Virtual Agents in Conflict

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Abstract. In this paper, we address a problem on how to model agents that engage in natural conflict situations. We propose that, in order to create such natural conflict situations, we need to rely on the agents' emotional reactions to situations. Emotional agents were created and embedded in a serious game, for helping children learning conflict resolution strategies. Agents have incompatible goals and respond emotionally to what happens in their environment. We conducted an evaluation to assess whether participants are able to perceive the conflict escalation process according to the agents' emotional behaviour. The results suggest that actions intensity, which changes due to emotional states, conveys the idea of conflict escalation and conflict is perceived.

Keywords: Pedagogical Environment, Intelligent Virtual Agents, Conflict, Emotion.

1 Introduction

Conflict is a normal part of everyone's life and it should be considered as a constructive process that makes our society move forward. Although conflict had been considered to be something to avoid due to the negative feelings and destructive behaviours associated to it, recent research acknowledge that conflict can yield beneficial aspects as well [19].

The work described in this paper is integrated into the SIREN[1] project, which aims at exploring games as a tool to teach conflict resolution skills to children. Games support learning in various forms as the virtual setting responds differently depending on the player's choices. In addition, people can take different roles, experience different perspectives and realise the consequences of their actions [10]. Yet, engaging players in learning-oriented games is a hard task. Over the years, the balance between learning and engagement has been approached, by using autonomous synthetic characters. These intelligent virtual agents are integrated into the game to affect the user's engagement and empathy towards the game's characters ([1] and [18]). It is by interacting with virtual characters and exploring the environment that the players will learn, by practice, to master skills they don't have [15]. Game learning environments have been developed

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[1] http://sirenproject.eu

for different purposes such as, raising awareness on general population, teaching students about a subject or army training and education [3][18]. In addition to that, using games for conveying children conflict resolution skills have also been explored, as it is the case of *FearNot!* [1] or *The Prom* [13].

These games deal with variations of the conflict topic, such as bullying or relationship/friendship management based on the characters personalities. In the particular case of *FearNot!*, the user takes responsibility for the victim of bullying and has to help her to make decisions. On the other hand, in *The Prom* environment, the user manages social relationships by taking actions that will balance the social world. Its focus is on the importance of characters' personalities to the social exchange.

In this paper we describe a prototype model of conflict that intends to convey conflict related aspects by the means of emotional agents. We explore how deep elements of conflict, such as one's emotions, convey aspects as conflict emergence and its escalation. The model is mainly focused on overt manifestations of conflict which are influenced by the emotional state of the agent. We believe that the cognitive appraisal is an important element to capture the essence of real conflict scenarios. This model was then embedded in a game scenario, which works as tool to support learning. Finally, we performed an evaluation in order to understand if the users could perceive conflict, due to the agent's behaviours, and whether they perceive the role of emotions in conflict escalation.

2   Background - Conflict

In the literature, there is not a reconciled definition for conflict. However, we may say that conflict varies along five dimensions: participants, causes, initiating action, participants' responses (one's attitudes, behaviours or strategies) and outcomes. Furthermore, conflict episodes have been compared to a plot [9], they have an initiating action (complication), a rising action (set of actions that contribute to conflict escalation), a climax and the outcome.

When the conflict gets worse, we say that it escalates. When it reaches the turning point (*climax*) and the magnitude of the situation decreases, we say that de-escalates. Escalation occurs when one or both parties engage in the conflict, moving it from a less severe stage to more contentious and heavy state [16]. We may say that escalation is driven by inner triggers [8], that is, emotions that weight one's current goals and assess the affective value of the situation [11].

To bring the situation to an end participants in the conflict may take several approaches according to Thomas' taxonomy [20] such as: *accommodation*, *avoidance*, *competition*, *collaboration* and *compromise*. These approaches are underlined by the dimensions of assertiveness and cooperativeness, which are phrased as intentional terms. Assertiveness refers to the extent to which protagonists try to achieve their own goal and cooperativeness refers to the extent of protagonists trying to satisfy the concerns of others.

3   Capturing Real Conflict Situations with Agents

Emotions are at the heart of social interaction and they play a relevant role triggering events such as conflict [14]. Therefore, the cognitive appraisal is an essential element for understanding conflict, where such situations emerge from one's subjective evaluations of the environment. Our model is illustrated in Figure 1. The conflict dynamics specified by our model tries to capture the essence of Thomas' definition [20] of the phenomenon, in which conflict is defined as "the process which begins when one party perceives that another has frustrated, or is about to frustrate, some concern of his". Further, we inspired in FAtiMA emotional model for agents [7] and Tessier et. al [19] conflict-handing model.
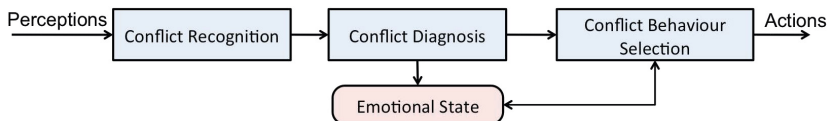

Fig. 1. Conflict handling model

The model consists in three main modules, where each works as follows.

First, in the **Conflict Recognition Module**, others' actions or events that affect (positively or negatively) a certain concern of the agent are perceived. These are checked, in order to evaluate whether they raise potential conflicts or contribute to the *escalation* of the current situation. It is specified the urgency of conflict, which determines how intense the situation is.

After that, in the **Conflict Diagnosis Module**, the diagnosis process is executed in two steps. First, a conflict description is generated, which depicts the *cause* (goal frustrated), *participants* involved, relationship between them and the importance of the conflict. With this description, emotional reactions are triggered and emotions are generated (this process is undertaken by FAtiMA [7]), where the intensity of the emotion reflects the urgency of the conflict [12].

Finally, in the **Conflict Behaviour Selection Module** the behaviours for handling conflict range within the *assertiveness* and *cooperativeness* dimensions (see Section 3). For simplification reasons, we considered *Attacking* and *Evading* behaviours (from Raider's AEIOU model of communication in conflict [17]), which are associated to [*high* assertiveness, *low* cooperativeness] and [*low* assertiveness, *low* cooperativeness], respectively. The values of assertiveness and cooperativeness are balanced by the agent's emotional state. The reason behind this choice is based on the assumption that negative emotions are linked to less cooperative approaches [6], which will lead to more conflicts and their consequent escalation. For example, an agent becomes less cooperative as he gets more frustrated with the situation at hands. In this model, whether an agent is more prone to one of the aforementioned behaviours is determined by personality traits.

Our current investigation only aims to model simple behaviours, in order to demonstrate escalation. Therefore, we decided to focus on a set of behaviours that might lead to potential conflicts and their escalation to explore what believable conflict-oriented behaviour might be at the eyes of the human perceiver. In this way, we set that negative emotions will affect negatively the agent's actions towards conflict diminishing the possibility for cooperation [2]. A broader and more detailed set of behaviours will be developed in future work. The following Section describes the scenario where this model was applied and tested.

4   Case Study: My Dream Theatre

The *My Dream Theatre*[2] (see Figure 2) is an educational game that aims at teaching children, aged 9 to 11, some conflict resolution skills. The game setting is a theatre company and the user/child is challenged to be the director and to select the adequate cast for each performance.

Each virtual actor has a set of characteristics, such as: a proficiency level, preference for roles, interests and personality. As the player grants roles to the characters, conflict situations may emerge when characters themselves perceive an obstruction to their goals (e.g. hero role). How the agents appraise the situation will make their responses vary and consequently the interplay between characters will vary as well. The role of the child is to manage the conflict, advise the agents, and try to do so in a manner that the conflicts are resolved for a better performance in the end.

Fig. 2. *My Dream Theatre's* screenshot, showing two characters having a discussion about a role

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[2] The assets of the game scenario were developed by Serious Games Interactive (http://www.seriousgames.dk/).

In this early prototype, we decided to model the *Attacking* and *Evading* behaviours, as we believe these are more likely to generate *escalation* as a result of what these behaviours bring to the social interaction. The conflict model (previously described) was implemented in FAtiMA emotional agents' architecture and integrated into the agents' minds. Inspired by natural conflict behaviours from the literature, agents with the tendency to *Attack* follow a destructive path to cope with the conflict [17]. These agents are prone to have high assertiveness and low cooperativeness. The actions, taken by agents with this tendency, range from a low level of aggressiveness to an extreme. For example, as the agents' emotional state worsens, their actions may progress as follows: lesser insult, criticise negatively, harsh insult, and threat. On the other hand, an agent with an *Evading* tendency may try to avoid conflict situations. Initially, this agent may want to cooperate [17]. However, the build up of negative emotions leads the agent to become less cooperative. Furthermore, as the emotional state gets worse, the actions performed by an agent with this kind of behaviour progresses as follows: ignore the situation, sacrifice own's goals to avoid further involvement and, finally, leave the scene.

In order to illustrate the agents' behaviours, consider the following scenario. In the first session with the *My Dream Theatre* game, the user has to direct a play where two characters, Andy and Bob, share the desire for the same role, the "Hero" role. For the user, the most rational choice for the part is Bob. Bob has higher proficiency and he is more cooperative comparatively to Andy. The complication starts when Bob receives the role. Andy appraises the situation as a negative interference to his self-interests what generates a negative emotional state. This is aggravated by the fact that Andy considers the role highly important to him. This trigger makes Andy upset enough to approach Bob aggressively, by verbally insulting him. With that, Bob who was initially happy, starts feeling upset, but as he was given his preferred role, he limits himself to only question the reason of the insult, trying to resolve this situation. Andy disapproves Bob's approach and gets even more upset. As the situation gets even more intense, as it escalates, Andy attacks Bob, who eventually reaches a high level of frustration. In the end, if the user doesn't intervene, Bob will end up giving up the Hero role, which is not good for the play.

5   Evaluation

In order to test the conflict model, we performed a preliminary evaluation phase, where we tried to assess whether people were able to recognise a conflict interaction by evaluating its participants' behaviours, contributions and outcomes. For that, we conducted a between-groups evaluation where participants were exposed to our model of conflict, full model (FM) condition, or to a control condition, a simplified model (SM) condition, where agents had no emotional affect on their behaviours.

A total of 80 participants (19 females, 61 males aged 14-48)[3] took part in the study, which was available through an online questionnaire that randomly assigned participants to one of the above test conditions. After watching a video of a user interacting with *My Dream Theatre*, which presents a situation similar to the one portrayed in Section 4, participants rated characters' behaviours and the situation process through 5-point likert scales.

The questions used were adapted from a self-serving questionnaire on conflict behaviour and escalation [5]. The data was analysed using the Mann-Whitney test. The first set of questions comprised characters' behaviours towards the conflict. Andy's behaviour, in the FM condition, was considered significantly ($p < 0.001$) more hostile, more competitive and evil-minded, compared to the control condition (SM). These results are consistent with its internal drives to follow a destructive path in a conflict interaction. On the other hand, Bob's attitude was considered to be more constructive. Participants rated Bob as significantly ($p < 0.001$) more friendly, collaborative and good-hearted in the FM condition, than in the SM condition. The second set of questions assesses the escalation process of the situation, in which participants reported that, in the FM condition, Andy significantly ($p < 0.001$) obstructed more Bob's goals. Further, only Bob was reported to significantly ($p < 0.001$) become more frustrated, in the FM condition. Nevertheless, the ambient was reported to worsen significantly ($p < 0.001$) more in the FM condition, compared to the control condition (SM). The detailed analysis of the results can be found in [4].

6   Conclusions

In this research, we aim to address the conflict phenomena by creating agents, which engage in natural situations of conflict, in the environment of an educative game to teach children conflict resolution skills. At the heart of this prototype is a model of conflict behaviour implemented in FAtiMAs emotional architecture, and integrated in the *Dream Theater* prototype. The modelled behaviours were inspired on natural conflict scenarios and agents' reactions are a result of their emotional state. To address whether the agents were effective in simulating a natural conflict scenario we performed an evaluation on our scenario. The results suggest that the agents' emotional behaviours are consistent with the process of conflict escalation, as well as, "attacking" and "evading" behaviours inspired by the literature on the subject.

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[3] Although the age range it is not the same as the target population for the learning game, we wanted to rapidly test the participants perception of conflict as a result of the agents behaviour before proceed.

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