

# Emergent Story Generation: Lessons from Improvisational Theater

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## Abstract

An emergent approach to story generation by computer is characterized by a lack of predetermined plot and a focus on character interaction forming the material for stories. A potential problem is that no interesting story emerges. However, improvisational theater shows that – at least for human actors – a predetermined plot is not necessary for creating a compelling story. There are some principles that make a successful piece of improvisational theater more than a random interaction, and these principles may inform the type of computational processes that an emergent narrative architecture draws from. We therefore discuss some of these principles, and show how these are explicitly or implicitly used in story generation and interactive storytelling research. Finally we draw lessons from these principles and ask attention for two techniques that have been little investigated: believably incorporating directives, and late commitment.

## Introduction

Attempts to develop computer models that can generate stories have prompted researchers to investigate the relationship between narrative and the human condition. A lesson learned from one of the first story generation systems, TALE-SPIN (Meehan 1981), is that generating a story is more than simulating life, as a mimetic view on stories might suggest. Then again, life-like behavior of characters is essential for an audience to suspend their disbelief. The ability to generate empathic and believable character behavior situated within a story context allows the exploration of generative, dynamic models of story construction, opening up possibilities for the design of interactive storytelling applications. Simulating character behavior will not lead to tightly orchestrated plots as action movies often portray. However, the emergent narrative practice has made some good progress in generating engaging drama *without* careful orchestration of plot, as the interactive storytelling application FearNot! demonstrates (Aylett *et al.* 2005).

As a real life example of emergent narrative, improvisational theater shows the possibility of creating unplanned but compelling stories. Such stories *must* be emergent; no single player can anticipate the course of events from a global perspective, since cooperation from other players cannot be

ensured. Indeed, performance decreases when players think too far ahead about a particular story plan, only to find it disrupted by the input of other players (Johnstone 1979).

Emergent narrative research can draw some valuable lessons from processes, structures and techniques that bring about a compelling piece of improvised theater. An actor must not only react believably and in an emotionally engaging way, but must also proactively create story opportunities. In this paper we take some small steps into investigating the relationship between character behavior and story generation from the point of view of improvisational theater. We will discuss four main principles used in improvisational theater (stemming from both literature and personal experience) that facilitate a co-construction of stories, and show how they find their counterpart in current research on story generation and interactive storytelling. This discussion identifies two promising techniques that have been little investigated: believable incorporation of directives, and making late commitments on the state of the story world.

## Principles in Improvisational Theater

In improvisational theater, actors attempt to improvise interesting scenes using suggestions from the audience. Improvised scenes are emergent, yet every actor needs to keep an eye on the scene as a whole. When actors lose sight of the scene's bigger picture, the scene will deteriorate into trivial interactions. However, actors must also act believably, or risk breaking the audience's suspension of disbelief. To facilitate this dual task, actors have developed many principles to keep in mind while improvising a scene (Johnstone 1999). Some of these can be related to story generation techniques already under investigation. We will look at four of those principles that we deem most relevant to emergent story generation. Other principles (e.g., use of status, reincorporation of previously generated elements) are discussed in (Hayes-Roth, van Gent, & Huber 1997).

Improvisation actors are taught early on about the importance of emotional impact. Events in the story should affect the character they are playing. If this impact is ignored, the scene becomes boring extremely quickly. Consider actor A opening a scene with:

Player A: "Uhm... I'm afraid I just ran over your dog, sir."

The audience now expects player B to be devastated by the loss of his dog, and anticipates an interesting emotional situation between A and B. If B replies with:

“That’s all right, I didn’t like the dog anyway.”

The emotional impact is ignored, and the audience feels ‘cheated’. A simple principle saying that every event must have emotional impact on all characters quickly leads to interesting (if simple) stories:

Player A: “Uhm... I’m afraid I just ran over your dog, sir.”

Player B (Sadness): “Oh no, James! Not my dog! I can’t live without my dog!”

Player A (Fear): “I-I’m really v-very sorry sir... please don’t hit me again!”

Player B (Anger): “Don’t hit you? Don’t hit you? Think about what you did to poor mister Paws!”

This kind of dialog is often performed as an exercise for improvisational actors, and almost always results in interesting characters and entertaining stories. This is an important principle in improvisational theater: *focus on emotional impact*.

The emotional impact in the sample dialog can also be emphasized by showing the importance of the dog to player B. For example, before the dialog occurs, player B could have taken the time to carefully fill the dog’s feeding bowl or look lovingly at a portrait of his dog. This shows the audience that player B has a clear ideal: caring for his dog. Characters with ideals lend themselves very well to storytelling, since disturbing their ideals will almost always prompt an interesting action in response. This is another important principle in improvisational theater: *have an ideal*.

An often used structure in free improvisation is to have one player enter the stage and express his ideal, after which a second actor enters and either strengthens the ideal (“Your dog has been elected poodle-of-the-month!”) or conflicts with it (“I’m afraid I just ran over your dog, sir”). Above all, the scene should revolve around the ideal.

Focusing on emotional impact and having ideals are principles that help to generate interesting scenes. The following two principles describe techniques that are meant to guide the players into situations where they can achieve emotional impact or interesting ideals.

For example, think about what would have happened if player B would have replied:

“You’re wrong, I don’t have a dog!”

This would have stopped the scene dead, because suddenly player A and B have nothing to talk about anymore. What happened? Hidden in player A’s opening sentence is an offer to player B: “Let’s pretend that you have a dog, and I ran over it.” To create a fluent emergent scene, it is important for all actors to accept offers like these. When B states he does not have a dog, he rejects A’s offer (*blocking*), and the actors are left without any agreement on what is going on. A principle used by improvisational actors to keep the scene moving forward is: *accept all offers*.

There are several kinds of offers. First, there is the offer that allows another player to respond emotionally. In the example, player A running over the dog allows player B to have an intense emotional response. Then there is the offer that prompts another player to do something (“Let’s go and bury the dog”). Finally there is the possibility of an offer that adds new information which redefines another player’s view of either himself or the story world (“Don’t hit me *again*”). This is a challenging offer because it requires the player to believably accommodate such information.

Improvisation actors have no set environment when they start a scene. Instead, they make up their environment as they go along, using offers such as the one above. Just from the short sample dialog, actors know that player A is player B’s servant, player B is called James, player B has beaten player A before, player B had a dog, which was called mister Paws, and was run over by player A.

The importance of *framing the story world* is the last principle we will consider. Quickly framing the story world by defining what the world contains through offers avoids confusion between the actors. A clear shared view of the world allows players to introduce ideals and emotional responses much easier.

## Lessons for Emergent Story Generation

Principles like the ones in the previous section might inform the design of story generators that rely on emergence, rather than plot construction, to generate appealing drama. We will discuss how these principles interrelate and how they are related to research on story generation and interactive storytelling. First we will discuss the driving force of engaging drama in the form of emotion, afforded by the ideals of the characters. Then, we will argue that accepting offers and framing of the story world are techniques that highlight issues of semi-autonomy and late commitment that little story generation and interactive storytelling research has focused on.

### Ideals and Emotion

The importance of emotional reactions as a major ingredient for story creation was extensively investigated in the Affective Reasoner project (Elliott 1995). Elliott offers a view on “storiness” that identifies the characters’ emotions, and in particular emotional *response* to situations, as a necessary and sufficient element for the creation of stories. This work forms a foundation for the emergent narrative practice, in which an affective architecture is used to generate appraisal-based emergent drama (Aylett *et al.* 2005; Theune *et al.* 2004), using emotional impact as substitute for dramatic value. Louchart & Aylett (2007) describe work moving on from there towards more proactive character agents, as argued for in this paper. Their character agents assess the emotional impact of actions on other characters in order to select actions that heighten dramatic impact.

Ideals allow a character to have emotional reactions to new information. An ideal might be best seen as a character-defining goal or drive. Having a clear ideal allows for the opportunity of conflicts to occur, a main principle underlying

ing drama (Szilas 1999). Goals form an important structural feature of stories. Cavazza, Charles, & Mead (2002) use superordinated goal structures to author a variable plot through character behavior, since the pursuit of goals and subgoals create episodes and sub-episodes. For story generation, these goals are often predetermined – the exception being the work of Riedl (2004), where character goals are formed by the effects of actions in a story plan. Such goal formation could afford the incorporation of directives as discussed in the next section.

### Accepting Offers

The most challenging type of offer is the one that adds new information which redefines a character's view of himself or the story world, which requires the player to believably accommodate such information. The offer "Please don't hit me!" has a hidden directive in it: "Hit me!" Accepting this directive might mean becoming someone who is violently angry, and inventing a reason for it.

For computer characters, the ability to believably incorporate directives and new information about the world is a little investigated issue. Blumberg & Gaylean (1997) discuss the issue of exerting prescriptive and proscriptive control over animated autonomous agents, which can be classified into four different levels: (1) the motor skill level (move your arm), (2) the behavioral level (pick up the apple), (3) the motivational level (you want to eat) and (4) the environmental level (there is an apple on the table). The first three of these types of directives pose a potential believability problem, because behavior needs to appear personally motivated. Directives on the behavioral level can be made believable by adopting a goal that motivates the directive. Directives on the motivational level require the ability to make a believable transition from goals already adopted to a prescribed goal. Assanie (2002) has identified the different types of conflicts that can occur between goals and within goals of semi-autonomous character agents, and has especially focused on coherent transitions between goals. Riedl & Stern (2006) have investigated how such agents can believably abandon their goals in favor of prescribed goals, using hand-authored transition behaviors.

Improvisational actors must in principle accept all offers; one reason is that the offers are also visible to the audience. Computer characters can communicate and negotiate about such offers out of character, much like children do (Sawyer 2002), but hidden from the audience. Out of character offers can be very explicit and because there is no requirement of pursuing a particular plot, a character receiving the offers can decide for itself if it can believably accommodate them.

### Framing the Story World

In current emergent narrative approaches, the course of events is determined implicitly by the initial state of the story world and its characters. In order to gain some authorial control over the unfolding of the story, the story world is cut into more or less independent episodic frames with predefined start states, as a scalable basis for emergent (inter)action (Klesen, Szatkowski, & Lehmann 2001; Theune *et al.* 2004; Aylett *et al.* 2006). These episodic frames define the who,

what and where out of which the scene evolves. Hayes-Roth, van Gent, & Huber (1997), use *directed improvisation* to frame the characters' behavior.

Authoring the frames in which characters will act requires predicting (or testing) how the story might develop so that subsequent frames fit in with the story development (unless the frames are in a sense repetitive and can be arbitrarily ordered). Ideally, these frames can be constructed as part of the story generation process, so that the system can determine what frames are needed, based on the emerging story development. In order to make this possible, the relationship between a start state and the emerging dramatic sequence should be computationally accessible.

So what does this relationship consist of? In improvisational theater, an improvised story starts without such framing<sup>1</sup> and takes place in one of many possible worlds which is gradually constrained by information conveyed to the audience. This conveyed information is interpreted by the audience and complemented with meaning-giving connections, which Oatley (1994) suggests are the result of the audience 'thinking for the characters'. It is not problematic for the audience when new information breaks such connections (as long as it does not contradict explicitly given information), indeed, this leads to emotional arousal and puts the previous events in a new perspective. This opens up possibilities for improvisational actors to participate in the retroactive construction of the frame according to the needs of the scene.

Here we face an important issue that has permeated this section and the previous ones, which is one of *late commitment*. For an emergent narrative architecture, we could adopt a view in which much of the initial state of the story world or one of its episodes is a *result* of its use in story world events. Riedl & Young (2005) investigate this possibility with their Initial State Revision (ISR) planning algorithm. The ISR algorithm is a partial order planning algorithm in which the start state – representing the initial story world state – is defined as a space of possible worlds in the form of mutual exclusion (mutex) sets. A mutex set is a set of sentences with undetermined truth value of which only one can be made true. A story planning algorithm can then choose to unify operator preconditions with one of these sentences, effectively committing to truths in these possible worlds to enable a particular story plan. We can adopt a similar late commitment view for emotions and ideals, since there are many ways to emotionally respond to situations, and many reasons to do so. In this sense, late commitment may afford the incorporation of directives.

The freedom to introduce aspects of the story world in a late commitment fashion, is constrained by the way in which the story is presented, in terms of medium and genre expectations. In a visual medium one needs to make sure that the displayed virtual world does not overly constrain the possibilities to define this world differently when necessary. For example, in a realistic 3D environment, it might appear strange when a broom pops up out of nowhere the moment a cleaning lady wants to sweep the living room floor. A

<sup>1</sup>Input from the audience is often asked (e.g., a location or profession), but a scene can also develop without such input.

cartoon-like visual medium might have fewer problems with this. A textual medium offers the most flexibility; one can always rely on the potential presence of the broom unless its presence was specifically denied. In a graphical medium, displaying the living room without a broom can remove this potential. This is one of the reasons why improvisational theater makes little use of props and uses mime instead.

## Conclusion

This work shares interest with the work of Louchart & Aylett (2004), which forms an attempt to articulate a model for the design of an emergent narrative system. It adds to this attempt with a more in-depth discussion of one specific form of emergent story, namely that of improvisational theater. In this light we have identified some important principles that make an improvised co-construction of an interesting story possible, and discussed how they are reflected in story generation and interactive storytelling research. It is our belief that future research into the use of emergence to create a story-like experience can benefit from explicitly considering such principles. One useful technique for computer characters in emergent narrative is the ability to believably adopt directives – not so much to be able to follow a directed plot, but to be able to respond believably to unexpected offers. A second important technique that facilitates the first is to allow late commitment decisions about the details of the story world and character state. When there is a co-emergence of events and their cause, a lot of flexibility is added to the emergent development of stories. Future work will focus on providing an architecture and implementation of a model that incorporates these ideas. We do not aim for the construction of computer characters with the broadness and flexibility of human improvisational actors, but rather at understanding the interrelationships of the mentioned ideas that make the authoring of a flexible story domain possible.

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