Engaging Females with a Model for Affective Storytelling

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***Abstract*— Female gamers have been underrepresented in some game genres. One of the reasons for this is the gender difference in players' emotional experience. According to psychological studies, females are more likely to be concerned with other's emotions and tend to involve their emotions in the storytelling by empathising with the characters and experiencing other-directed emotions [12]. Given these considerations, this paper proposes a model for affective storytelling which aims to create an engaging emotional experience and involve the player's emotion with the characters. More importantly, the player's emotions, evoked by appraising the story and empathizing with the characters, determine the character's behaviors and therefore have an impact on the whole storyline. Since the model for affective storytelling aims to create an engaging emotional experience for the player without following a goal-oriented narrative approach, it appears that males and females might have a different user experience in this model for affective storytelling. Future work therefore will be carried out to develop an affective storytelling system and test if females are more engaged and satisfied with the affective storytelling system.**

Keywords—affective storytelling, narratological model, female players.

I. INTRODUCTION

Females play an important role in the gaming industry. According to Forbes [1], female players accounted for nearly 41% of all gamers in the United States in 2020. This number increases to 50% in the UK for the same year [2]. However, while the overall ratio indicates that female gamers are on the rise, there are significant differences between game genres. A report released by Quantic Foundry [3] reveals that mobile match-3 and social farming games are the two most popular genres among female gamers, where 69% of females who took the study often play match 3 games. In comparison, female gamers are highly underrepresented in genres such as sports games and first-person shooters, where only 2% of sports games players are females and the proportion for tactical shooters is 4%.

The reasons for gender differences between game genres are attributed to many factors: stereotypical role models portraying female characters either as the weak victim or in an exaggerated sexual role, an abundance of violent content, limited social interaction, and many competitive activities and rules [4,5,6,7,8].

Although these findings provide some inspiration for improving the design of digital games in order to attract females, a deeper reason can be attributed to the differences in emotional experience between males and females. In general, females are deemed to experience emotions more intensely and more frequently than males [9,10,11]. Specifically, females have been found more likely to experience other-directed emotions and less likely to experience self-directed emotions [12]. In contrast, males are more likely to experience self-directed emotions and less likely to experience other-directed emotions than females. According to Ryan [13], other-directed emotions refer to emotions directed towards others through a vicarious experience, while self-directed emotions concern the player's own desires and success in completing a set of goals and tasks. This finding is consistent with the conclusions drawn from most studies on gender differences in empathy, specifically; females are more empathic than males in terms of emotional response to the other's affective condition and perspective-taking [14].

In this sense, females are more likely to involve their emotions with games and interactive narrative via empathizing with the characters and experience the characters' emotional states vicariously than males. Females are generally looking for a compelling and emotionally engaging narrative in interactive entertainment. However, most digital games employ a goal-oriented narrative mode, *i.e.* the player is engaged with the story through fulfilling a number of goals rather than empathizing with the characters and experiencing an enriched emotional experience [15], which tends to elicit self-directed emotions rather than other-directed emotions.

Given this consideration, a model for affective storytelling is proposed in this research. In contrast to the goal-oriented interactive narrative approach, this model for affective storytelling attempts to create an engaging emotional experience, and in-volve the player's emotion with the characters. More importantly, the player's emotions, evoked by empathizing with the characters, determine the character's behaviours and therefore have an impact on the whole storyline.

II. BACKGROUND AND RELATED WORK

Emotion is one of the most central experiences of a human being [16]. It is subtle and has many facets. Therefore, different approaches have been developed to study emotions. In particular, a cognitive approach has been considered as the central par-adigm of studying emotions since 1960s. Most cognitive theories of emotion examine the cognitive experience of emotion in terms of two processes: appraisal and coping. Appraisal is defined as the individual's interpretation of their relationship with the environment or events. It is informed by the cognitive process and has been consid-ered as the central process of eliciting emotions. Coping refers to the individual's cog-nitive responses to the appraised significance of events [17]. It consists of cognitive and behavioral responses which can be perceived internally or externally by individ-uals in the form of physiological and behavioral change.

In recent years there has been significant expansion in research which applies psychological theories of emotion to developing interactive narrative systems, driven by the potential of modelling believable virtual characters to build empathic interactions and generate emotional coping strategies to create coherent and dramatic interactive stories [18,19, 20]. Therefore, a number of computational models of emotion have been proposed, among which EMA and FearNot! are well developed on the cognitive theories of emotion as a basis.

A. *EMA*

Marsella and Gratch [17] designed a computational model of emotion, EMA (EMotion and Adaptation), to simulate naturalistic emotional experience in a computational environment. EMA focuses on the dynamics of emotion across a range of eliciting situations which is developed on the basis of Smith and Lazarus' [21] cognitive theory of emotion.

In the structure of EMA [17], a character's interpretation of the character-environment relationship is represented as a conjunction of propositions. Eight appraisal variables are used to evaluate each proposition. All appraisal variables are maintained in a data structure called the appraisal frame. There are multiple appraisal frames in EMA, and each appraisal frame is responsible for evaluating one proposition. As a result, the evaluation leads to multiple emotion labels and intensities. In order to select one emotion as the individual's explicit emotional state, a higher-level notion, mood, is introduced as the aggregation of all emotional intensities with the same emotion label across various appraised events.

The appraised significance of events leads to two types of coping behaviours in EMA: emotion-focused and problem-focused coping activities. To achieve these two types of coping activities, a series of coping strategies are employed in terms of their impact on the individual's attention, beliefs, desires or intentions. Multiple coping strategies can be applied towards a given circumstance. However, they are executed in sequence. The consequences of coping also exert an influence on the environment and alter the character's interpretation of character-environment relationship, which leads to a dynamic and cyclic emotional appraisal and coping process.

B. *FearNot!*

FearNot! (Fun with Empathic Agents Reaching Novel outcomes in Teaching) is a narrative based interactive storytelling system which is designed for anti-bullying education. The player plays the role of an 'invisible friend' who gives advice to the victim (virtual character) in order to influence the victim's behaviours. FearNot! attempts to create an empathic relationship between the player and the victim by modelling believable characters to get the player involved.

To achieve this, there are five modules to work through in FearNot![22][23]: sensors, appraisal, emotional state, coping and effectors. Sensors are used to perceive the environment, including events, objects etc in the world. After receiving the perceived information, the character appraises its significance based on the goals, intentions and plans. The emotion theory adopted in FearNot! is that of Ortony, Clore and Col-lins (OCC)[16]. FearNot! can generate most types of OCC emotions (*e.g.* Fortune of Others emotions, Wellbeing emotions, Attraction emotions [16]).

The consequence of appraisal triggers the appropriate emotional state which leads to a set of coping strategies. The coping strategies are turned into voluntary behaviours and carried out through effectors. In particular, there are two distinct levels of coping in FearNot!: a fast mechanism to appraise and react to a given event or a much more complex appraisal and coping behaviour that takes a longer time.

C. *Other Applications of Emotion in Interactive Narrative Systems*

EMA and FearNot! are the computational instantiations of cognitive theories of emotion. They are used to model emotions for virtual characters in intelligent storytelling systems. However, when they are applied to an interactive storytelling system, emotions modelled by EMA and FearNot! only consider the character's pre-authored personality, including his/her goals and desires, but fail to consider the influence of the player's interaction on the character's emotional states and the development of the story. In order to increase the player's level of enjoyment and engagement, it is necessary to allow the player to express his/her emotional states and dynamically adapt the character's actions and storylines along with the player's emotional states. A number of attempts have been made to incorporate the player's emotional state into interactive storytelling systems.

Cavazza and colleagues [24, 25] proposed a character-based interactive storytelling approach in which the generation of the plot arises from the interaction between characters and the player. They introduced an emotional planner to improve their original character-based interactive storytelling system which allows player emotion to have an impact on virtual characters' feelings and behaviors. The story is based on Gustave Flaubert's Madame Bovary. Instead of describing a character's emotions at a cognitive level, a detailed description of characters' emotions by Gustave Flaubert has been used. The player could interact with the character using natural language. The emotional content of the player's utterance influences the character's emotional states and behaviors.

Blom and Beckhaus [26] presented an 'emotional storytelling' model, which parameterized the player's emotions and compared them with the author's ideal emotional value; the outcome was used to guide the story development. Two core components were introduced into interactive storytelling systems. One was the Emotion Tracking Engine (ETE) which was used to keep track of the player's expected emotional state. Another one was the Emotional Path Graph (EPG) which was a time dependent graph showing the ideal emotional experience for the player from the author's perspective. Blom and Beckhaus applied these two components in order to improve the interactive drama Façade [32]. The whole storyline in Façade is divided into a set of story segments. Each story segment is given an expected tension value. By tracking the difference between EPG and ETE, the story engine selects the best story segment to play to enhance or impair the player's current tension level.

A similar attempt to make storytelling driven by the player's emotions was made by Roberts et al. [27]. They inserted several questions into the course of storytelling and authored the story based on the player's emotional responses. At first, the player is presented with text and videos to get information about the story, then at several specific decision-making points, questions are asked such as "How do you feel about…?" or "what would you like to do in response…?" When selecting a video to present to the player, if the system

has a goal of eliciting a specific emotion, two kinds of player emotional states are tracked: the average emotional response of the players who have already seen the video, and the emotional response of a particular player. The system reasons how the player's emotional reactions are likely to be different from those expected and presents the video that may be better at evoking the goal emotion. This approach integrates the player's emotional response to guide the development of a story. One disadvantage is that it uses questions to ascertain the player's emotion, which interrupts the story flow and is likely to negatively influence the player's experience [25].

III. A Model for Affective Storytelling based on Player Emotion

Similar to EMA and FearNot! the model for affective narrative is designed on the basis of Smith and Lazarus' theory [21], specifically, it is built on three propositions: First, Smith and Lazarus' theory focuses on the influence of personality on an individual's emotional experience. They emphasize the importance of goals to the generation of emotions, *i.e.* if there are no goals to be achieved, little or no emotion will be evoked. In this sense, each emotion is related to some specific goals. The goals in interactive storytelling could be player-defined goals which are invented by the player as part of his/her personality, or author-defined goals which are pre-set by the author without considering the player's personality. Most existing interactive storytelling systems use author-defined goals as the motivation for eliciting self-directed emotions. But in the model for affective storytelling, player-defined goals are important for evoking emotions.

Second, Smith and Lazarus' theory provides a comprehensive interpretation of an individual's emotional experience. This experience does not only include how emotions arise in a particular situation (*i.e.* appraisal), but also includes how individuals are likely to respond given their personality (*i.e.* coping). Smith and Lazarus distinguish the outcome of appraisal into three categories: action tendencies, subjective experience or "affect" and physiological responses. In the model for affective storytelling presented in this paper, the character's emotions are not generated autonomously, but captured from the player as inputs. Therefore, the appraisal process is carried out by the player rather than the storytelling system, and the system is responsible for regulating how the character behaviours respond to the player's appraisal.

Third, Smith and Lazarus argue that emotion is a dynamic process rather than a static reaction. The emotional behaviours resulting from emotions serve as new stimuli to provoke the subsequent appraisal and lead to new emotions. When Smith and Lazarus' theory is applied to storytelling, it helps to move the story and the player's interaction forward to generate a complete interactive story.

Applying Smith and Lazarus' theory into the model for affective storytelling, the framework of the model for affective storytelling can be illustrated in Fig 1.

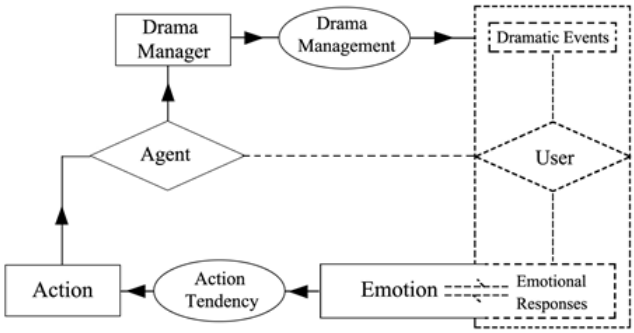

Fig. 1. Framework of the model for affective storytelling

In this flow chart, three groups of components Identity, Processing and Module are shown respectively in three shapes: rhombus, oval and rectangle. Specifically, Identity refers to the person or object who takes part in the interaction; Processing is the process of reaching the subsequent Module. Module is the component of the system which can be a piece of a program or software package. It is used to store the content of a story and monitor the implementation of Processing. In the model for affective storytelling, there are two identities which are user (*i.e.* player) and agent, two types of processing which are action tendency and drama management, three modules which are emotion, action and drama manager. Each of them plays a role in the model for affective storytelling (see Table 1).

Fig.1 demonstrates the processing and modules that are implemented by the affective storytelling system. The module Emotion is the connection between the player and the affective storytelling system. The player's emotional responses, on one hand, are outcomes of the player's appraisal and empathy, but on the other hand, are the inputs of the affective storytelling system. According to the framework, players can react with quite similar or entirely different emotions towards the same situation. The player's emotional response to the story is captured and leads to action tendencies. At a point in the story when there is an emotional conflict, the Action Tendency processing chooses the appropriate action tendency according to the player's emotional response. The selected action tendency is turned into the corresponding action directly, and carried out by the agent. Consequently, the relationship between the agent and the environment or other characters is changed accordingly, which leads to a new event. The Drama Manager evaluates the new event to assess whether or not it can create an emotional conflict to motivate the player's interaction. If so, the system will continue the loop, from capturing the user's emotional responses to assess the dramatization of the event. Otherwise, the Drama Manager will dramatize the plot by adding some new events until an emotional conflict emerges to allow the user's emotion-al response to influence the storyline.

TABLE I. COMPONENTS IN THE MODEL FOR AFFECTIVE STORYTELLING.

Identity	User/Player	person who participates in affective storytelling
	Agent	main character in the story whose emotions are attached to the player
Processing	Action Tendency	process whereby emotions are turned into actions
	Drama Management	process whereby the narrative is unfolded and dramatized
Module	Emotion	stores the player's emotional responses and regulates how emotions are turned into actions
	Action	stores all possible actions for the character. When a specific emotion is captured from the player, the corresponding action would be chosen
	Drama manager	stores all scenes and events and makes a decision on the evolution of the story

IV. DISCUSSION

This model for affective storytelling abandons a goal-oriented narrative mode and uses emotion, especially players' emotions, to influence the evolution of the story. Insights are therefore gained into digital games design: tracking the player's emotional responses and adjusting the storylines accordingly might provide players with an engaging narrative experience.

The player's emotions can be captured in different ways according to the media and technology used. Ideally, the player's emotions are captured in real time, which results in the real-time control over the character's emotions. In particular, facial expression is regarded as an effective way to recognize real-time emotions [28, 29]. In addition, gesture and speech are also used in some interactive storytelling systems, *e.g.* [25, 30, 32]. But special techniques and devices (*e.g.* sensors) are usually needed to capture and analyze the player's facial expression, gesture and speech [31]. The study in [27] used the relatively easier way to capture the player's emotional responses by asking them questions directly.

As explained earlier, the drama manager should monitor the dramatization of the story and change the plots accordingly to create emotional conflicts. This, however, leads to a challenge in controlling narrative time: how long the narrative takes to accumulate enough emotion and create emotional conflicts? If the narrative time is too short, the player's emotion may not be enough to motivate him/her to make a choice. But if the narrative time is too long, which means the player needs to wait for a long time until he/she is allowed to make a choice, the player would get bored and feel like he/she is watching a linear story. Therefore, choosing the best timing for the player's interaction is an important job for the Drama Manager.

Currently, two types of Drama Manager are widely used in interactive storytelling design: Search-based Drama Managers and Planning-based Drama Managers. However, because there are no pre-authored goals in the model for affective storytelling, a Search-based Drama Manager would be more suitable, instead of Planning-based Drama Manager which relies on pre-authored goals to generate plans.

In order to determine whether or not there is an emotional conflict, each story segment is assigned with several emotional values which define the possible emotions evoked by this story segment (*Ve*) and the intensities of these emotions (*Vi*). Only when the intensities of these emotions are equal, an emotional conflict is produced. For example, a story segment is about the character intending to secretly meet his/her lover. Two main emotions are possibly experienced by the character: one is happy for meeting his/her lover; another is guilty for cheating on his/her partner. Therefore, *Ve*=Happy & Guilty. If the value of the intensity for happiness is 10 (*Vi-happy*=10), and the value of intensity for guilty is 3 (*Vi-guilty*=3), because *Vi-happy* $>$ *Vi-guilty*, there is no emotional conflict. Therefore, other story segments, which can increase the character's guilt, should be presented until *Vi-happy* $=$ *Vi-guilty*. In order to control the narrative time, the Drama Manager should always choose the story segment which can produce emotional conflict in the shortest time.

V. CONCLUSION AND FUTURE WORK

This paper proposes a model for affective storytelling which aims to engage female players with an emotional experience without following a goal-oriented narrative approach. Furthermore, the player's emotional experience determines the character's behaviors and therefore has an impact on the whole storyline.

Previous studies have found that females are more likely to be concerned with other's emotions and engage with a story by experiencing the character's emotions vicariously. The model for affective storytelling is developed based on these findings and takes it further. Emotions in this model, are not only the player's responses to the story, but also act as a driving force, directly and explicitly contribute to storytelling and user experience.

Future work will be carried out to test if females are more engaged and satisfied with this model for affective storytelling than males. To achieve this, an affective storytelling system will be developed.

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