A Computational Model for Finding the Tilt in an Improvised Scene

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Abstract. Improvisational theatre (improv) is a real world example of an interactive narrative environment that has a strong focus on the collaborative construction of narrative as a joint activity. Although improv has been used as an inspiration for computational approaches to interactive narrative in the past, those approaches have generally relied on shallow understandings of how theatrical improvisation works in terms of the processes and knowledge involved. This paper presents a computational model for finding the tilt in a narrative environment with no pre-authored story structures, based on our own cognitively-based empirical studies of real world improvisers.

Keywords: autonomous improv agents, interactive narratives.

1 Introduction

The use of improv as a motivation for Interactive Narrative (IN) is not wholly novel [1],[2],[3]; however, these systems have relied on shallow understandings of common practices and / or teachings in improvisation. In the Digital Improv Project [4] we use the study of real world improvisers as a data source for the empirical analysis of the cognitive processes involved in story creation [5],[6].

Inspite their intrinsic unpredictability, improv presentations tend to fall into a three *beat* storytelling sequence: *establishment of a routine; breaking routine; resolve discrepancies* [7]. In the first beat, players are concerned about building a shared understanding about the story *platform* [8], by introducing the elements that define *where* a story is happening, *who* participates in it and *what* are they doing, e.g. a woman (who?), sitting alone in her apartment (where?), reading about a burglar that is entering a victim's house through the window (what?).

Although the creation of a routine within a balanced platform defines a story starting point it does not provide a direction for the action to follow. Actors must break the initial balance. The platform transition from a balanced to an unbalanced state that moves the story forward is called the *tilt* of the scene and is considered a core function of improvised scene work [7]. Continuing our example, a tilt could happen when the woman raises her eyes to find that the burglar from the book she is reading is actually in front of her. The improvisers now have to adapt to the

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fundamental change in the story world that exists in this new "tilted platform." We call an actor's response to this new platform *tilt riding* [6], a metaphor for actors remaining steady on new "tilted" ground.

Beat three occurs when the improvisers find the need to connect the story elements and present a conclusion to the audience. Going back to our example, after the improvisers are done exploring the tilted platform, the woman picks up a pen and starts to erase the burglar from the book. The burglar vanishes, the woman seats back in her chair and reading a new book. The story platform is therefore returned to a balanced state.

Tilt and tilt riding are real life examples of reasoning over story development without prior knowledge about the story structures, which can helps to define the implementation of more dynamic IN systems. The focus of this work is to contribute to the creation of computational models of tilt and tilt riding.

2 Data Analysis

The creation of computational models for these functions requires the identification of which story elements they use and how they use them. During a performance, improv players develop individual models of a story (*story frames*) that are used to create to create common understanding over story development *(dramatic frame)* in a process called *cooperative emergence* [8]. Cooperative emergence is a turn-by-turn process in which players propose new story elements (*offers*) and confirm or reject previous offers (*response*). Story elements included in an offer are kept in the individual *story frame* of each player and do not take parte in the dramatic frame. Only confirmed story elements may take part in the dramatic frame.

In order to identify the story elements used in a tilt, we defined a coding scheme for real improv performance analysis based on cooperative emergence (Table 1).

Table 1. Coding Scheme

Code	Description
P (Proposed)	When any variable is presented to a scene, it is labeled with P on the frame of the player who proposes it.
R (Received)	When an agent proposes a variable, the other agents interpret it and register the result of this interpretation with the value R.
A (Altered)	If the scene development leads into a state in which the value of an R variable is no longer consistent, the agent modifies its value into a possibly consistent value and marks it as A.
C (Confirmed)	When a variable is addressed by another than the one that originally proposed it, the variable is marked as C.

The story elements annotated are organized according to the platform elements of *who*? (characters name, occupation, habits, physical attributes, relations affinity and status) *what?* (activities subjects, targets, props) and *where?* (variables that define the scenario location). At each relevant story turn we are able to annotate which elements compose each individual story frame and also which of those elements take part in the shared dramatic frame. One should note that the assessment of each variable state in each story frame is only possible because our data includes not only videos of improv performances, but also videos of individual and collective post-performances interviews where the players comment their own performances [4].

Table 2. Strong tilt examples from two scenes with different actors

	Tilt Example (scene A)	Tilt Example (scene B)
Buildup	Two players (1 and 2) emphasize how 1 is saving the world reselling Fair Trade products. Player 3 enters as F.T. worker.	Three players (4, 5 and 6) Player 6 acts as “serious no fun guy” that teaches his friends how to behave in public places.
Tilt	Player 3 – Please feed me! Player 1 - <fails to explain himself>	Player 5 – <towards player 6> Does she (player 6’s wife) hit you?
Effect	Player 2 - <shocked at player 1>	Player 6 – I don’t want to talk about it guys… <avoids eye contact>
Info	Total length 3m20s; 3 actors; 65 actor turns; 2 weak tilts; 3 strong tilts; avg. number of variables/story frame 68	Total length 4m; 3 actors; 76 actor turns; 1 weak tilt; 1 strong tilt; avg. number of variables/story frame 76

Two scenes with the best tilt examples from our data were analyzed (Table 2). In both a group of three improvisers was asked to improvise a three-minute scene. In scene A no additional constraints were given, while in scene B the improvisers received an initial setup of “three college friend at the zoo”.

3 Results

In scene A, we found evidence of a tilt that occurred when two actors (D1 and D2) had different values for “Location” in their individual story frames. This divergence was a result of D2’s misinterpretation od D1’s initial activity.

Table 3. Players Frames at Turn 2. D2 received (R) D1’s activity as maintenance and proposes (P) Coffee Shop for location. D1 is forced to alter (A) his previous proposed value for location.

	D1 Frame	D2 Frame
Activity	D1 Mopping (A) (Breaking Leaves (P))	D1 Maintenance (R)
Location	Inside (A) (Outside(P))	Inside(P) Coffee Shop(P)
Props	Mop(A) (Rake(P))	

In both examples analyzed, relations and roles were clearly defined whenever a tilt occurred; furthermore there is evidence in both cases of shifts in the relations’ properties annotated. In example A the main shift was in player 2’s affinity towards player 1, and in example B there was a clear status shift for player 6. Also, in both cases we detected the introduction of new story elements that oppose properties that are strongly associated with the characters on scene, which will be explored in the next section.

3.1 Tilt Strategies Analysis

A tilt is a process that operates over a previously defined story platform, unbalancing it and providing story elements to explore in order to move the story forward. This is why, the creation of a tilt function depends of the platform implementation.

Platform Representation

Following our working definition, a platform is a collection of elements that establishes the characters (who?), activities (what?) and location (where?) of a scene. In our data analysis we observed that in some cases where? is not commonly established. This observation suggests that this element contributes to a platform definition but is not essential for the tilt process. We argue that location's contribution to story development is similar to props (objects that exist on a scene) contribution, which is to add more associations to the story elements, in order to feed the players process of adding elements to a scene. Based on this, we propose that the knowledge structure used by improv agent to represent a platform should include four elements: who?, what?, where?, and props.

Each specific platform is a unique combination of different instantiations of platform elements. Like in improv, there are no restrictions to the possible combinations of these elements in a platform. Nevertheless, there are some combinations of platform elements that are more likely to occur in the same platform (co-occur),.Two platform elements that are very likely to co-occur have a strong value associated to their relation, while platform elements that are very unlikely to co-occur have weak values associated to their relation. In order to express this particular aspect, we propose to include in each relation a Degree of Association (DoA), representing a strength of the association between two elements. We consider that the strength of the associations between platform elements is directional, e.g. coffee shop -> drink coffee might be a stronger association than drink coffee -> coffee shop (Fig.1).

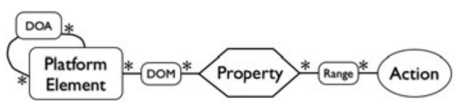

Fig. 1. Structure for Platform Elements Representation

The hierarchical structure of platform elements (Fig. 1) is an adaptation of the character prototype structure used in the Digital Improv Project's Party Quirks system [9], where each element is characterized by a set or properties, e.g. a stadium can be characterized by being crowded. The strength of the relationship between the elements and the attributes is represented by a DOM (i.e. the non-Boolean degree of membership of an element belonging in a given set). The main purpose for DOM in our case is to provide a value for the importance of a variable in the definition of an element. For each property there is a set of actions portraying it. The relationship between a property and each of the actions that portray it includes a range, which is a probabilistic distribution of how much an action portrays the corresponding property. This value should be used for providing more variability when selecting an action to portray a property. Relations between elements' properties include a value for consistency, which represents the strength of how much the semantic value of a property conflicts with another. The need for this representation is related with the recurrent improv technique of creating conflict and it will be detailed further ahead.

Tilt Strategy: Property Inconsistency

In a minor tilt from scene B player A endows himself with the prototype of a zoologist. Following our knowledge structure approach this means that the zoologist (who?) is associated to player A. Supposing that in the knowledge base a zoologist has the property of respecting animals with a high DOM associated, which can not be added to the platform, because it has not been addressed. Further on, player A endows himself the attribute of "not respecting animals", by saying "*animals are lesser than humans*,*"* Such property has a negative value for consistency with "respects animals", which is an attribute with a very strong DOM associated to the zoologist prototype enacted by player A. Now there is a tilt variable that breaks the normal "routine" of a zoologist, which can be explored. In this case a tilt agent using our knowledge structure would create a tilt by endowing a character with a property which is inconsistent with a "who?" element of the target character. The impact of this strategy should be related with the DOM between the character "who?" and the property that is placed under inconsistency. We could say that an agent performing this technique would follow two steps: 1- Select a property of an active *who?* element with a high DOM value that has not been addressed. 2 - Select an action that endows the character playing the *who?* with a property that is not consistent with the property addressed in the firs step.

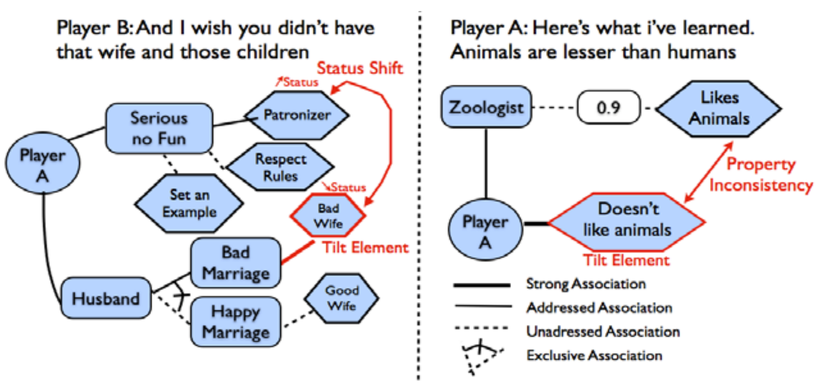

Fig. 2. Tilt Strategies

Tilt Strategy: Status Shift

This example occurs in scene B where player A is portraying a "serious no fun guy". We could consider "serious no fun guy" as a character prototype that has propertiy "patronizer" and also consider that portraying this property raises the status of the character. This should result in a story platform where player A is associated with "serious no fun" where, after portraying "patronizer" player A has a high status.

When player B wishes player A did not have that wife, he adds "friends don't like her" attribute to A's wife. This new attribute is strongly associated to a "Bad Wife" prototype, i.e. player B is establishing a connection between player A's "husband" attribute and a "Bad Wife." Furthermore, if we consider that the actions that portray "friends don't like her" lower the status of the "husband" associated with "bad wife", player A status drops provoking a status shift from a high value to a low value.

Based on this we consider that a tilt agent using a status shift technique could follow these steps: 1 - Detect if a particular character is gaining relatively more status than the others. Define that character as a target. 2 - Select an action that endows the targeted character with a property that affects status negatively.

4 Conclusions

In this paper we present a proposal for the creation of autonomous actors by relying on an empirical study of improv, where tilt is the nuclear function that moves the cooperative story creation process.

Although preliminary, the results presented in this paper contribute to the formalization of tilt and tilt riding, by eliciting story elements that can be used in a tilt process as well as strategies that can be used to tilt a platform.

In the future we expect to collect more data and contribute to the development of computational agents that reason about story development without using pre-authored story knowledge, the same way improv actors do. The creation of such agents would contribute to an extreme reduction of the creative constraints that IN systems present their users, specially the limititations imposed by pre-authored content.

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