

A Neo-Aristotelian Theory of Interactive Drama

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Introduction

Interactive drama has been discussed for a number of years as a new form of AI-based interactive entertainment (Laurel 1986, Bates 1992). While there has been substantial technical progress in building believable agents (Bates, Loyall and Reilly 1992, Blumberg 1996, Hayes-Roth, van Gent and Huber 1996), and some technical progress in interactive plot (Weyhrauch 1997), no work has yet been completed which combines plot and character into a full-fledged dramatic experience. The game industry has been producing plot-based interactive experiences (adventure games) since the beginning of the industry, but only a few of them (such as *The Last Express*) begin to approach the status of interactive drama. Part of the difficulty in achieving true interactive drama is due to the lack of a theoretical framework guiding the exploration of the technological and design issues surrounding interactive drama. This paper proposes a theory of interactive drama based on Aristotle's dramatic theory (Aristotle 330 BC) but modified to address the interactivity added by player agency. It is hoped that this theory will both provide design guidance for interactive dramatic experiences (answering the question "What should I build?") and technical direction for the AI work necessary to build the system (answering the question "How should I build it?").

This Neo-Aristotelian theory borrows from Laurel's treatment of Aristotle in an interactive context (Laurel 1986, Laurel 1991), but extends it by situating user agency within the model; the new model provides specific design guidelines for maximizing user agency. First I will briefly describe what I mean by interactive drama, and how drama differs from narrative. Then I will briefly describe Murray's (Murray 1998) three categories for analyzing interactive story experiences. For our purposes, agency will be the most important of these three categories. Next I will describe Aristotle's theory of drama and the integration of user agency into this theory. Finally I will draw some design and technology guidelines from the new theory.

Defining Interactive Drama

In interactive drama, the player assumes the role of a first person character in a dramatic story. The player does not

sit above the story, watching it as in a simulation, but is immersed *in* the story.

Following Laurel, dramatic stories are distinguished from narrative stories by the following properties:

- Enactment vs. Description
- Intensification vs. Extensification
- Unity of Action vs. Episodic Structure

Enactment refers to action. Dramas utilize action rather than description to tell a story. Intensification is achieved by arranging incidents so as to intensify emotion and condense time. On the other hand, narrative forms often "explode" incidents by offering many interpretations of the same incident, examining the incident from multiple perspectives, and expanding time. Unity of action refers to the arrangement of incidents such that they are all causally related to a central action. One central theme organizes all the incidents that occur in the story. Narratives tend to employ episodic structure, in which the story consists of a collection of causally unrelated incidents.

Though the model developed in this paper will provide design guidance on how to generate a sense of user agency in any interactive experience, it is primarily designed to illuminate this conception of interactive drama.

Murray's Aesthetic Categories

Murray proposes three aesthetic categories for the analysis of interactive story experiences: immersion, agency, and transformation.

Immersion is the feeling of being present in another place and engaged in the action therein. Immersion is related to Colridge's "willing suspension of disbelief" - when a participant is immersed in an experience, they are willing to accept the internal logic of the experience, even though this logic deviates from the logic of the real world. A species of immersion is telepresence, the feeling of being physically present (from a first person point of view) in a remote environment.

Agency is the feeling of empowerment that comes from being able to take actions in the world whose effects relate to the player's intention. This is not mere interface activity. If there are many buttons and knobs for the player to twiddle, but all this twiddling has little effect on the experience, there is no agency. Furthermore, the effect must relate to the player intention. If, in manipulating the

interface elements, the player does have an effect on the world, but they are not the effects that the player intended (perhaps the player was randomly trying things because they didn't know what to do, or perhaps the player thought that an action would have one effect, but it instead had another), then there is no agency.

Transformation is the most problematic of Murray's three categories. Transformation has at least three distinct meanings.

- Transformation as masquerade. The game experience allows the player to transform themselves into someone else for the duration of the experience.
 - Transformation as variety. The game experience offers a multitude of variations on a theme. The player is able to exhaustively explore these variations and thus gain an understanding of the theme.
 - Personal transformation. The game experience takes the player on a journey of personal transformation.
- Transformation as masquerade and variety can be seen as means to effect personal transformation.

Integrating Agency into Aristotle

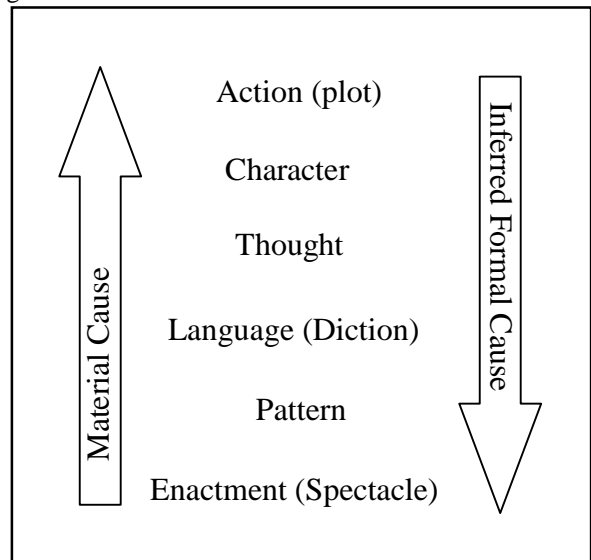
Murray's categories are phenomenological categories of the interactive story experience, that is, categories describing what it *feels* like to participate in an interactive story. Aristotle's categories (described below) are structural categories for the analysis of drama, that is, categories describing what *parts* a dramatic story is made out of. The trick in developing a theoretical framework for interactive drama is integrating the phenomenological (that is, what it feels like) aspect of first person experiences with the structural aspect of carefully crafted stories. In attempting this integration, I will first discuss the primacy of the category of agency. Second, I will briefly present an interpretation of the Aristotelian categories in terms of material and formal cause. Finally, agency will be integrated into this model.

Primacy of agency

From a dramatic perspective, agency is the most fundamental of Murray's three categories. Immersion, in the form of engagement, is already implied in the Aristotelian model. Engagement is necessary in order for an audience to experience catharsis. In addition, agency can be seen as a precondition for immersion; when a player's sense of agency is diminished, immersion is diminished. Transformation, in the form of change in the protagonist, also already exists in the Aristotelian model. Murray's discussion of transformation as variety, particularly in the form of the kaleidoscopic narrative that refuses closure, is contrary to the Aristotelian ideals of unity and intensification. To the extent that we want a model of interactive *drama*, as opposed to interactive narrative, much of Murray's discussion of transformation falls outside the scope of such a model. For these reasons, agency will be the category integrated with Aristotle.

Aristotelian Drama

Following Laurel (Laurel 1991), Aristotle's theory of drama is represented in the diagram below. Aristotle analyzed plays in terms of six hierarchical categories, corresponding to different "parts" of a play. These categories are related via material cause and formal cause.



The material cause of something is the material out of which the thing is created. For example, the material cause of a building is the building materials of which it is constructed. The formal cause of something is the abstract plan, goal or ideal towards which something is heading. For example, the formal cause of a building is the architectural blueprints.

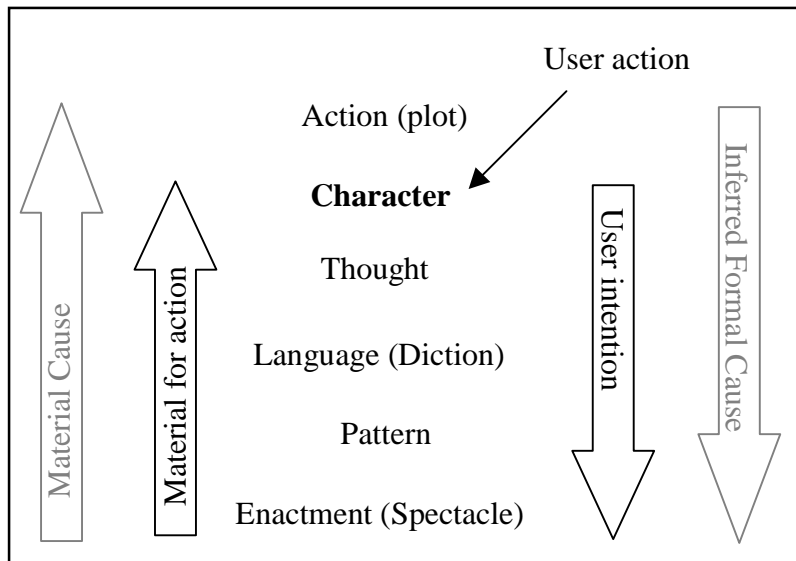
In drama, the formal cause is the authorial view of the play. The author has constructed a plot that attempts to explicate some theme. The characters required in the play are determined by the plot; the plot is the formal cause of the characters. The character's thought processes are determined by the kind of character they are. The language spoken by the characters is determined by their thought. The patterns (song) present in the play are determined, to a large extent, by the character's language (more generally, their actions). The spectacle, the sensory display presented to the audience, is determined by the patterns enacted by the characters.

In drama, the material cause is the audience view of the play. The audience experiences a spectacle, a sensory display. In this display, the audience detects patterns. These patterns are understood as character actions (including language). Based on the character's actions and spoken utterances, the audience infers the character's thought processes. Based on this understanding of the character's thought processes, the audience develops an understanding of the characters, the character's traits and propensities. Based on all this information, the audience understands the plot structure and the theme. In a successful play, the audience is then able to recapitulate the chain of formal causation. When the plot is understood, there should be an "ah-ha" experience in which the

audience is now able to understand how the characters relate to the plot (and why they must be the characters they are), why those type of characters think they way do, why they took the actions they did and said what they did, how their speech and actions created patterns of activity, and how those patterns of activity resulted in the spectacle that the audience saw. By a process of interpretation, the audience works up the chain of material cause in order to recapitulate the chain of formal cause.

Interactive Drama

Adding interaction to the Aristotelian model can be considered the addition of two new causal chains at the level of character.



In this diagram, the gray arrows are the traditional chains of material and formal causation. The player has been added to the model as a character who can choose his or her own actions. This has the consequence of introducing two new causal chains. The player's intentions become a new source of formal causation. By taking action in the experience, the player's intentions become the formal cause of activity happening at the levels from language down to spectacle. But this ability to take action is not completely free; it is constrained from below by material resources and from above by authorial formal causation from the level of plot.

Material resources. The elements present below the level of character provide the player with the material resources (material cause) for taking action. The only actions available are the actions supported by the material resources present in the game. The notion of affordance (Norman 1988) from interface design is useful here. In interface design, affordances are the opportunities for action made available by an object or interface. But affordance is even stronger than implied by the phrase "made available"; in order for an interface to be said to afford a certain action, the interface must in some sense "cry out" for the action to be taken. There should be a

naturalness to the afforded action that makes it the obvious thing to do. For example, the handle on a teapot affords picking up the teapot with your hand. The handle cries out to be grasped. In a similar manner, the material resources in an interactive drama afford action. Thus these resources not only limit what actions can be taken (the negative form of constraint) but cry out to make certain actions obvious (the positive form of constraint). Several examples of the material affordances in interactive drama are provided below.

The characters in an interactive drama should be rich enough that the player can infer a consistent model of the characters' thought. If the characters' thought can be understood (e.g. goals, motivations, desires), then this thought becomes a material resource for player action. By reasoning about the other characters' thoughts, the player can take actions to influence these characters, either to change their thoughts, or actively help or hinder them in their goals and plans.

The dialog (language) spoken by the characters and the opportunities for the player to engage in dialog are another material resource for action. Dialog is a powerful means for characters to express their thoughts, thus instrumental for helping the player to infer a model of the characters' thoughts. Conversely, dialog is a powerful means to influence character behavior. If the game makes dialog available to the player (and most contemporary games do not), this becomes a powerful resource for expressing player intention.

The objects available in the game (I place the presence of interactive objects somewhere between spectacle and pattern) are yet another resource for player action.

Finally, the mechanics of interaction (spectacle) provide the low-level resources for player actions. The mechanics provide the interface conventions for taking action.

Formal (plot) constraints. In addition to the material affordances (constraints) from below, the player experiences formal constraints from above. Of course, these constraints are not directly perceived by the player, but, just as in non-interactive drama, are understood by recapitulating the author's chain of formal causation by making inferences along the chain of material causation. In non-interactive drama, understanding the formal chain of causation allows the audience to appreciate how all the action of the play stems from the dramatic necessity of the plot and theme. In interactive drama, the understanding of the formal causation from the level of plot to character additionally helps the player to have an understanding of what to do, that is, why the character they are playing would take action *at all*. Just as the material constraints can be considered as affording action from the levels of spectacle through thought, the formal constraints afford *motivation* from the level of plot. This motivation is conveyed as dramatic probability. By understanding what

actions are dramatically probable, the player understands what actions are worth considering.

Agency. We are now ready to propose a prescriptive, structural model for agency. A *player will experience agency when there is a balance between the material and formal constraints*. When the actions motivated by the formal constraints (affordances) via dramatic probability in the plot are commensurate with the material constraints (affordances) made available from the levels of spectacle, pattern, language and thought, then the player will experience agency. An imbalance results in a decrease in agency. This will be made clearer by considering several examples.

Many puzzle-based adventures suffer from the imbalance of providing more material affordances than formal affordances. This results in the feeling of having many things to do (places to go, objects to fiddle with) without having any sense of why any one action would be preferable to another. For example, *Zork Grand Inquisitor* offers a rich world to navigate and many objects to collect and manipulate. Yet, since there is no unity of action, there is no way to relate current actions to the eventual goal of defeating the Grand Inquisitor. This leaves the player in the position of randomly wandering about trying strange juxtapositions of objects. This detracts from the sense of agency - though the player can take action, this action is often not tied to a high-level player intention. Notice that adding more material opportunities for action would not help the matter. The problem is not a lack of options of things to do, the problem is having insufficient formal constraint to decide between choices.

Quake (and its ilk) induce agency by providing a nice balance between material and formal constraints. The proto-plot establishes the following formal constraints (dramatic probabilities):

1. Everything that moves will try to kill you
2. You should try to kill everything
3. You should try to move through as many levels as possible.

From these three principles, all the rest of the action follows. The material affordances perfectly balance these formal affordances. The player can run swiftly and smoothly through the space. The player can pick up a wide array of lethal weapons. The player can fire these weapons at monsters and produce satisfying, gory deaths. The monsters' behavior is completely consistent with the "kill or be killed" ethos. Everything that one would want to try and do given the formal constraints is doable. There are no extraneous actions available (for example, being able to strike up a conversation with a monster) that are not dictated by the formal constraints.

An interesting thought experiment is to imagine increasing the richness of the formal constraints of a first-person shooter without increasing the richness of the material constraints. This would be the equivalent of trying to add a plot to a first-person shooter. My understanding is that *Half-life* attempts to do this. Not having played *Half-life*, I will nevertheless make the critique that would be

implied by my model. By adding a plot without increasing the opportunities for action, the sense of player agency would decrease. As the player fights through the levels, the plot would be slowly unveiled (through cut-scenes or canned dialog). As the plot is revealed, this would create additional dramatic probabilities. But the player would not be able to act on these probabilities. The only actions afforded by the material constraints are to kill and kill again. Other actions suggested by the plot (ask a character for more information, take an alien substance to the lab and test it) would be unavailable. The plot would be like a treat - after killing a certain number of monsters, you get dolled out the next piece of plot. This imbalance would decrease the agency experienced by the player of the game.

In order to invoke a sense of agency, the game must strike a balance between the material and formal constraints. A game that "works," that is, that successfully invokes a sense of agency, inhabits a "sweet spot" in design space. Trying to add additional formal constraints (more plot) or additional material constraints (more actions) to a balanced game are likely to move it out of the sweet spot.

Relationship to Immersion and Transformation

Agency was taken as the fundamental Murray category to integrate with Aristotle. In this section, I examine what the new, integrated model has to say about immersion and transformation.

Immersion. Murray suggests three ways of inducing immersion by structuring participation with a mask (an avatar), structuring participation as a visit, and making the interaction conventions (the interface mechanics) seamless. These three mechanisms can be viewed in turn as a way to provide material and formal constraints, as a design suggestion for balancing the constraints, or as a design suggestion for providing effective material constraints at the level of spectacle. Agency is a necessary condition for immersion.

An avatar can provide both material and formal constraints on a player's actions. The avatar can provide character exposition through such traits as physical mannerisms and speech patterns. This character exposition helps the player to recapitulate the formal, plot constraints. Through both input and output filtering (e.g. the characters in *Everquest*, Mateas 1997), the avatar can provide material constraints (affordances) for action.

A visit is one metaphor for balancing material and formal constraints when the material opportunities for action are limited. From the formal side, the conventions of a visit tell the player that they won't be able to do much. Visits are about just looking around, possibly being guided through a space. Given the limited expectations for action communicated by the formal constraints, the game designer can get away with (and in fact, must only) provide limited material means for action.

The mechanics provide the material resources for action at the level of spectacle (the interface can be considered part of the spectacle). Providing a clean, transparent

interface insures that agency (and thus immersion) will not be disrupted.

Transformation. Most of Murray's discussion of transformation examines transformation as variety, particularly in the form of kaleidoscopic narratives which can be reentered multiple times so as to experience different aspects of the story. Agency, however, requires that a plot structure be present to provide formal constraints. An open-ended story without a clear point of view may disrupt the plot structure too much, thus disrupting agency. One way to support the exhaustive exploration of an experience would be to have a story in which each run-through has a clean, unitary plot structure, but which allows the player to experience the game multiple times with different, unitary plot structures. In such a game, small changes in the player's choices early on could result in experiencing a different unfolding plot. The trick would be to design such a game so that, once the end occurs, the entire experience has dramatic necessity. That is, one does not want explicit branch points. The story should have the dramatic probabilities smoothly narrowing to a necessary end. Early choices may result in different necessary ends - later choices can have less effect on changing the whole story, since the set of dramatically probable events has already significantly narrowed.

What's this got to do with AI?

The neo-Aristotelian model of interactive drama provides guidance for AI research aimed at enabling this medium. The model both indicates why AI techniques will be necessary (probably accepted as automatically true by the attendees of a AAAI symposium!), and specific guidance on the direction AI research in this area should take.

The primary heuristic offered by the model is that to maintain a sense of player agency in an interactive experience, material and formal constraints must be balanced. As the sophistication of the theme and plot of an experience increases, maintaining this balance will require characters whose motivations and desires are inferable from their actions. In addition, these characters will have to respond to the player's actions, including dialog spoken by the player. Building interactive characters with these capabilities will require AI techniques. An interactive drama system must communicate dramatic probability (likely activity given the plot) while smoothly narrowing the space of dramatic probability over time. A system capable of such drama management will also require AI techniques.

Besides indicating that AI will be a necessary ingredient in interactive drama, the model begins to provide specific directions for research. The function of interactive characters is primarily to communicate material and formal constraints. That is, the player should be able to understand why characters take the actions they do, and how these actions relate to the plot. Sengers (Sengers 1998A) provides a nice analysis of how this focus on agents as communication vs. agents as autonomous, independent

entities, results in changes in agent architectures. When the focus changes from "doing the right thing" (action selection) to "doing the thing right" (action expression), the technical research agenda changes (Sengers 1998B). The neo-Aristotelian model indicates that action expression is exactly what is needed. The drama manager as well must focus on communicating plot level constraints (dramatic probability) through coordinating story action. Most work in deliberation (e.g. planning and game-playing) focuses on making sure a goal is achieved in the face of hostile interference. A focus on communicating with the world as opposed to controlling the world may change the technical research agenda of such deliberative systems. Weyhrauch (Weyhrauch 1997) built a system that attempts to influence a player in order to make a good story happen. Yet even in this work, the focus is on *control* versus *communication*.

Conclusion

In this paper, Murray's concept of agency was integrated into the Aristotelian structural model to yield a proposed Aristotelian interactive poetics. This model illuminates the general conditions under which a user will experience agency in any interactive entertainment experience and provides design and technology guidance for the particular case of building interactive drama systems.

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