Contextual Drama Facilitation for Digital Games

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Abstract. In this position article, we discuss the representation of narrative trajectories in digital games and investigate the possibility for Non-Player-Characters' (NPCs) AI controllers to react contextually to narrative situations. We propose to define the foundations of a context-based model for NPCs and the remit of intervention of such an approach. Our proposal lies in NPCs that understand dramatic trajectories and exploit narrative opportunities, reflective of emotional and contextual factors relevant to a player in an interactive environment.

1 INTRODUCTION

Over the last 20 years, digital games have made significant technical strides (hardware and software) which arguably increased both their influence and popularity. Digital games have also conceptually evolved in terms of storytelling, and the role and importance of narrative design has greatly increased. Particularly in mainstream productions, AAA releases now offer players increasingly complex and intertwined narrative structures (i.e. non-linear storylines[11], characterization[12] and environmental storytelling norms[4]).

Current storytelling approaches in the games industry offer narrative flexibility but do not generally address key problems associated with Interactive Digital Narrative[9] (IDN) research such as the relationship between character consistency and coherent narratives structures, an issue inherently linked to the notion of narrative context[17]. Character consistency refers, in this instance, to the believability of NPCs in making rational decisions; whereas narrative coherence relates to a characters ability to react to events in a manner coherent with the players perception of that characters personality and motives. The development of dynamic characters is key to IDN research and the conceptualization/implementation of mechanisms allowing NPCs to meaningfully adapt to player experiences is an open research question.

In this position article, we propose to investigate the conceptualization of context-based narrative trajectories towards driving the behavior of NPCs in games, thus providing mechanisms for managing character consistency and narrative coherence in digital games.

2 RELATED WORK

The Emergent Narrative[1] (EN) approach was first conceptualized in the wake of booming interest in Interactive Storytelling (IS) from the Artificial Intelligence (AI) research community. With IS research still in its infancy, the notion of the Narrative Paradox[8] was identified as a core, though complex, priority issue and focused on identifying ways to reconcile the demands of a carefully structured story experience with the necessary freedoms (movement, decisions) one would expect to grant an interactive user. The EN approach proposed a radical hypothesis in which it was argued that characters, and not necessarily the plot, should be central to the development of an interactive and dramatic user experience. Since it was impossible to guarantee that synthetic actors (SAs) would perform dramatically interesting actions, or a sequence of dramatically interesting actions, unless they were entirely scripted, Louchart and Aylett proposed to embed the notion of character intelligence within an emotion-based agent architecture. In developing the EN approach Louchart and Aylett made modifications to an existing affect-based synthetic character architecture and integrated an additional loop in its appraisal mechanism so that SAs would systematically select, from their available goals and actions, those that offered the highest emotional impact. This work introduced a double appraisal[3] approach (DA) which consisted of a meta-narrative layer in which a SA was aware of the implication(s) of its actions on other characters, including the player character. A similar meta-narrative approach is widely in use in collaborative Live-Action Role-Play (LARP), or to a certain extent in Improvisational Theatre (Improv), from which players act not only towards developing their own character, but through collaborative opportunities with other characters, so as to allow for further character development collectively.

The DA approach described above offered the possibility for SAs to consider, albeit at a very high-level, the potential impact of their actions on a user character through a complex emotion simulation algorithm. The affect-based agent architecture used in the context of this work, allowed SAs to simulate the potential emotional reaction of the user character based on a pre-determined set of character reactions to various stimuli and situations. However, given the dynamic nature of such a simulation, it would result in different outcomes or different degrees of affect depending on the timing, order of events or the identity of the protagonists. For the purpose of this research however, the need is for SAs to act intelligently in a dramatic fashion in order to be contextually relevant and will be addressed later.

From a creative perspective, a DA approach such as the one proposed opens up the potential for complex SAs that could eventually adapt to changing situations and circumstances while still delivering a dynamic dramatic consideration of the user. With respect to this research, NPCs that consider emotionally relevant material with respect to a dynamic player model may aid in developing contextually relevant narrative trajectories. Specifically, NPCs that show an understanding of emotional valence may arguably manage their own character consistency to a higher level. Yet, an inherent need is arguably to run simulations of addressed external factors (such as timing and desired order of events) in order to provide a degree of authorial desirability. Narrative trajectories in turn could then incorporate contextual factors built upon an existing emotional foundation, providing exploratory opportunities within an authored environment.

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3 DISTRIBUTED DRAMA MANAGEMENT

An emotionally considerate SA platform may provide the means for contextually-driven narrative trajectories to be employed in digital games, particularly if a level of authorial intent can be managed at run-time. The desire for authorial intent is pivotal in order to provide SAs motivation and direction when considering their next best course of action; otherwise they may end up doing nothing particularly exciting or thoughtful. The Distributed Drama Management (DDM) concept as proposed by Weallans et al[19] was first developed as a means to allow virtual characters in EN to consider actions on both a character level, with regards to their own goals and motivations, and on an actor level in which the character is aware of its role within a narrative and its relationship to a player character.

The DDM architecture draws inspiration from techniques used in both Improv and approaches to LARP in which participants aim to stay in-character at all times but while also attempting to create opportunities for dramatic collaborations between themselves and other characters. This Character/Actor distinction is reflected in the DDM system architecture in which character decision-making is carried out on a character level, in terms of its own set of action, goals and emotional state, and on an out-of-character level with regard to the story world and authorial expression via emotional trajectories. These authorial targets aim to adjust the scene and the actions of its characters to respect the desired, hypothetical emotional level (joy and distress) of the player whilst remaining consistent to character. For example, the scene may wish for an emotional uplifting of the player from low joy to high joy and thus characters are more inclined to take actions to that effect.

The Character Layer is responsible for simulating the character according to its own beliefs, desires and intention. The Actor Layer, on the other hand, is responsible for mediating the character action selection process by simulation of potential actions against a hypothetical player character. This player character, whom we refer to as the Virtual User (VU) represents the hypothetical emotional state and intentions of the player character and is used to predict the emotional impact of potential SAs actions. In order to facilitate a collaborative storytelling environment, IS systems or LARP often employ a story facilitator or Game Master to create, structure and manage the resulting player experience.

The DDMs Drama Manager (DM), however, is not a story facilitator in the vein of a traditional role-play experience, but has more in common with Nordic LARP[7] approaches where the GM relinquishes a greater degree of control in order to facilitate greater player agency. In the context of the DDM, the Drama Manager does not exert any direct control over agent action but exists to mediate the conversation between the Actor Layers of the various SAs. The DM is tasked with determining when all agents in play have submitted their potential action sequence proposals and evaluates all suggested sequences, making a decision based on the current emotional targets, and authorizes the initial action in the sequence of best fit. The target player emotional experience is defined by a Story Specification file, describing the emotional user experience as a sequence of emotional trajectories for each target emotion in the current scene.

Thus, the DM determines when a character from their own perspective should make a less than optimal decision in order to facilitate high story goals in terms of the author determined user experience from an emotional perspective. There is no guarantee that the agent will succeed in executing the action and characters cannot propose actions that are not consistent with their character's own goals and intentions therefore making them more consistent in the eyes of the player. If the emotional trajectories of a scene are authored to raise the joy of the player, agents will thus target joyful actions in turn as seen in Figure 1:
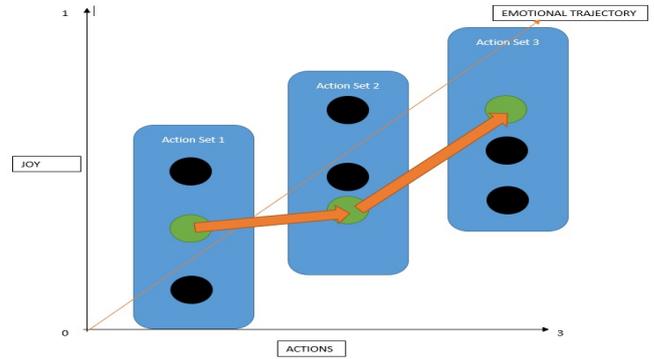

Figure 1. DDM ASM Simulation Graph [authorized actions (green) over potential actions (black)]

The DDM presents a powerful platform for managing authorial intent in the form of emotional trajectories. However, as SAs do not incorporate an awareness of their actions' meanings (context) and therefore only choose actions that are most emotionally relevant, this arguably may prove problematic for storytelling purposes. For example, an SA aiming to hypothetically raise the joy of a player via the kissing action might be emotionally relevant, but as the SA has no idea what the context of kissing is to the player, it may not be contextually relevant. The concept of what might be contextually relevant but not emotionally relevant (and vice-versa) and what sort of correlation this might offer is up for debate. Arguably, as positioned in this paper, SAs with the ability to understand the context of their actions in a storytelling environment may allow for SAs to prove to be more coherent by choosing actions that meet contextual authored trajectories.

This layer of authorial intent combined with an enhanced level of character consistency provides an ideal foundation for the manipulation and exploitation of narrative context in a digital games spectrum. However the concepts of what constitutes as context and to how can it be modeled must now be brought to the fold and examined in detail.

4 INVESTIGATING CONTEXT AND NARRATIVE MODELLING IN DIGITAL GAMES

Contextual Drama Facilitation (CDF) is a novel, ambitious approach addressing fundamental issues in both IS and EN development. CDF proposes a context-based framework where emotionally-relevant data can be coherently attributed to be consistently reflective of a synthetic agents personality; thus enhancing the very nature of the agent's action selection mechanism (ASM) in an interactive narrative environment. In effect, consideration for the context of any situation could allow for the most dramatic of character-to-character interactions to become plausible possibilities.

CDF proposes the development of an appropriate contextual approach and adaptation to the ASM: linking low-level character autonomy and the wider story world environment together via 'context', where context for the purpose of this research is reflective of the narrative and dramatic interactions. Arguably in effect, an agent

could react coherently and consistently with consideration to their current contextual and emotional setting as opposed to their sole understanding and representation of the world state. CDF is composed of both an enhanced EN architecture (built upon DA and DDM) and subsequent EN theory to articulate such data to remain emotionally relevant to a consistent agent and coherent to the agents character in a narrative environment (inclusive of an interactive player character). The proposed effect is an affect-driven agent that could consider if the most emotionally relevant interaction is the most contextually appropriate; a subtle yet paramount differentiation that could have a profound effect on a subsequent player character.

If emotional trajectories as shown with the DDM allow SAs to target specific emotional actions, hypothetically, contextual trajectories could therefore assist in selecting the most contextually-relevant actions as well. The integration of a contextual mediator layer into an adapted DDM framework will thus hypothetically strengthen agent character coherence in a narrative environment. However it does come with its own share of issues, chief amongst them being if a definition (or a role) for context is not addressed, an exponential data conundrum will become apparent[13]: if everything is context, how do we selectively choose what information is most relevant given finite data resources? For example, why would the CDF consider the color of one characters hair prevalent to another character for consideration within their ASM, and how would it come to the conclusion that is contextually relevant?

Previous research into defining context[17] and preparing an appropriate model[18] has arguably deduced that context is type-based with a focus on narrative and emotional annotations. Such that EN dictates that the most emotionally significant data to each agent characters ASM is the interactions between itself and the user character, in addition to their inherent knowledge of the meta-narrative layer. Such a range of data could be considered to similarly represent the notion of context, of which is the amalgamation of past, current, and hypothetical event consideration. However with that in mind, and in order to steer clear of the exponential data conundrum, only emotionally significant data should then be considered as context. As such, an agent character will disregard that the drapes in the living room are blue, unless blue is the agent characters favorite color and has an affect on an emotional threshold such as lowering their stress level. Additionally, an agent character with no regard for punctuality will not consider the current time of day as context, as it is not emotionally relevant. From a technical standpoint within a DDM architecture, contextual trajectories are author defined and aim to provide agents with a sense of contextual-emotional significance for any potential action.

CDF proposes a system where an agent characters ASM would be enhanced by the ability to consider the actions of itself and other agent characters, the world state and narrative environment, and the context of a situation. Agents must do so whilst regarding emotionally significant contextual data and remaining consistent to their agent core and coherent to their character role. With this in mind, CDF proposes a foundation where each agent has a dynamic personality and the ability to adapt to situations with the introduction of a contextual layer. Without CDF an agent would remain with the static mindset it began with, and demonstrate no character facilitation as seen in Improv. Additionally, with the introduction of a meta-narrative layer, agents would have the inherent ability to manage and adapt to narrative events, demonstrating narrative facilitation as seen in LARP. In tandem, CDF provides SAs that demonstrate a greater degree of narrative depth and coherence within an interactive narrative environment through the use of contextual narrative trajectories.

5 CONTEXTUAL NARRATIVE TRAJECTORIES

But how do you model contextual trajectories as seen earlier with emotional trajectories (joy and distress)? Interactive mediums such as Improv[16] have been investigating, but how is the notion of contextual data reflected accordingly within the realm of digital games? In studying narrative context across the digital game spectrum[18], we identified a model of narrative context representation; specifically narrative, character, and environment layers which target players or player characters through implicit and/or explicit channels of communication as seen in Figure 2:
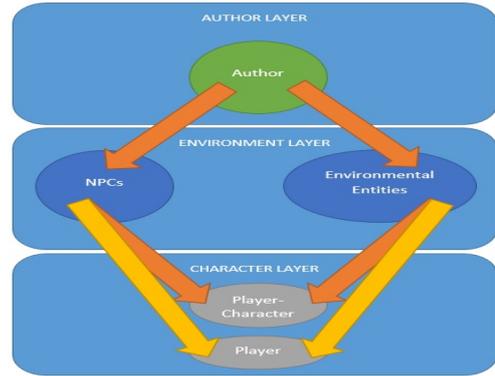

Figure 2. Layers of Context with Explicit (orange) and Implicit (yellow) Communication on Player Targets

Narrative contextual information is expressed through authors, characters and environments, and communicated to the player through a number of channels such as a narrative layer (communicating the authorial intent), a character layer, and an environment layer. There are a number of ways therefore through which context can be represented and exploited by players and NPCs alike in an interactive environment:

Firstly, by targeting a players desirability for an action, one could support NPCs in making better decisions in relation to a players experience (narrative or otherwise). For example, a NPC could be aware of a players reluctance to explore dark areas but decide to bring the player to a dark forest if its intention is to create tension and conform to some level of authorial intend that aims to unsettle the player. Secondly, equipping NPCs with the means to understand the impact of an action on the player would lead to a better consideration of contextual information with regards to the overall game narrative. A NPC might understand the authorial necessity for romance for instance. Whilst there might not be any romantic action available in its action repertoire, understanding that a flirty action could be related and relevant would allow the NPC to choose the next best action with regard to the contextual relevance of the situation. Thirdly, providing NPCs with an understanding of its environment would lead to location awareness and add an environment-based contextual dimension to a NPCs action decision mechanism, thus allowing for the consideration of desirability and undesirability of actions from an environmental perspective.

We argue, in this article, that if one was to structurally implement these considerations within CDF, NPCs could potentially display a heightened sense of character consistency and narrative coherence through the use of narrative trajectories or targets. Digital games will arguably exhibit one or two of these premises but never exhibit both;

such that while they tend to depict consistent characterization, they are often deficient in terms of narrative coherence or do not take fully into account the intention of a players actions, and vice-versa.

For example, within the Walking Dead[5] series, NPCs regularly exhibit heightened levels of character consistency in retrospect of a player and their choices through emotional trajectories in the form of moral and personality traits. However their potential actions are inherently limited and therefore they cannot coherently communicate the state of the narrative outwith the scope of their limited script due to the lack of contextual trajectories. Conversely, if an NPC were allowed multiple actions rather than purely scripted ones, they arguably would fail to recognize which actions would move the story forward.

From another spectrum, the Fallout[14] series demonstrates a lack of emotional trajectories. Whilst NPCs recognize the state of the world and all actions taken by the player and react contextually accordingly, they lack a sense of the emotional significance of their surroundings. Whilst NPCs understand the contextual significance of a quest resolution, they do not then possess an emotional understanding of these events and given the opportunity would arguably not know how to resolve a quest in the most emotionally satisfying way.

The next section describes the implementation of an AI controller which aims to contextualize narrative information (in addition to emotional) from all aspects of narrative communication, namely: authorial intent, character, and game environment.

6 CONTEXTUAL DRAMA FACILITATION

The CDF management system is a dynamic ASM developed for affective agents aimed at relaying narrative contextual information to NPCs AI controllers in real-time. In line with the description above, the CDF action selection mechanism determines a set of desirable narrative trajectories expressed through affect/emotional targets for NPCs, allowing for the expression of authorial, player and environmental considerations in NPC decision-making dynamically.

6.1 AUTHORING NARRATIVE TRAJECTORIES

The CDF system has been designed for digital games or IDNs of episodic nature for which each chapter includes a series of narrative trajectories or targets derived from a list of pre-authored type-based, hierarchical 'tags'; for example, a kissing action may be tagged as 'romantic' or 'romantic-serious' based on how the author would like the agents to understand it. These narrative tags effectively assist the CDF system in selecting actions that best fit both the emotional and contextual relevant trajectories for each chapter. Agent actions are allocated tags in the tag hierarchy in order to facilitate a distributed approach to the overall drama management as seen with the DDM. The hierarchy allows for authors to structure their tags into relevant groups that may later be navigated by agents evaluating their available actions to the relevant tag hierarchy. In the example below, the narrative targets are described and authored in Figure 3:

- Raise joy from -1.0 to 2.0 (a seriously positive action)
- Aim to do this through a romantic-serious action (such as kissing)

With these parameters set, agents will now aim to select from their list of available actions the one that best fits both the emotional and contextual targets:

```
Chapter 3
JOY -1.0 2.0
Tag romantic-serious
GoodReaction 0.1/0.3
BadReaction -0.1/-0.3
TagsHierarchy /good //romantic ///romantic-playful ///romantic-
serious ///romantic-passive //friendly ///friendly-playful
///friendly-serious ///friendly-passive /neutral //passive /bad
//aggressive ///aggressive-playful ///aggressive-serious
///aggressive-passive //depressing ///depressing-playful
///depressing-serious ///depressing-passive
Location Office romantic/-0.3 romantic-playful/-0.5 aggressive/-0.1
Location Club depressing/-0.2
```

Figure 3. Authoring of Narrative Trajectories

6.2 BEST FIT EMOTIONAL AND CONTEXTUAL ACTION-SELECTION MECHAISM

Once both the authorial trajectories and tags for actions and environments are set, the system will attempt to find a best-fit scenario for each agent action relevant to the tag hierarchy and emotional target. Such that if a 'romantic-serious' action is the target but none exist, what is the next best fit? In this case, if a 'romantic-serious' action is not acceptable as a target in the current location, what is the rating of the root tag 'romantic' and all of its associated children? In practical terms, the CDF system aims to take the emotional rating for actions, derived from affective appraisal (double appraisal), and outset it with the modification factor of the tag relevant to the authorial trajectory of the chapter. Such that it selects the best fit actions for simulation in the Distributed Drama Manager and picks the action scoring the highest for authorization as seen in Figure 4:
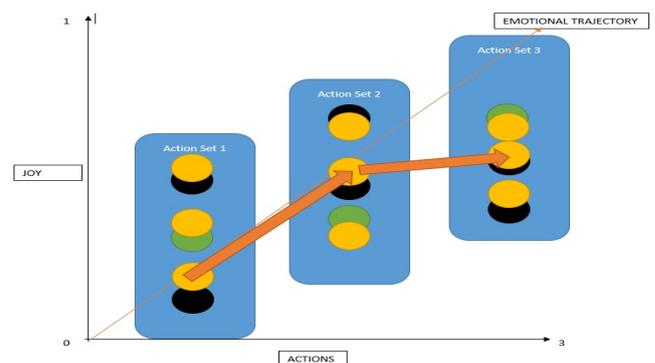
Figure 4. CDF ASM Simulation Graph [new authorized action positions (yellow) over old authorized action positions (green)]

With this approach, SAs arguably remain consistent to character (as they only have actions available to them that they define) and coherent to the narrative (as they have targets for both emotional and contextual relevancy to the story). However what of the player's agency[10] or involvement in both the role of the characters and the narrative itself?

6.3 PLAYER INTERACTION AND CONTEXTUAL ADAPTATION

The CDF system not only operates on a static level (responding to tag relevance only), in that it follows the authors intentions entirely. In essence, the system supports a level of dynamic user feedback in adjusting the relevance of agent actions, whilst remaining consistent to an agents tendencies, and respecting the coherence of the narrative an author wishes to tell (authorial trajectory). It achieves this by adjusting the scaling factor of the tag hierarchy set out by the author, based on how the user responds to agent actions. For example, if a player has shown a history of dislike for romantic gestures from a particular NPC, the CDF will adjust accordingly by targeting the next best-fit action relevant to the authorial trajectories. In effect, it allows for a basic level of dynamic modification to the DDM decision making process at run-time as seen in Figure 5:
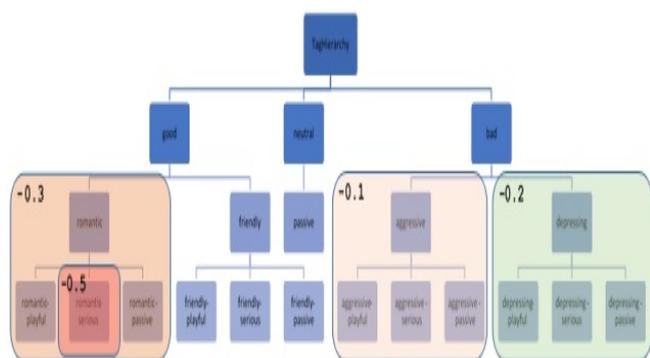

Figure 5. Dynamic Contextual Trajectories on Player Feedback

This CDF player feedback loop allows for decisions taken by the player to be considered relevant by SAs and changes the landscape of the original authorial intent. Players are arguably now seen as participants[2], rather than spectators[2], in that they influence the story and how it will be communicated by the NPCs.

7 FUTURE WORK

With the foundation that CDF presents, our next goal is to investigate the advanced mechanics of LARP, particularly the concepts of the often employed 'black-box'[6] mechanic. Within the remits of role-play, this feature allows for characters to enter a room outside the story space and discuss the narrative as actors. From this spot, they may build off previous encounters and plan for better future encounters more in line with the desired story experience and therefore create opportunities for not only themselves, but other players as well. For CDF, this may allow for the manipulation of the architecture to allow for SAs to not only simulate towards a goal, but from it - a simple but pivotal differentiation. In essence, SAs may then work backwards from a desired goal they earlier constructed in the 'black-box', at run-time, and thus open up narrative opportunities for all characters, the player-character included. Additionally, the advancement of authoring systems[15] for these scenarios is critical as well.

8 CONCLUSION

In this position article, we investigated the nature and mechanisms of the narrative implications of contextual authorial trajectories from the perspective of digital game productions. We discussed the implication of contextual representation and facilitation for the development of NPCs and game AI for digital game and interactive digital narrative designs. In doing so, we investigated the history of affect-driven NPC architectures and the premise of building upon authorial emotional trajectories. Finally, we discussed the foundation for advanced NPC game AI by enhancing NPCs action-selection mechanism in order to allow for the consideration of authorial and contextual information in the agent decision-making process. Our position is that NPCs that consider both emotional and contextual trajectories (targets) will arguably exhibit heightened levels of character consistency and tell coherent narratives.

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