Games

The design of almost all adventure games relies on hypothesis made about the player behavior and abilities. For instance, the level design defines, through a mix of topological and logical constraints, the expected paths and progression of the player in the game [6].

Using this expected behavior, the game designer is making assumptions about a future sequence of events. In order to avoid repetitive dialogs, a NPC will then be programmed as a state automaton providing several different dialogs. This approach reflects the general "Turing test" point of view adopted in almost all games AI [13] : *An intelligent behavior in a game is a behavior which seems to be intelligent considering the current knowledge of the player.*

In the DEEP Project, we try and formalize this practical approach. We build an explicit model of the player experience and history in the game. This is usually implicitly made by a game designer or a scenarist like in the previous example. The explicit model allows the DEEP architecture to dynamically adapt to the player behavior, resulting in believable NPC, accurate and relevant from the player perspective.

Building a user model to improve the design of games is not a new idea [1] [18] [14], but in these approaches, it is mainly the player as a human being which is modeled. In our very pragmatic approach, we design the model of the player as its avatar in the game, registering its history and experience in the game universe.

3.2 The User Model in the DEEP Architecture

We have identified two categories of data to represent the player history in the game, clues and environmental data, stored in **the knowledge base for the user Model**.

In every adventure game, the progression of the scenario relies on solving enigma and understanding the current plot. Information is disseminated throughout the game and **clues** are uncovered gradually by the player, very often through dialogs with NPCs. By registering correlated data, we allow the NPC dialog engine to sort out what clues the player is missing for solving the current plot.

This approach is related to Mori and Hoshino's work [12] in which the story is controlled through key actions changing the NPC dialogs. However, in our approach, the dialog is modulated according to the player actions when variation related to the game environment evolution can be introduced through the NPC emotional model (see section 4).

The model also registers **environmental data**, used by the dialog engine to achieve the immersion in a believable universe. These data are related to the background of the game universe, the player's avatar personal story, or the environment and atmosphere. The NPC dialog engine will use this base for picking dialog elements corresponding to the player experience, thus improving the player immersion in the game.

The user model is also linked to **a light formalization of the scenario**. We propose a model of the player experience in the game which can be dynamically used to control the dialogs provided by the NPCs. All interactive narration model rely on a partial order of events and plot points, implicitly or explicitly defined, which can be represented as a graph [6]. Our model uses goal nets [3]. Associated to plot points are data related to the player progression. At a given step, some of this data are known, maybe known or are unknown by the player. A correct progression leads to discard some clues, hide other ones, and use known environmental data to provide realistic dialogs.

Our narrative model is locally defined by the level designer, stamping triggers, clues, environmental datas and defining a partial order between the corresponding events. Using this partial and atomic information, we are able to reconstruct an oriented graph representing the interactive story, only as exhaustive as described by the game designer. By matching this model with the dynamic description of the linear story as witnessed by the player (which is a subset of this graph) we are able to define what kind of knowledge will help the player and communicate it to him through a NPC via the DEEP dialog architecture.

4 Emotions and Personality Model

In this section, we explore the structure of emotions and personality information as well as its link with perception, decision and expression. Indeed, the effect of personality and emotions on behavior has been widely studied, whether it

concerns a general influence on perception, behavior [10], decision-making and planning [4] or social interaction [8].

Our purpose is to introduce a NPC architecture model allowing the representation of emotions, personality and experience in order to bring flexibility and modularity in the individualized reaction of NPCs. These models must include data related to personality factors, which play an important role in differentiating physiologic and cognitive behaviors of each character. They must also process emotion categories, in order to create realistic reactions of the NPC vis-a-vis specific events and to equip each one with appropriate attitudes, in particular in the dialog process. Processing emotions requires also to memorize the previous emotional value of events.

We first present and discuss some emotions and personality models from psychology research. Then, we briefly introduce the principles of our emotional model.

4.1 Theoretical Bases

Personality is an important domain of psychology research. Unfortunately, there is no consensus on the definition of a personality. Thus, several personality models have been defined. These models consist of a set of factors, where every factor is a specific property of the personality. For example, Eysenck [5] proposes to describe personality from extraversion and neuroticism, while the *Big-five* model [11] uses five factors: extraversion, agreeableness, conscientiousness, neuroticism and openness. In these models, each personality factor has an impact on the emotions generated by perceived events, and therefore on the character's resulting behavior. By definition, the personality factors are constant over time.

Much work, related to cognitive appraisal theory, proposes various criteria in order to distinguish emotions [16] [15]. These models allow to specify properties and criteria on events which cause emotions. Roseman model [16] generates seventeen emotions according to a set of criteria. Ortony, Clore and Collins [15] propose an emotional model, named OCC, allow to cover a vast set of emotional situations. This model became the standard for generation of emotions and is used in several work. However the emotional process defined in these models is not complete : the personality factors influences the feeling of emotions is not defined operationally. Moreover, links between emotions and their intensity, and the intensity levels corresponding to the activation of each emotion are not defined despite their importance confirmed in various experiments [7].

4.2 Emotional Model

Our model is based on an explicit representation of personality and emotions, and of the influence of each personality factors on the sensitivity to emotion categories.

The personality factors are represented by a vector p of n dimension and the emotional state at time t by a vector $e(t)$ with m dimension. n and m are defined according to the used models (for example, $n = 5$ for *Big five* model, $n = 2$ for

Eysenck model, ...). The influence of each personality factor (let $p_i \in p$) on the sensitivity of each emotional category (let $e_j \in e$) is represented by a function $f(p_i, e_j)$. Thus, a matrix M_{n*m} of functions is formed representing all influences of each personality factor on the all emotional categories. From this matrix, we can calculate the personality-emotions sensitivity. The last one influences also the decay slope of emotions.

The model updates the emotional state according to the OCC process' five steps : classification, quantification, interaction and mapping [2]. This steps are started after either each time cycle or stimulus reception.

The architecture of our affective reasoner on NPC is a set of three components:

- *Personality and emotions* : this module identifies the environment events which can affect the NPC. It evaluates their emotional potentials and calculates their influences on the emotions, taking account of the personality and the emotional memory of the NPC.
- *Knowledge and reasoning* : this module makes decisions adapted to the emotional state and the active objectives of the NPC, and its personality. In the DEEP project, we focus on decisions producing Dialogs.
- *Behavior* : this module produces emotional behaviors adapted to the situation. It consists in carrying out the decisions of the knowledge and reasoning module by taking account the current emotional state.

5 Conclusion and Open Issues

In this paper, we have described the DEEP project, and how we combine a narrative perspective with an autonomous believable agent approach in order to build an architecture providing rich and varied NPC dialogs in adventure games. Integrating these two points of view is a challenging task, especially when designing a generic solution ready for industrial use.

The integration of emotions, personality and narratives within the NPC reasoner is the key to the success of the DEEP projet. We are still working on this problem and have to consider several issues.

We have defined an emotional model based on research on psychology. It propose allows to represent both the personality, emotions, and the correlation between them based on psychology research. Thus, the updating process of the emotional state is based on the personality factors of a NPC, its previous emotions incremented by the influence of stimuli on emotions. Currently, we are working on the influence of the emotional state on the dialog and the decision-making process.

From the narrative perspective, an interesting open issue is the way to deal with the dramatic evolution of the game, in order to extend the capabilities of the dialog engine.

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