Directing value–driven artificial characters

Rossana Damiano
Dipartimento di Informatica
and CIRMA
Università degli Studi di Torino
C.so Svizzera 185, 10149
Torino, Italy
rossana@di.unito.it

Vincenzo Lombardo
Dipartimento di Informatica
and CIRMA
Università degli Studi di Torino
C.so Svizzera 185, 10149
Torino, Italy
vincenzo@di.unito.it

ABSTRACT

In this paper we introduce the notion of character's values to mediate between agents and story direction in storytelling systems. By relating characters' goals with their values, the activation of goals depends on the values that are put at stake by the story incidents. Based on this framework, we propose a reference architecture for value–based interactive storytelling.

Categories and Subject Descriptors

I.2.11 [**Artificial Intelligence**]: Distributed Artificial Intelligence—*intelligent agents, multiagent systems*

General Terms

Languages,Algorithms,Theory

Keywords

Virtual characters, interactive storytelling, values

1. EXTENDED ABSTRACT

This paper deals with the modeling of characters in storytelling–based applications through the augmentation of BDI agents with the notion of character's values [3]. Values are an author–compliant, high–level guidance of the plot development, useful to convey a unitary direction to the story. The notion of value belongs to the realm of ethics and economics [1]; a value is a subjective assignment of importance to some type of abstract or physical object. Following a tradition dating back to [5] – and recently reaffirmed by [4] – we claim that characters respond to values at stake, and provide a framework for driving the development of the plot in which the direction is not directly expressed in terms of characters' goals, but stated in terms of values. Characters react to values at stake by forming value–dependent goals. Given this requirements on characters, the paradigm of BDI agents can be used to model characters, with the advantage that authors can specify the direction in terms of values (in compliance with authors' practice).

Although the BDI model allows creating believable characters from a rational point of view, some decisional oppositions cannot be dealt with on a purely rational basis. In stories, a character's intentions are often traded–off against unexpected options, that challenge the character's established commitment on moral grounds [2]. The notion of value can be effective to model this kind of situations, characterized by a prominently moral nature. Values are arranged onto subjective 'scales of values' [6] and characters react to values at stake as a consequence of the specific values put at stake and their position on the scale. The ranking of importance of some type of abstract or physical object for a character, encoded by values, reveals the inner nature of an individual character as the plot evolves.

So, the character model [3] consists of a BDI agent integrated with values. This model is included in a reference architecture (see Figure 1) that takes as input the definition of a story world, a set of characters, and a story direction. The story world (bottom right) is maintained by a simulator; its definition also includes a set of 'triggering events", i.e., a list of events that put values at stake. The direction is an ordered sequence of pairs containing a value and a boolean flag to indicate whether the value must be eventually enforced in the story: $Direction = \langle\{V_1, bool_1\}, \ldots, \{V_n, bool_n\}\rangle$. The order of values in the direction must be consistent with the characters' individual rankings of values.

Each character is a BDI agent integrated with values (Figure 1, top left). The system interactively generates a plot (bottom left) in which characters' values are put at stake and the characters respond to values at stake by adopting new *value–dependent goals*. See [3] for the details of how characters form value-dependent goals in response to values.

The Story Manager executes the following loop:

1. **Triggering events generation.** For each character, the system matches the condition of the next value at stake against the triggering events (*query on values*). If no value can be put at stake (for any character), the story manager returns a failure.

2. **Value-dependent goal generation.** Given the list of *candidate values at stake*, the system queries the characters to know which candidate values at stake may lead that character to form a value-dependent goal and to make it active (*query on goals*). Since a goal becomes active only if there is a viable plan to achieve it, the character performs, for each candidate value at stake, anticipatory planning by assuming the adoption of the value-dependent goal.

3. **Selection of candidate value-dependent goals.** For each candidate value-dependent goal, the system

Cite as: Directing value-driven artificial characters, R. Damiano, V. Lombardo, *Proc. of 9th Int. Conf. on Autonomous Agents and Multiagent Systems (AAMAS 2010)*, van der Hoek, Kaminka, Lespérance, Luck and Sen (eds.), May, 10–14, 2010, Toronto, Canada, pp. . 1531-1532

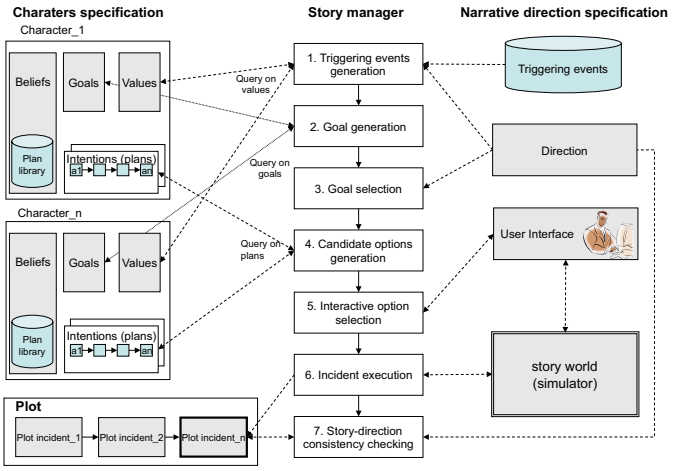

Figure 1: A reference architecture for value–sensitive storytelling. It includes a set of characters (left), a story engine that puts the characters' values at stake, generates the user options based on the response of the characters (center), and maintains the plot representation (bottom left). On the right, the author-defined knowledge (direction, triggering events, story world).

verifies if it conflicts with the other characters' active goals. If there is a conflict, and the failure to reestablish that value is compatible with the direction, the goal is expunged from the set of candidate value-dependent goals.[1]

4. **Candidate options generation.** After the set of candidate value-dependent goals has been computed, the story manager queries the characters to obtain the plans by which each candidate goal can be achieved (*query on plans* in the figure). If any of the candidate value-dependent plans puts further values at stake (no matter if they belong to the same or to another character), and the new value at stake has a higher priority than the current one but is not consistent with the direction, that plan is removed. Plan actions, indexed by characters, constitute the *candidate options* for the next story incident.

5. **Interactive option selection.** The candidate options become the user options, and are communicated to the user through the application–specific display environment; the selected option is then acted in the storyworld. Finally, characters who are not affected by new values at stake perform a deliberation and an execution step as defined in [3].

6. **Incident execution.** When the story world and the plot are updated, each character updates its mental state and conflicts may emerge. The character may realize that new values are at stake, and that some values are not at stake anymore. Or, the character may realize that a value-related goal has become unachievable, thus facing a failure.

7. **Story–direction consistency checking.** Due to the emergent aspects of the characters' interaction, it may be the case that, for a certain character, some value was put at stake too prematurely with respect to the ordering prescribed by the direction, or that the character fails to achieve a value-dependent goal. In both cases, the system has failed to enforce the direction. The story ends when all the prescribed values have been put at stake, and the characters have formed and (if required) successfully pursued the appropriate value–related goals.

This architecture is successful in representing value–goals relationship and encoding the story direction. It does not account for some relevant sources of knowledge that affect the character and story design, like the emotional aspects, recently addressed in virtual storytelling.

As future work, we will implement a prototype of the architecture to test the appropriateness of the value-based paradigm to story editing for interactive storytelling, and will study the extension of the model with dynamic values.

[1]Clearly, this strategy is not sufficient to detect the conflicts within the candidate goal set, which may emerge later when a certain subset of goals actually becomes active. In order to address this issue, we think that suboptimal plots may be generated by relaxing the constraints in the direction, or by allowing the system to backtrack.

2. REFERENCES

[1] E. Anderson. *Value in Ethics and Economics*. Harvard University Press, Cambridge, Mass., 1993.

[2] H. Barber and D. Kudenko. Generation of dilemma-based interactive narratives with a changeable story goal. In *Proc. of 2nd INTETAIN*, Brussels, 2008.

[3] R. Damiano and V. Lombardo. Value-driven characters for storytelling and drama. *LNCS 5883-0441 (Proc. of AI*IA10)*, 2009.

[4] R. McKee. *Story*. Harper Collins, New York, 1997.

[5] G. Polti. *Les trente-six situations dramatiques*. Mercure de France, Paris, 1895.

[6] B. van Fraassen. Values and the heart's command. *Journal of Philosophy*, 70(1):5–19, 1973.