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Qualifying and Quantifying Interestingness in Dramatic Situations

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Abstract. Dramatic situations have long been studied in Drama Studies since they characterize tension and interestingness in a plot. In the field of Interactive Digital Storytelling (IDS), integrating knowledge about dramatic situations is of great relevance in order to design improved systems that dynamically generate more narratively-relevant events. However, current approaches to dramatic situations are descriptive and not directly applicable to the field of IDS. We introduce a computational model that fills that gap by both describing dramatic situations visually and providing a quantitative measure for the interestingness of a plot. Using a corpus of 20 Aesop's fables, we compared the calculations resulting of the model with the assessments provided by 101 participants. Results suggest that our model works appropriately at least for stories characterized by a strong plot structure rather than their semantic content.

Keywords: interactive storytelling, interactive narrative, interactive drama, computational narratology, computational models of narrative, dramatic situation, Aesop's Fables.

1. Dramatic Situations and Interactive Storytelling

In theatre and drama, the concept of *situation* is a key dimension in the analysis of a given piece [15, 18]. A situation is understood here as a set of characters and their relationships that makes the drama interesting. Examples of dramatic situations include the 'love triangle' —two characters love a third one—, forbidden love between siblings (who may ignore their family ties), love between different social classes, and others just to mention the romantic domain as example.

The concept of dramatic situation is interesting in the field of Interactive Digital Storytelling (IDS) because it provides a founding principle that may be used to dynamically generate narratively-relevant events. More precisely, a dramatic situation describes a narrative in a static manner[1]. As P. Pavis puts it: "Describing the situation of a play is like taking a picture of all the relationships of the characters at a particular moment, like 'freezing' the development of the events to take stock of the action"

[1] This makes "situations" radically different from "plots", usually defined as sequences.

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[14]. This "atemporality" — the term comes from C. Levi-Strauss' analysis of myths [9] — is particularly relevant in the field of IDS, because it makes possible to provide potentialities for interesting developments of the story so far, without explicitly providing a temporal order [23].

Of course, not any set of characters and their relationships is likely to create an interesting drama, and the concept of dramatic situation, as it is found in existing plays or movies, implicitly supposes that the situation is *interesting*. In this paper, we are willing to characterize, formalize and implement, as a computational model, such interestingness of a situation, with the underlying idea that the latter contributes to the interestingness/appreciation of a story as a whole. The concept of dramatic situation is related to the concept of *conflict* in drama, as already formulated by G. Polti: "any dramatic situation arises from a conflict between two main directions of effort" [15]. A fair number of computational models of conflict have been proposed and evaluated [2, 3, 21, 25], that compare human perception of conflict with predictions of a model. Our research problem is slightly different, because our goal is to characterize a whole dramatic situation that may include several conflicts of different types. In addition, with the long-term goal of building a narrative engine for interactive drama, we consider dramatic situations to be part of what the author would need to write. Therefore, our goal is not only to characterize a dramatic situation but also to represent it visually so that an author could write at this very level. Effectively, dramatic situation appears to be an appealing concept for authors, judging by the frequent reference to Polti's 36 dramatic situations in the domain of screenwriting[2].

The goal of this research is therefore to build a computational model of dramatic situations that will enable to both *qualitatively describe* these dramatic situations for non-interactive and interactive narratives and drama, and *quantitatively assess* the interestingness of such situations for a given story. In the next section, the computational model of dramatic situations and their interestingness will be presented, followed by two kinds of validations: First, in Section 3, the model will be applied to various existing stories, and compared with other drama representations; Second, the capacity of the model to predict human judgment of interestingness will be assessed.

2. A computational Model of Dramatic Situations

2.1 Representing Dramatic Structure

As mentioned in the introduction, a dramatic situation consists of a set of characters and their relationships. Before characterizing a situation, one needs a language to

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[2] http://writeworld.org/post/44959188412/the-36-dramatic-situations
http://www.wordplayer.com/columns/wp12.Been.Done.html
https://gideonsway.wordpress.com/2009/10/31/screenwriting-tip-15-%E2%80%93-the-36-dramatic-situations/
http://www.scenario-buzz.com/2011/01/26/lecons-de-scenario-les-36-situations-dramatiques/

describe these characters, in particular their intentions and goals. Artificial Intelligence formalisms have been widely used in the field for that purpose, in particular in the agent-based approach of AI [16]. With authors in mind, we will, for this research, use a formalism that is based on dramaturgy and screenwriting, already described in detail elsewhere [22] that we summarize here. It consists of the following six fundamental elements:

- Goals, that represent a state a character may wish for.
- Tasks, that represent an action a character may undertake.
- Obstacles, that represent the failure to perform a task.
- Side effects, that represent an event that occurs as a consequence of a task although it was not the primary intention of the character.
- Characters, who are impacted, positively or negatively, by what happens.
- Families (in the general sense), representing some ties (not necessarily genetic) between two or more characters.

A dramatic structure — we use here the term *structure* rather than *situation* to indicate that it may be quite uninteresting from a dramatic point of view — is defined as a set of elements of the above-mentioned six types connected to each other via *relations* of various types. For example, a task is related to a goal via a *reaching* relation. All relations in the proposed model are summarized in Table 1.

Table 1. Various relations in the model of dramatic structures

Relation:	reaching (r)	hindering (h)	collateral (c)	needing (n)	inhibiting/exciting (i/x)	satisfying/unsatisfying (s/u)	belonging (b)	failing (f)	Weak success (w)	degradation (d)
Source:	Task	obstacle	task	side-effect	goal	goal	character	obstacle	task	task
Target:	Goal	task	side-effect	goal	obstacle	character	family	goal	obstacle	character
Weight:	1	-1	1	-1	-1/1	1/-1	1	-1	1	1

A dramatic structure can therefore be represented as a graph, with nodes and edges, which enables a visual representation. We take the example of the famous last scene of "The Caucasian Chalk Circle" from B. Brecht (derived from a Chinese play and the biblical story *The Judgment of Solomon*): A judge must decide who is the real mother of a child. He places the child at the center of a chalk circle and states that the woman who manages to pull the child from the circle will obtain the child and if both pull, the child will be pulled apart. At the end, one mother refuses to pull and, instead of losing the child, she is declared to be the real mother. The corresponding dramatic structure is represented in Fig. 1. The mother and the false mother both wish to get the child (goal), by pulling him from the circle (task), but both may fail (obstacle). Should the mother fail or succeed, the child would be hurt (side effect) which is negative for her (conversely, the false mother does not see things this way). Finally, the graph shows that both goals satisfy them (characters), and that both characters are people (family).
In this example, the judge —a central character in the scene— is not represented, neither his goals or tasks, because he does not intervene in the dramatic situation itself but rather before, by setting it, and after, by making his judgment.

This kind of visual representation shares similarities with other narrative formalisms such as Drammar [10], plot units [8], or DramaBank [5]. The main difference here is that we are not necessarily trying to capture all actions in a scene, as it is the rule when adopting an annotation approach, but instead we are constructing an abstraction of a scene, representing what is considered as the core meaning of the scene. In addition, the next section will show more clearly the specificity of our representation of dramatic situations.

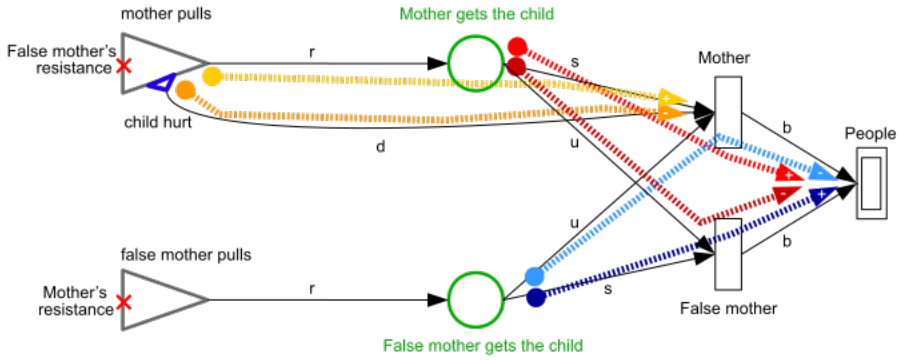

Fig. 1. The dramatic structure of "The Caucasian Chalk Circle" story. Triangles, circles and rectangles represent nodes, while arrows represent relations (see this section). Dashed lines represent dramatic cycles (positive and negative paths, see next section).

2.2 What Makes a Situation Interesting from a Dramatic Point of View?

A first answer, taken from screenwriting prescriptive theories is: "obstacles" [7, 11, 24]: a structure with an obstacle is already narratively relevant if, for the concerned character, the goal is significant and the consequences are fearful if the obstacle is not overcome [19]. However, it seems that the mere presence of an obstacle in a dramatic structure does not cover all cases of interesting dramatic situations. In that respect, the term 'conflict', also mentioned as the main feature of drama may be more distinctive to define dramatic situations, but given the fuzziness around the term 'conflict', it is difficult to draw some formal properties from it. Finally, we take the observation of B. Nichols as a starting point: "[narratives] tend to share in this quality of stretching out paradox by holding contraries in juxtaposition before resolving them" [12]. This concept of *paradox* is related to the notion of conflict, but its pseudo logical formulation "if A then B, but if B then not-A" provides a hint on the topological configuration needed for a dramatic graph to be an interesting dramatic situation. Let us consider the graph in Fig. 1: We observe that if the mother pulls her child, on the one hand she may be satisfied if the child comes to her but on the other hand, performing the task might hurt or even kill her child. This corresponds to a cycle in the structure. More precisely, a *dramatic cycle* is defined as a subgraph containing two nodes A and B such as one *positive path* goes from A to B and one *negative path* also goes from A to B, as illustrated in Fig. 2. This constitutes the basis of a formal definition of dramatic

situations. We have documented elsewhere how this formal definition may be used to generate abstract graphs that may be instantiated into interesting dramatic situations [22]. By analyzing the structure in Fig.1, one can derive the following dramatic cycles that we express both formally and in plain English as follows:

- c1: If the mother pulls her son, she can reach her goal of obtaining him, which satisfies her, but at the same time, her child is hurt and she is unhappy: {(mother pulls ↠ mother gets the child ↠ mother),(mother pulls ↠ child hurt→mother)}[3]
- c2 and c3: If the mother reaches her goal of getting her child, she is satisfied but the other mother is not, and reciprocally: {(mother gets the child↠mother↠people),(mother gets the child→false mother↠people)} and {(false mother gets the child↠false mother↠people),(false mother gets the child→ mother↠people)}.

2.3 Comparing Different Types of Dramatic Situations

Are all dramatic situations equal in value? In screenwriting for example, it is common to distinguish between external and internal obstacles, with the idea that the latter is more valued than the former. Within our representation formalism, one can distinguish different kinds of dramatic cycles:

- The two paths converge towards one goal: this is a typical paradox, because an event or action can both support and hinder the same goal.
- The two paths converge towards the same character: this happens when a character has two conflicting goals.
- The two paths converge towards the same family: this represents a conflict between characters.

In order to quantify the interest of these different kinds of cycles, we give non-integer weights to some relations, and use the following formulas:

Let c be a dramatic cycle, c being composed of two paths p^+ and p^- from A to B of opposite strengths.

Let s, the strength of a path p, be:

$$s_p = \prod_{m,n \in p} w_{m \to n} \quad (1)$$

with $w_{m \to n}$ being the weight of the relation between node m and node n.

Then the interest of a dramatic cycle is calculated as follows:

$$I(c) = \frac{|s_{p^+}| + |s_{p^-}|}{2} \quad (2)$$

Finally, the interest of a dramatic situation S as a whole is estimated as follows:

$$I(SIT) = \sum_{c \in \mathcal{C}_{SIT}} I(c) + \sum_{o \in \mathcal{O}_{SIT}} I(o) \quad (3)$$

with $\mathcal{C}_{SIT}$ being the set of all cycles in the situation SIT and $\mathcal{O}_{SIT}$ being the set of all "free" obstacles, that is, obstacles that are not part of any dramatic cycles. This calcu-

[3] Simple arrows represent negative weight relations while double arrows represent positive weight relations.

lation considers that even without dramatic cycles, obstacles contribute to the interest. For the current version, this contribution is simply estimated by:

$$I(o) = \Omega$$

with Ω being a constant.

Two important remarks are necessary at this point: First, these calculations are somehow arbitrary, that is, other variants may be proposed in the future. Second, it needs to be reminded that these estimations are structural/syntactical only because they put aside all semantics associated with the nodes.

The interest calculation depends on the relations' weights. With all values being either 1 or -1, the interest of a dramatic cycle will be equal to 1. But if the weight of the satisfaction relation is lowered, then the interest of a situation with conflicting goals will be lower than the interest of a conflict with only one goal, without satisfying relations. Similarly, by lowering the weight of the belonging relation, one lowers the general interest of the enclosing dramatic situation, compared to other kinds of dramatic cycles. In addition, it makes sense to choose variable weights for the belonging relation depending on the situation: a simple interpersonal conflict may occur when two persons are unrelated, but if the two persons are close friends, then it is a betrayal situation and we may suppose that such a situation is more interesting. Consequently, by setting the weight of the regular belonging relation lower than the weight of the friend belonging relation, the interestingness with a simple interpersonal conflict is effectively lower than the interestingness of a betrayal situation, according to Equations (1) to (3) above.

3. Application of the Model to Existing Stories

We claim that this model is applicable to a large set of stories, following B. Nichols approach[12]. For example, we have successfully analyzed Disney movies' plots (*the Little Mermaid*, *Aladdin*). Note however that it is easier to apply the model to simpler stories. For example, we can borrow from W. Lehnert [8] the analysis of the story *The Gift of the Magi*, in which she has already simplified the original short story [6]. In Fig. 2 we compare the visual representation of this story analyzed by three approaches: Plot Units [8], SIG [4] and our model. All three representations show the symmetry in the story. The specific contribution of our model is that it also visualizes the dramatic situation, in terms of dramatic cycles. The structure contains four cycles, two of them being almost identical. The cycle represented on Fig. 2 can be expressed in plain English by: "By selling her hair, Della can buy him a gift which pleases *him* but at the same time she makes Jim's goal of pleasing Della unreached, therefore she displeases *him*". The almost identical cycle consists in replacing the "*him*" in the previous sentence by "her". Then the two other cycles are the symmetrical ones, considering Jim's point of view when he sells his watch.

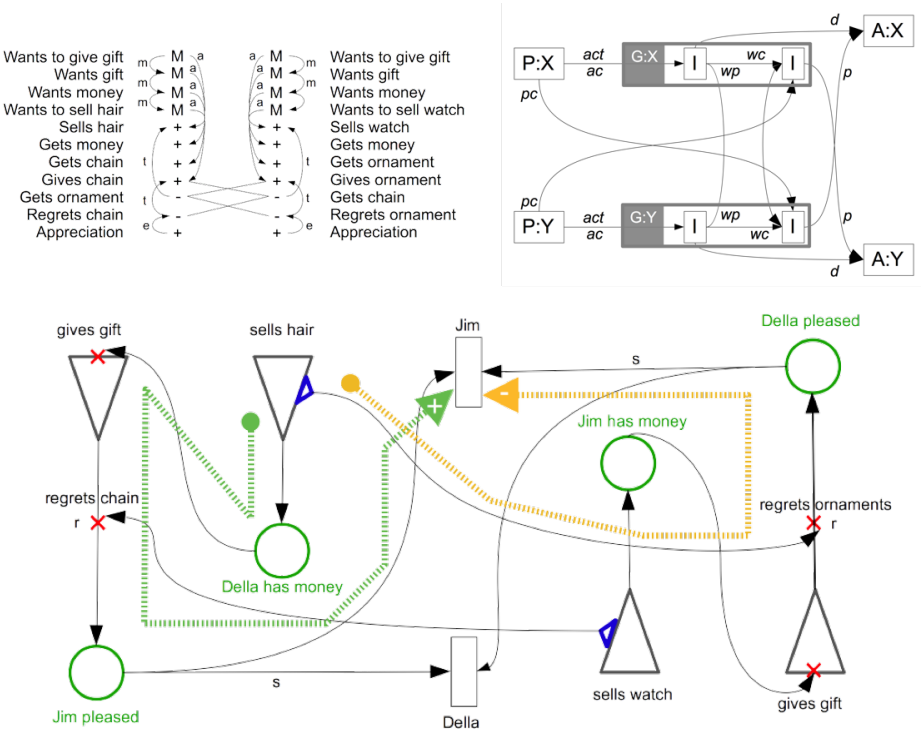

Fig. 2. Different representations of the 'Gift of the Magi' story. Top left: Plot Units, Top Right: Story Intention Graph, Bottom: our proposed model.

Finally, beyond these illustrations of the model, it is also useful to provide a more comprehensive evaluation, based on a *corpus* of stories. We chose Aesop's fables for that purpose. Very importantly, once the choice of Aesop's fable was made, the detailed composition of this corpus was randomly made. This randomness is critical, because by doing it differently, which could be done by selecting *illustrative* stories, one would tend to select the stories that seem to fit the model and discard the others. This would obviously bias the analysis. In our case, we selected the first twenty fables of the paperback book edition [1]. The underlying research question is: do these stories effectively possess dramatic cycles? The choice of fables to evaluate a model inherited from drama theory may seem questionable. However, without entering a complex narratological discussion that would be out of the scope of this paper, our position is that, as far as we are concerned with the story content (characters, goals, etc.), narrative and drama do not have strong boundaries. In other terms, to quote a current narrative theorist: "it seems high time to give up cherished normative dichotomy between fiction and drama" [13].

For each story, one of the authors manually extracted the dramatic structures, and exhibited the dramatic cycles. Because the application of the model for analyzing an

existing story is still difficult to perform, we did not hire a pool of raters to estimate an inter-rater agreement. Such a procedure could be adopted in the future.

In some cases, a story needed two successive situations, which we represented visually by two rectangles containing the two corresponding structures. With more complex stories, one can expect much more successive dramatic situations. Examples of analyzed fables are shown in Fig. 3, and the complete list has been made available online[4].

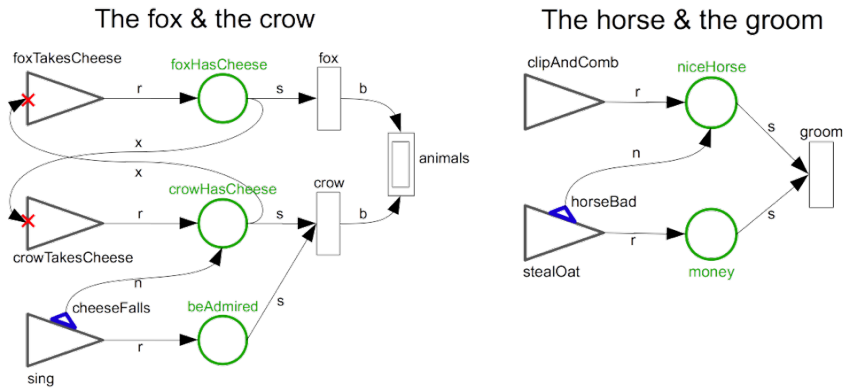

Fig. 3. Two examples of Aesop's fables represented using the proposed model. In "The Fox & the Crow", three dramatic circles are identified: two cycles correspond to the diverging interest of The Fox and the Crow (if the Fox has the cheese, the Crow has not, and vice versa) while a third one corresponds to the fact that the Crow is tempted to sing although it would lose the cheese if it did. In "The Horse & the Groom", there is one dramatic cycle: stealing the oat provides money to the groom but at the same time it prevents him to have a nice horse.

17 out of 20 stories have one or more dramatic cycles. In average, the number of dramatic cycles per story is 1.85, with a maximum of 6 (as in "The Ass, the Fox & the Lion"). This shows that the characterization of stories in terms of dramatic cycles makes sense, vis-à-vis real stories.

The fables that do not contain dramatic cycles are: "The Fox & the Grapes", "The Crow & the Pitcher" and "The Moon & Her Mother". These three stories still have at least one obstacle. What characterizes these three stories is that they seem to be fundamentally sequential, meaning that they surprise the reader by an unexpected twist, yet based on simplistic situations. In the Fox and Grapes for example, it is the very fact that the character drops his goal that makes the story interesting, not the plot itself, which is a simple obstacle. In the "The Moon & Her Mother", it is the semantics of the elements that conveys the main meaning of the story. The obstacle met by the mother, the impossibility to make a dress for the ever-changing moon, is interesting because of its content, while in many other fables, obstacles could be easily replaced by other similar obstacles.

[4] http://tecfalabs.unige.ch/mediawiki-narrative/index.php/Aesop's_Fables

4. Preliminary Empirical Evaluation

In order to further evaluate the relevance of the proposed model of dramatic situations, we attempted to assess whether the model could predict how humans would rate dramatic situations.

4.1 Method

A total of 101 subjects were recruited online, via a microworking website[5]. According to their explicit declaration on the microworking website, they were all native English speakers and in terms of education they were at a college level or higher.

All participants had the same task: after a general explanation of the exercise, they had to read four Aesop's fables in English and answer the following question on a 10-point Likert scale: "How interesting did you find the plot of this story? Give it a score between 1 (not at all) and 10 (extremely)". The four fables were randomly selected from the abovementioned pool of 20 fables, for which a dramatic situation graph was already built. In addition, at the end of the experiment, we asked them the optional question "What do you think makes an interesting plot?", in order to get qualitative information regarding the participants' judgment and involvement.

This experiment enabled to collect a number of judgments regarding the first 20 Aesop's fables. Additionally, for each fable, the above formula (3) applied to the dramatic situation graphs produced a score. The set of weights and parameters of the formula was decided according to our own judgment, before the experiment: weights for the un/satisfying (u/s) relations were set to 0.8, weights for the belonging relation (b) were set to either 0.5 (target is "people" or "animal"), 1.5 (target is "friends"), or 1 for others; weights for weak success relations were set to 0; all other weights were set to 1; and Ω was set to 0.2. The resulting estimations are represented in Table 2.

4.2 Results

All 101 subjects completed the experiment. We put a minimum threshold to the duration of the experiment at 90 seconds, which discarded one subject, who finished the experiment in only 70 seconds. The 100 remaining subjects (57 males, 43 females; M=34 years, SD=9.7, range 18-59) completed the experiment in slightly less than 4 minutes in average (M=3'53''; SD=2'9''; Min=1'33''; Max=15'34'').

All subjects but one completed the optional open question. The 99 subjects who answered provided a serious explanation, except for one subject. This provides some hints that the subjects took time and effort to read and assess the four fables. Note also that most subjects came from the UK or USA. Each fable received a number of scores, depending on the random affectation of fable to the participants. If in average, each fable received 20 scores, it varied from 12 to 26. For each fable, the average score was calculated, providing 20 scores. These scores were compared with the 20

[5] http://www.prolific.ac

scores provided by the interest evaluated through the above formula (see Section 2.3). Raw results are displayed in Table 2. Then, the correlation between these two series of data was computed (Kendall's tau-b coefficient). No significant correlation was found (0.316, sig.=0.055).

Table 2. Model's estimation of interestingness for the first 20 Aesop's fables, compared to the human judgment. Fables between parentheses have been later withdrawn, see text.

Fable	1	2	(3)	4	5	6	7	(8)	(9)	10	11	12	13	14	(15)	16	(17)	18	19	(20)
Human	3.9	6.9	4.9	6.3	4.7	6.4	6.3	4.2	6.8	3.8	6.1	6.1	6.1	6.1	5.9	5	7.2	7	6.2	6.9
Model	0.2	1.4	1.1	2.1	1	1	2.9	1.2	1.6	0.8	1.3	0.8	0.6	1.6	2.5	0.2	1.8	5	1.7	0.2

When looking at specific stories, some showed a big contrast between the two scores. An extreme case for example was The Crow and the Pitcher: human subjects evaluated this story very high while our formula gives it a low score, because the situation is basic. At the same time, the observation of the answer to the open questions suggests that subjects did not clearly distinguished between the interest of the story in general and the interest of the plot/structure itself, the latter being what we are assessing. Therefore, we decided to restrict the domain of the experiment by considering only stories for which the dramatic structure is predominant, compared to the semantics of particular actions and events. Taking the above example of The Crow and the Pitcher, the story seems interesting because of the particular task (using pebbles) that the character undertakes to solve his problem (drink in the pitcher) that surprises the reader because it is creative. For that purpose, we asked one expert to read all 20 fables and to select which one were "semantic" and which ones were "structural", with a proper explanation of these two categories. In addition, the expert was asked not to put more than 6 stories into the semantic category, in order to avoid ending up with too little data to find any correlation. As a result, 6 stories were discarded (The Cat & the Mice, The Dog & the Saw, The Fox and the Crow, The Old Woman & the Doctor, Mercury and the Woodman, The Crow and the Pitcher). With the 14 remaining fables, the Kendall's tau-b coefficient was calculated and a significant correlation of 0.506 (sig.=.013) was found.

4.3 Interpretation

The absence of correlation between the human judgment of plot interestingness and our estimation based on dramatic situation shows that, in general, stories such as Aesop's fables generates the reader's interest via many different "components" that mask the role of the specific dimension of dramatic situations. However, when focusing on stories for which a plot's structure is predominant, our model of dramatic situation manages to predict the interest of the story's plot fairly well. We can therefore conclude that the concept of dramatic situation matches reader's perception of plot's interest, at least for a certain type of stories.

Beyond the above correlation results, the diversity of answers on a single story combined with the observation that people provided very different criteria for plot's interestingness, suggest that our protocol for evaluation could be improved. One di-

rection could be to manipulate the story itself, in order to neutralize some dimensions, rather than using ecologically valid stories.

5. Conclusion and Future Work

The temporal nature of narratives has driven most research in computational models of narrative (e.g. planning, problem solving, Petri nets). In this article, a different approach is taken, by considering situations as a "static picture" of the story at a significant moment of time. The proposed model allows to both represent situations visually and to evaluate their interest quantitatively. Assessing the relevance of such a model is a difficult task, then two approaches were taken. First, at the qualitative level, the model was applied to numerous existing stories in order to estimate to which extent the model covers a variety of narratives. In particular, the systematic analysis of 20 arbitrary Aesop's fables enabled us to concretely assess its abilities and limitations. Second, its estimations were compared to human judgments of plot interestingness. Results showed that the model correctly assess interestingness, but only for stories that are more driven by their structure than by their semantic content.

To use this model for story generation and interactive storytelling, a situation must be derived into a temporal succession of actions. This is not a challenge per se because it is a goal-based representation of events, similar in that respect to several existing IDS systems [2, 17, 20]. Two research directions deserve more attention: First, the story generation could be performed as a series of transitions from one dramatic situation to the other, each successive situation being automatically calculated from one single author-defined situation. Second, when rendering a story, the dramatic situation that a single action is part of, could provide the pragmatic context for surface realization in order to insert appropriate linguistic markers. This may improve current automated story generation systems in which successive events tend to be rendered flatly without logical connectors. On the visual side, dramatic situations could inform the staging of events, regarding the elements that are in conflict.

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