Using Values to Turn Agents into Characters

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Abstract. Systems for interactive storytelling and drama rely on agent theories to model characters, and adopt various techniques to cope with non-determinism at the story level, such as story models, combining them according to sophisticate architectural designs. However, a consolidated approach has not emerged yet, that fully reconciles these two dimensions. In this paper, we propose a unifying framework to accommodate the tension between story control and character behavior. By using a model of agent to analyze a classical example, we show that this tension cannot be solved by discharging the distinguishing properties of agency. Rather, we claim that the accurate modeling of agency is a prerequisite to the success of any attempt to solve this tension, together with the possibility for the author to state the story direction in terms of explicitly declared values.

1 Introduction

In the last decade, a number of systems for entertainment and communication have appeared that – notwithstanding different design goals and conceptions – share a number of common features, including the use of artificial characters and the adoption of storytelling in the interaction with the user. These systems rely on multiple modalities for communicating with the user, such as natural language, graphics or virtual reality, and support different styles of interaction, such as dialogue, direct manipulation or embodiment.

For example, the Façade entertainment system involves the user as an active character in a dramatic situation in which a couple, whose marriage is falling apart, invites her/him for a drink, with wife and husband trying to bring the user on their respective sides. In the interactive storytelling system by [1], the user is immersed in a virtual reality environment, where he/she plays the part of one of the characters of the French novel "Madame Bovary", interacting with the other characters and affecting their feelings and behavior. In the Dramatour guide application for cultural heritage [2], a virtual character, the spider Carletto, accompanies the visitor in a historical location from a portable device, engaging in a dramatic monologue that exposes his psychological conflict between the roles of 'guide' and 'storyteller'. In the FearNot! edutainment system [3], the dynamics underlying bullying incidents in schools is dramatized in a cartoon-like environment, in which the child user intervenes as an empathic observer to give advice to the victim.

Given this heterogeneity of goals and instruments, a first, broad distinction has been established in the literature between story-based and character-based systems [4,1,5,6].

J. Filipe, A. Fred, and B. Sharp (Eds.): ICAART 2009, CCIS 67, pp. 283–296, 2010.

Story-based systems are characterized by centralized architectures, in which the behavior displayed by the system, possibly through characters' mediation, is driven by the unifying principle of a story. The story to be conveyed is usually underspecified in some way, so as to provide some support to non-determinism and interactivity. Character-based systems rely on the autonomous behaviour of characters to create situations, which are then interpreted as emergent narrative structures [7].

Whatever the chosen approach, it is widely acknowledged that the author's control over the story is related with communicative effectiveness; however, it must be traded off against the autonomy and the believability of the characters. For some specific forms of communication and entertainment, clear design strategies have emerged: for example, in video games, the quality of playability, anchored in carefully shaped and strongly constrained stories, is preferred over the definition of psychologically believable, autonomous characters. On the contrary, AI systems generally envisage interactivity as a main objective, sustained by a rich literature on interactive storytelling and drama [8,9,10]. However, a consolidated approach has not emerged yet that fully reconciles the two conflicting dimensions of story and characters.

In this paper, we sketch a formal system that systematizes the functions of story and characters in a unified theoretical framework. By using this framework, we accommodate the components of a variety of practical systems, pointing out the relevance of the notion of agency as a prerequisite to reconciling story and characters. Finally, we propose the notion of value to fill the gap between the language of agents and the author's control on drama.

2 A Formal Framework for Drama

The theoretical framework presented in this section lays out the 'language of drama', independently of the form and the media through which specific dramas are realized. Based on previous work by [11], revised here with a particular concern towards the contribution of AI and agents, the framework encompasses the major features of the practical systems mentioned above.

Following drama studies [12,13], for 'drama' we intend a form of narrative that describes the story via characters' action in present time and has a carefully crafted premise, i.e. an authorial *direction* that shapes the dramatic climax until its solution. Given this definition, the framework consists of two levels, the *directional level*, that encodes the specific traits of drama, and the *actional level*, that connects such traits with the notion of agency. The directional level of the system (Fig. 1, top) is centered on the notion of *drama unit*. A drama unit (*du*) is any segment of the drama that contributes to the story advancement, that is, it achieves a direction corresponding to a change in the emotional or belief state of one or more characters [13]. Originally expressed by Aristotle as "unity of action", a drama unit provides an effective direction for the story advancement operated by the segment of the story to which it is associated.

A drama unit can be recursively expanded into a number of children drama units, forming the *plot tree* (Fig. 1, top). The plot tree is licensed by the formal rules of drama, which pose constraints on the expansion relationship of *du*s (dominance relation in formal grammar terms). In particular, the direction of the parent *du* must include all the

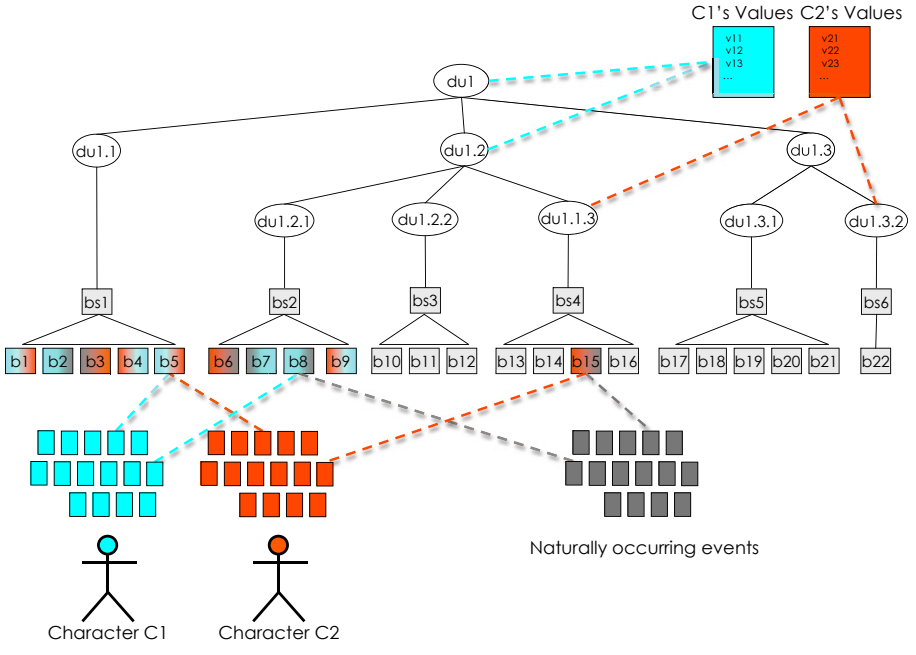

Fig. 1. A graphical representation of the formal system of drama. At the top, the directional level of drama, i.e. the way it achieves its direction through a sequence of elements situated at different levels of abstraction (*du*s), which manipulate characters' values; below, the actional level, represents the anchoring of the direction into the characters' actions contained in beats and rooted in a rational and emotional model of agency.

directions of children *du*s, with consistent initial and final states in case of subsequent changes in the belief or emotional states of the characters. The expansion of drama units into smaller drama units stops when, at the basic recursion, drama units are expanded into a sequence of *beats* (*b*s in Fig. 1, center), that will be exposed to the audience. Beats are the minimal units for the story advancement and consist of incident pairs (represented as pairs of adjacent boxes in the central part of Fig. 1), where incidents are characters' actions – executed as part of their plans – or unintentional events. The prescription that the direction is achieved through *c*onflict is captured by the constraint that, for each beat, the intended outcome of the second incident should be incompatible with the intended outcome of the first incident.

The incidents that form beats are retrieved from the *actional* level of drama (Fig. 1, bottom), that includes a full-fledged model of agency, such as the belief–desire–intention (BDI) model [14]. This model provides the glue that links the behavior of characters into a coherent causal chain to sustain their believability. BDI agent architectures have proven an effective basis for the design and implementations of character-based storytelling systems [15,16,3,17]. The reason for their effectiveness in modeling characters lies in the fact that the BDI model provides a library of actions that encompass the actual behavior of characters in drama, including the actions that are executed

as part of the typical agent loop: once an agent *commits* to a goal and *plans* a course of action to achieve it, it *executes* the actions that are prescribed by that plan. After executing actions, the agent *monitors* their effects through sensing and updates its model of the world accordingly, modifying its commitment through meta–deliberation and re–planning if necessary. [17] argue that the BDI characterization of agency is necessary also to model characters' emotions. Here, we assume a cognitive model of emotions like the one proposed by Ortony, Clore and Collins [18]; this model, largely employed in interactive drama (starting from [19]), defines emotion types based on an agent's appraisal of self and other agents' intentions.

In order to illustrate how this framework applies to specific drama, we resort to a well-known example, the 'nunnery scene' from Shakespeare's *Hamlet*, describing how the characters' rational and emotional states are plotted by the author to achieve the direction of the scene, namely Hamlet's failure to convince Ophelia to leave the court and his loss of trust in her.[1] For all the segments that compose the scene, we sketch the structure of the scene in terms of characters' beliefs and emotions states, with the goal of showing how the plot incidents affect them (a formal derivation is omitted for space reasons). The $feel$ operator models emotional states; the bel operator models beliefs and the has_goal operator models intentions. Table 2 illustrates the beliefs, goals, plans and emotions that we attribute to the characters in this scene.

The scene has a tripartite structure; the direction of the overall scene is Hamlet's attitude toward Ophelia, which changes from positive to negative ($feel(Hamlet, love\_for(Ophelia))$). In the first part (see Table 2, 1.1), Ophelia is sent to Hamlet by Claudius to induce him to reveal his inner feelings, $has\_goal(Ophelia, confess(Hamlet, inner\_feelings))$, as a way to confirm the hypothesis that his madness is caused by his rejected love for Ophelia. In order to do so, she has devised a simple plan that consists of meeting Hamlet, starting an interaction with him, and asking him to talk about his inner feelings ($has\_plan(Ophelia, (meet(Ophelia, Hamlet), start\_interaction(Ophelia, Hamlet), ask(Ophelia, confess(Hamlet, inner\_feelings$ $))))$). Hamlet does not want to meet Ophelia, so he tries to leave her, but is forced to answer by Ophelia's insistence, as she makes subsequent attempts to start an interaction with him. This segment of the scene establishes Claudius' belief that Hamlet is mad because of rejected love $bel(Claudius, mad(Hamlet))$; Ophelia's emotional state includes *fear* about Hamlet's madness, $feel(Ophelia, fear\_for(Hamlet\_madness))$ and *hope* (related with the fulfillment of her task to convince Hamlet to reveal his inner feelings.

At the beginning of the second part (Table 2, 1.2), Hamlet reactively forms the goal of saving Ophelia from the corruption of Elsinore court, $has\_goal(Hamlet, save(Hamlet, Ophelia))$, by inducing her to go to a nunnery ($has\_goal(Hamlet, has\_goal(Ophelia, go(Ophelia, nunnery))))$). In order to do so, he resorts to a rhetorical plan to convince her that moral and affective values do not hold anymore, and that everybody, including himself, is corrupted, with the intention that she would spontaneously decide to go to the nunnery ($bel(Hamlet, (bel(Ophelia, corrupted(court)) \rightarrow has\_goal(Ophelia, go(Ophelia, nunnery)))))$). Hamlet's emotional state is now set to *hope* about the effect of his rhetorical plan to convince Ophelia, $feel(Hamlet, hope$

[1] See [20] for a detailed analysis of the scene.

SCENE	CHARACTER	BELIEFS	GOAL	PLAN	EMOTIONS
1.1	Ophelia	has_goal (Claudius (know_if (Claudius, mad (Hamlet)))	confess (Hamlet, inner_feelings)	meet (Ophelia, Hamlet), start_ interaction (Ophelia, Hamlet), ask (Ophelia, confess (Hamlet, inner_feelings))	fear_for (mad (Hamlet)) love_for (Hamlet) hope (done (confess (Hamlet, inner_feelings)))
1.2	Hamlet	corrupted (court) in_danger (Ophelia) bel(Ophelia, corrupted (court)) → has goal (Ophelia, go (Ophelia, nunnery))	has_goal (Ophelia, go (Ophelia, nunnery))	convince (Hamlet, Ophelia, corrupted (court))	love_for (Ophelia) hope (has_goal (Ophelia, go (Ophelia, nunnery)))
	Ophelia				self_satisfaction (done (tell (Hamlet, inner_feelings)))
1.3	Hamlet	overhearing (Claudius)	know_if (bel (Ophelia, corrupted (court))) know_if (sincere (Ophelia))	ask (Hamlet, Ophelia, tell (Ophelia, where_is (Claudius)))	disappointment (not (done (convince (Hamlet, Ophelia, corrupted (court))) anger (not (sincere(Ophelia)))
	Ophelia	mad (Hamlet)			fear_confirmed (mad (Hamlet))
	Claudius	mad (Hamlet)			

Fig. 2. A representation of the rational and emotional state of the characters of Ophelia, Hamlet and Claudius along the "nunnery scene"

$(has\_goal(Ophelia, go\ (Ophelia, nunnery))))$, since he does not know if Ophelia's belief about the corruption of the court $(bel(Ophelia, corrupted(court)))$ has been established.

Finally, in the third part of the scene (Table 2, 1.3), Hamlet verifies whether he has convinced Ophelia that the court is corrupted. Prompted by the fact – a contingent event – that he has noticed Claudius and Polonius hidden behind the curtains, $bel(Hamlet, (overhearing(Claudius))$, he realizes that she maybe be lying and asks her where her father is. For Hamlet, this is a way to verify if Ophelia is still subdued to her father's authority. As she answers that her father is at home, her lie, for Hamlet, counts as a confirmation that his plan has failed So, Hamlet is upset and angry at Ophelia's blameworthy behavior and starts feigning madness again, thus confirming Claudius' beliefs about his madness, $bel(Claudius, mad(Hamlet))$. The scene ends with Ophelia complaining about her tragic destiny. Hamlet's emotional attitude towards Ophelia has changed $(feel(Hamlet, love\_for(Ophelia))$ does not hold anymore), while his hope to convince Ophelia to go to the nunnery has turned into *disappointment* $(feel(Hamlet, hope\ has\_goal(Ophelia, (go(Ophelia, nunnery))))$ does not hold anymore as well), and *anger*, $feel(Hamlet, anger(not(sincere(Ophelia))))$. At the same time, Ophelia experiences the emotional state of *fear confirmed* about Hamlet's madness, $feel$ $(Ophelia, fear\_confirmed(Hamlet\_madness))$, not mitigated by the fact of having

accomplished her initial task $feel(Ophelia, self\_satisfaction\ (done(confess\ (Hamlet, inner\_feelings)))$.

As this short excerpt illustrates, at the actional level, even sophisticated characters like Shakespeare's show the typical behavior of rational agents: they recognizably have goals, they form plans to achieve them and monitor the execution of those plans, dropping the goals that have proven to be unachievable. For example, when Hamlet realizes that the integrity of Ophelia is threatened by Claudius' maneuvers, he reactively forms the goal to save her from the corruption of the court and devises a rhetorical plan to convince her to abandon the court. Later on, in the second part of the scene, he formulates the goal of knowing whether Ophelia is lying or not, as a way to monitor the outcome of his rhetorical plan. Finally, in the third part of the scene, when confronted with his failure to convince Ophelia to leave the court, he gives up, disappointed.

3 Applying the Framework to Practical Architectures

With respect to the dichotomy between story-based and character-based approaches, the adoption of a unifying formal framework brings the advantage of situating different systems against a background in which the two dimensions of story and characters are explicitly put in relation, thus providing a common evaluation grid. Moreover, the way each system copes with the tension between story design and characters' autonomy has relevant consequences for the role of the procedural author [8] who will input the knowledge in the system. In practical systems, setting the focus on the directional level corresponds to giving the author immediate control on the direction of the story and constraining, by converse, the autonomy of characters. Since the directional level manipulates facts that relate, more or less directly, with the properties of characters, the internal structure of characters – a sum of emotions and beliefs – must be represented in the system in some implicit way.

In general, story-based systems tend to operate at the directional level and incorporate sophisticate story models (object-level knowledge about the semantics of drama according to the drama framework) to account for the structural aspects of narration and drama, ranging from semiotic structuralism [21,22,23] to cognitive models of story understanding [24]. The knowledge about story generation has often been encoded in the form of logical rules, like in the DEFACTO [25] and the IDtension [21] systems. These systems closely resemble expert systems, mixing the empirical and theoretical knowledge of the author in a set of rules that the system uses to generate the story; the effectiveness of these systems seems to be directly connected to their ability to integrate actional operators and emotional aspects. A different approach resorts to AI planning for the generation of the story. In these systems, the planner may replace the author in devising the plot: planning operators are represented by a set of possible plot incidents [6], which can be combined in a consistent sequence to achieve a transition from an author-defined initial and final states, with explicit constraints on the ordering of incidents and their causal relations (where intentionality can represent a weak form of causation). Or, the planner may be in charge of solving a planning problem from the perspective of the story characters, delegating the control over the direction to the author's capability of encoding full-fledged drama units into joint planning operators [26].

The control over the story direction is largely preferred to the manipulation of characters when it comes to designing authoring tools, as exemplified by a recent generation of systems [27,28,29]. In particular, [29] propose a hybrid, layered language for drama representation in authoring tools, aimed at allowing the author to design the story at the directional level, as a partially ordered set of plot points, while leaving the story generation system the task of mapping this representation onto a planning formalism. Similarly, the Automated Story Director [30] confines the autonomy of characters to the generation of low-level behaviors based on action libraries, giving a 'drama manager' [4] the responsibility for monitoring the story advancement to preserve, during the interaction with the user, the story goals encoded by the author.

As for the techniques employed, they vary within each family of systems (rule-based, planning-based and hybrid). The Mimesis [6] storytelling system, for example, explicitly aims at constraining the interaction with the user to the realization of a specific direction. The story is generated offline by a partial order planner; the planner assembles actions executed by a set of characters in order to construct an overall plan that fulfills the initial and final states given by the author. The plan is analyzed to detect the potential impact of user's input, and converted into a conditional plan in which inputs are accounted for in advance. This powerful technique, called 'narrative mediation', allows the author to predict, in full detail, the possible forms of the plot. At the same time, the system sees to it that the intentions of the characters remain clearly recognizable to the user along the plan, and that all actions in the plan are part of the motivational structure of the characters. The core of this system clearly operates at the directional level; however, the representation of the characters as agents is acknowledged, though indirectly, by the use of "intention frames", motivational accounts with which the actions included in the plot are annotated. A drawback of this strategy is that the mental state of the characters are only accounted for indirectly, blurring the conceptual distinction between the goals that are individually pursued by the characters and the drama goal.

The Façade system [26] is designed to conduct an interactive drama to a clearly stated set of outcomes, in which the couple of protagonists either split or remain together (see Section 1), with the user being neutral or sympathizing for one of the two sides. In Façade, the richness of the user experience resides in becoming a story protagonist, triggering (but not controlling) the evolution of the plot towards one of the available directions. The generation of the plot is obtained through a hierarchical plan language (ABL), that encodes multi-agent, joint plans; the plan language also accounts for the role of the user in the joint action. The inclusion of the joint plans in the interactive story is then affected by the interaction with the user and guided by a measure of the plot emotional value. In Façade, the characters tend to be shaped by the actions they perform and the things they say in the space of the interpersonal relations, instead of being stated by an a priori definition of their mental state from which intentions can subsequently be derived. For this reason, even if this system operates at the directional level, it is situated mid-way between the directional level and the actional level.

Character-based systems are situated at the actional level of the drama framework. They tend to an improvisational approach to drama, close to the "comedy of the art" tradition, first translated in a computational architecture by the work of Hayes-Roth [31]. According to this paradigm, drama emerges from the interaction of a set of characters,

constrained to specific roles. This approach – whose realization has been encouraged by the availability of conceptual and practical tools that implement the characters' deliberation – contrasts with the achievement of a specific direction. This situation corresponds to having a strongly underdetermined direction, subsuming a large variety of plots, or not having a specified direction at all. It is worth noting that practical systems tend to reduce the notion of character to mere deliberation and resort to planning techniques to implement it. The representation of the characters' mind is delegated to the use of truth maintaining techniques, while plan monitoring is delegated to the execution environments.

As an example of this approach, consider the "Friends" system described in [32], where the behavior of each character is generated by a hierarchical planner. Characters are committed to specific goals (like seducing another character), and reactively form intentions (i.e., partially instantiated plans) to achieve them. The user interacts with them as a 'deus ex machina' in a cooperative (i.g. giving suggestions) or conflictual way (i.g. preventing actions); so, user actions affect the behavior of the characters, either influencing their future deliberation (characters' high level plans are detailed out only when execution approximates, leaving room for the user's advice) or forcing them to replan. The characters' behaviors are executed concurrently, so that conflicts may emerge from their interaction. From the author's point of view, the use of the hierarchical task network (HTN) planning paradigm allows for a more direct control of the development of the plot, since it directly connects the characters' behavior with the specification of their goal; as a drawback, it reduces the responsiveness of the system, that must employ replanning techniques to display a flexible behavior. In practice, stating the drama direction in terms of the characters' goals releases the control over story; from a theoretical perspective proposed here, it collapses the distinction between the directional and the actional level, since the direction should abstract from how actions are represented in the system.

In the "Madame Bovary" based system by [1], the focus is on the responsiveness of characters' emotional attitudes. The behavior of each character is generated by a heuristic-search planner, and planning is limited to the selection of the next action, to cope with asynchronous user intervention without replanning. The planning operators represent how 'feelings' manipulate the characters' mental state. The author's control over the system is confined to the actional level, and consists of defining the initial mental state of the characters and a set of planning operators for each character. The resulting initial situation is open to opposite endings, depending on the user's input and the mental state of the characters. The notion of conflict is mostly internal to the characters' mental states, which can evolve towards different final outcomes. Within the conceptual dimension of the actional level of drama, this system privileges the accuracy of the emotional modeling of the characters; it does not contain an explicit notion of direction to provide a stronger control on the story development; the characters, in order to appear responsive and gain the user's engagement, exhibit an emotionally-based behavior rather than being driven by explicitly coded intentions, encouraging the user to explore, rather than 'direct', the advancement of the story. From the author's point of view, the possibility for the user to affect the beliefs and feelings of the characters at any time and the use of heuristic–search planning (HSP) lead to hypothesize a methodology consisting of iterative testing to tune the behavior of the system to the author's direction, which is not stated explicitly.

4 The Role of Values in Drama

The dichotomy between actional level and directional level systems, that is, between characters and story direction, can be reconciled through the notion of 'value': by extending the actional level definition of agent to include the values belonging to the directional level, agents can be leveraged to become characters.

The notion of value belongs to the realm of ethics and economics [33]. A value is an assignment of importance to some type of abstract or physical object; recognizably subjective, values are related with the regulation of behavior, but they retain a more abstract, symbolic meaning and do not exhibit a direct correspondence within the theories of rationality [34]; at the same time, they are very relevant for the establishment of the story direction. The notion of character's value has emerged in scriptwriting theory as a major propulsive force in story advancement. First stated in Egri's definition of drama premise [12], the notion of value underpins most of the subsequent work conducted in scriptwriting [35], until the recent formulation by McKee [13]. The progression of the story follows a cyclic pattern: a character follows line of action suitable to preserve its balance of values, when some event (typically, a twist of fate or an antagonist's action) occurs, that makes the character's line of action inadequate by putting some character's relevant value at stake. This constrains the character to abandon or suspend its current line of action and to devise yet another line of action to restore them.

Stories put characters' values at stake either by violating their values (e.g. fate of mankind in Bond movies) or by offering them the possibility of achieving the compliance with them (e.g, self-realization for Nora in Ibsen's A Doll's house). Values at stake possibly conflict with some other values (the hero's love for a beautiful girl in Bond movies, family values in Ibsen's drama). Notice that, in agent systems, strong limitations are posed to opportunistic behaviors, since they conflict with the requirement of behavior stability, and pose complexity issues. On the contrary, in fictional worlds, once the behavior of the character is consistently believable along the story, stability is not a desirable feature, because a story advances by changes rather than stability. The underlying assumption of inserting values in a computational framework of drama is that, if characters respond to explicitly declared values, the control of the author over the story direction can be improved, thus amending, at least partially, the problem of authorial control over storytelling systems, as it emerges from the survey conducted in the previous section. The use of values is motivated by the aim of lifting the authorial control from the need to deal with the inner mechanisms of characters that, in practical systems, are implemented through agent architectures developed without any specific concerns about storytelling.

So, we model characters as a 4-tuple $\{B, D, I, V\}$, where V represent character's values. Note that, here, we consider only the subjective dimension of values, and do not consider their relation with an external social system.

- Each character has a *set of values* V.
- Each value v is polarized, with a negative or positive *polarity* p, and is associated with a *condition* c. The negative polarity of a value means that, when the value condition holds in a certain state of the world, the value is violated; the positive polarity corresponds to the value being in force. In order to let characters arbitrate among their values, values are ranked according to their priority.

- A *value* v is defined by the construct $v(p, c, r)$ where p is a negative or positive polarity, c is a ground formula α and r is a priority (a real number).
- If the condition c of value v holds in a state of the world represented by the character's beliefs, that value is *at stake*.
- A character's *record of the values at stake*, VaS, is a subset of the constructs $v(p, c, r)$ such that c holds in the current state of the world or is expected to hold in the future, according to the character's beliefs.

The character's record of the values at stake (VaS) is a dynamic structure, updated along the progression of the story. When a character monitors its values, it considers not only the current state of the world, but also the world states that are to be generated by other characters' actions (the character's expectations). To model opportunism, we assume that the character monitors the possibility of bringing about its values, by verifying if their conditions are reachable from the current world state (self expectations). If the character is able to find a course of action that results in a state of the world in which the condition of the value holds, this state is added to the character's expectations.

When a character realizes that some value is at stake (either in the present or in its expectations), it reacts accordingly, by modifying its commitment in a way that restores the value. The way goals arise and are affected by values can be grasped effectively by the abstract goal architecture in [36], which provides a unifying account of goal types and describes how a goal state is transformed after the modifications of an agent's beliefs (Fig. 3). According to the goal framework in [36], *adopted* goals remain *suspended* until they are ready for execution; then, high priority goals become *active*, while active goals with lower priority are suspended. Goals can eventually be *dropped* if certain conditions hold [37].

The automaton in Fig 3 schematizes the framework in [36] and introduces the role of values at stake in goal adoption.

1. Given a construct $v(p, c, r)$ in VaS (the record of the values at stake), the character formulates and *adopts* a set of goals according to the following rules:
   (a) If the condition c holds in the character's *expectations* and the associated polarity p is *positive*, then the character forms the goal to achieve that state of affairs $g = c$ (*achievement goal*). Expectations model the opportunity of achieving the compliance with one's own values.

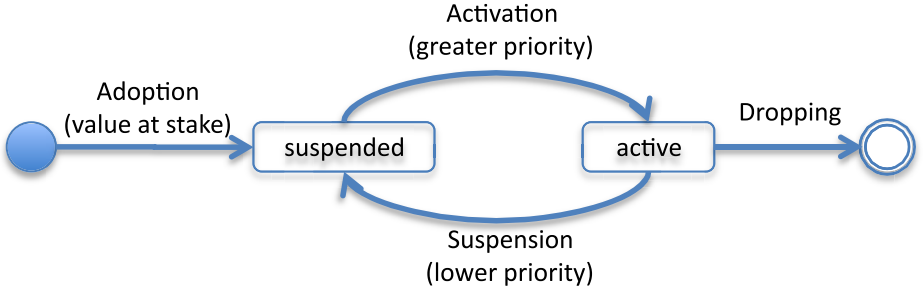

Fig. 3. A graphical representation of the goal states and transitions (inspired by [36])

   (b) If the condition c holds in the *present* or in the character's *expectations* and the associated polarity p is *negative*, then the character forms the goal to achieve a state of the world s in which that condition does not hold (any s such that $c \notin s$). This includes the case in which the character has to contrast the behavior of an antagonist whose behavior is expected to bring about just a state of affairs in which the condition c holds.
2. Goals that are adopted because of some value v become *suspended* immediately after the adoption. The activation of goals depends on the priority of the associated value v.
   (a) If the priority of the value at stake $v(p, c, r)$ is higher than the priority of the current values at stake, the goal becomes *active*; the character can *generate a plan* to achieve it and start to *execute* it (if the active goal was active in the past, the character may resume a previously suspended plan, if still valid).
   (b) Else, the new goal does not become active immediately (but can activated later depending on its priority).
3. A goal is *dropped* if the character realizes that it is impossible to find a plan to achieve it, it has already been achieved, or it is not relevant anymore, independently of its priority.

The "nunnery scene", analyzed in Section 2 in terms of characters' goals and emotions, is better accounted for in a framework that explicitly includes values. The value pursued by Claudius is the "control over the court", put at stake by behavior of Hamlet, who has been playing the fool since his arrival at Elsinore. From the point view of Claudius, Hamlet's behavior is associated with the violation of this value, since the control over the court presupposes, among other conditions, that all the members of the court obey the social rules of the court itself. So, the value-driven mechanism of goal formation establishes Claudius' goal of making Hamlet inoffensive (by rule $1.a$): finding out the cause for Hamlet's strange behavior is the first step of Claudius' plan to make him inoffensive.

Ophelia, although she is in love with Hamlet, is subdued by Claudius' authority. When she is ordered to investigate the cause for Hamlet's madness, coherently with her values, she reacts by forming the goal of making Hamlet confess his inner feelings ($has\_goal(Ophelia, confess(Hamlet, inner\_feelings))$) and formulates a plan to achieve it. Later on, when she is required by Hamlet to tell where her father is, the value of "obedience" conflicts with the value of "moral integrity", since the compliance with the value of "moral integrity", that would be enforced by the fact of telling the truth (by rule $1.b$), becomes incompatible with the value of obedience (expectedly violated by the revelation of Claudius eavesdropping their conversation – rule $1.a$). When Ophelia gives priority to the value of 'obedience' (by rule $2.a$), as a result, she exposes her scale of values to the audience, an event that is extremely meaningful in dramatic terms and constitutes the culmination of the climax of the scene.

Hamlet's behavior is driven by the value of "justice", put at stake by her father's murder by Claudius that constitutes, unpunished, a blatant violation of the value, prompting Hamlet's goal to take revenge over Claudius (by rule $1.a$). In the nunnery scene, however, this value is temporarily suspended in favor of the value of "moral integrity", triggered by Hamlet realization that Ophelia's integrity is currently threatened by her

submission to Claudius and Polonius, but can be restored if she abandons the court. So, by rule $1.b$, he forms the goal of saving Ophelia from the corruption of the court ($has\_goal(Hamlet, save(Hamlet, Ophelia))$) by inducing her to go to a nunnery ($has\_goal(Hamlet, has\_goal(Ophelia, go(Ophelia, nunnery)))$). Hamlet's effort to comply with the value of "moral integrity", however, is frustrated by Ophelia's behavior, dictated by her obedience to her father.

In summary, the direction states the frustration of a character's (Hamlet) attempt to preserve the value of "moral integrity", a frustration that is determined by another characters' (Ophelia) choice to comply with the value of "obedience". The conflict between "obedience" and "moral integrity" is solved in favor of the value of "obedience". The value-driven analysis of this scene also reveals the key role of emotions in establishing the direction: the conflict between "obedience" and "moral integrity" is exacerbated by the characters' emotions, whose polarity is changed as a result of the solution of this conflict: Hamlet's love for Ophelia switches from positive to negative, while Ophelia's feeling of hope is turned into despair by her belief that Hamlet is eventually fallen into madness.

The integration of values in the rational model of characters posits a computational system for storytelling in the position to account for the basic patterns of drama. When a character suspends the current goal (and the related plan) in favor of a new goal, associated with a value at stake of higher priority, the new goal becomes the active goal. The pattern is repeated until the story reaches its climax. At that point, the suspended goals, if any, are normally resumed in the inverse order. Some plans may not be relevant anymore, since their goals may have been achieved or become unachievable or irrelevant in the meantime (fortuitous events, expired deadlines, other characters' activities).

5 Discussion and Conclusions

Although there is a general agreement about the role played by characters and story in practical systems, the complex relations between the two have received much less attention. This situation that can be partly attributed to the fact that the notions of character and story, taken in isolation, rely on well established models (autonomous agents, planning and graph theories). However, the importance of the story direction has been amply recognized because of the difficulty encountered by the interactive systems to reconcile the authorial control and the interaction with the user.

In this paper we have sketched a formal framework to represent the interdependencies of the two levels of drama, i.e., direction and characters. The analysis of a classical example through this framework points out that a detailed model of agency is necessary to grasp the behavior of characters in drama. For example, agency is required to model the monitoring of actions by the characters, the reasoning about one's own intentions, and the meta-deliberation capabilities.

We have proposed to extend agency with the notion of "characters' values", providing a definition of how they are accounted for in characters' deliberation and a method for the formation of new goals based on values. The language through which the author expresses its message takes advantage from the introduction of explicit values, since it allows the author to control the advancement of the story by abstracting from the

functioning of characters as agents at the actional level of drama. Values can be explicitly manipulated by the author in the creation of interactive stories, mediating between the author's control of the story and the freedom of the user in the interaction with the characters.

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