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# Improving Computer Game Narrative Using Polti Ratios

by Richard Hall, Kirsty Baird

**Abstract**

Computer games are criticised sometimes as lacking in narrative. In this paper we introduce a model of stories (Polti ratios) into which computer games (meeting particular criteria) can be abstracted. Using this model, we designed a process to analyse and explore computer game narrative. We give a highly detailed example of applying this process to a computer game treatment currently under production called *Street Survivor*.

**1. Introduction**

The question of whether computer games *should* be analysed using stories has been intensely debated (Frasca, 2003). This discussion aside, we believe that stories *will* be used for such analysis due partly to their universality. Stories have acted as the primary structure of communication for millennia in many cultures (Chambers, 1984), and they easily transcend cultural boundaries (Colby, Kennedy and Milanesi, 1991). Explanations come from several academic fields. Historians claim that narrative fashions human experience into structures of meaning that are generally human rather than culture-specific (White, 1991). Philosophers have argued that stories have the highest degree of structure in the world (Bakhtin, 1981 Holquist, 1990).

In addition, psychologists have demonstrated that stories play an important role in cognition and in modelling the world (Graesser, 1995 Zwaan and Magliano, 1995). Studies have shown the superiority of stories over other information forms in various ways. Narrative texts took half the reading time of expository texts (Graesser, 1995). The recall accuracy of words organised in a story is twice as good as randomly organised words (Bower and Clark, 1969) and the same with expository text (Haberlandt and Graesser, 1985). Also, jurors structure volumes of unordered and conflicting evidence as stories (Pennington and Hastie, 1991).

However, narrative is not the only tool for computer game analysis in town there are other crucial aspects to successful computer games such as game playability (Fabricatore et. al., 2002). Nonetheless, within the scope of this paper we are going to naively assume that these aspects are independent for example, *good* narrative does not logically imply *bad* game playability. Integrated models must necessarily explore and define the conditions for which such relations hold in order to properly subsume these aspects.

So we focus on stories, but there are hundreds of ways in which stories can be modelled (see the *Dictionary of Narratology* Prince, 1987). We wanted the model to be described by quantitative measures so that any story, however complex, could be boiled down into single numbers. Such reduction can be justifiably accused of a corresponding loss of nutrition, for instance, how can *good* narrative equal a *high* number? Accordingly, these numbers alone will not necessarily show that one story is "better" than another, because there are so many dimensions to stories and our measures will ignore many of these. But whatever their drawbacks, and however they are constructed, scores are undeniably easy to grasp, discuss and compare.

Since scores are easy to compare, we could possibly exhaustively analyse and compare current popular games, such as *The Sims* or *Grand Theft Auto*,

or go beyond the computer game context into other media such as film or literature. But the purpose of this paper is to go beyond evaluation our project is to invent a simple and practical way to improve the narrative in a computer game design treatment. There are certainly aspects of evaluation, but the target audience of this paper is practitioners rather than theoreticians.

The organisation of this paper is as follows. In Section 2 we discuss the classes of story model that have been used in computational story modelling, under the assumption that such models might be amenable to the creation of quantitative measures. The story model we chose to describe in terms of these measures has the following three properties: it can differentiate between computer games that contain stories and those that do not (Section 3) it can be used to specify the characteristics of artificial characters in computer games (Section 4), and it can be used to evaluate and reconceive stories quantitatively (Section 5). The first property is important because a proper story model should be able to distinguish between a story and a non-story. The second property is important because our distinguishing feature is precisely that stories contain characters and we should be able to say what a character is. We then move to application in Section 6 we consider a real computer game design treatment (for a game called *Street Survivor*) as an extended case study. We apply our story model to this game and reconceive the story within the model (which was largely adopted).

## 2. The Appeal of Polti's Dramatic Situations

Computational story models appear to have two fundamental characteristics: a certain level of abstraction and a top-down or bottom-up construction (from a systems theory point of view). By abstraction we mean that components can be defined vaguely (e.g. "the impact was positive" à la *plot units*, Lehnert, 1982) or precisely (e.g. "Joe ordered a hamburger" à la *scripts*, Schank and Abelson, 1977). By top-down we mean that the model defines a sequence of components (like a template) that must be filled in (e.g. "starting equilibrium, falling event, rising event, turning point, final equilibrium" à la the *Aristotelian model*, Cassady, 1991). By bottom-up we mean the model defines a number of components that can be combined and used in any desired manner (e.g. "subsumption state, cause of termination event, problem-state description" à la *points*, Wilensky, 1982).

Within this framework, [Polti's situations](#) (Polti, 1895 Lucille, 1977, Hall et al, 2000, see Appendix 1) are highly abstract but have varying levels of detail. Some situations are explicit regarding what happens to whom in what relationships, while in others these details are omitted. For an example of an explicit situation, consider [rivalry of superior and inferior](#). Clearly, relations exist between characters and these relations entail norms that should not (but are) compromised. For an example of a less explicit situation consider [error of judgment](#). In this situation character(s) A makes a mistake of some kind, but no description of the mistake is given. It requires the audience to recognise that A has made the mistake.

In terms of systems theory, Polti's situations can be characterised largely as bottom-up. Polti does not specify how to combine or synthesise his units his project is identifying the minimum number of units (reviewing over a thousand stories). Many units do describe short causal sequences (e.g. [crime pursued by vengeance](#)) that are internally top-down but with respect to the other units are bottom-up. In terms of events occurring in a story, it appears that multiple units can be concatenated or nested as long as (most of the time) the causal sequences are completely represented. For example, [pursuit](#) can halt temporarily for various reasons.

The main advantage of these bottom-up abstract units is that they are descriptive, as opposed to prescriptive. They essentially provide a pattern language that can be either matched to existing stories or used in story authoring. And they help us substantially in our quest to create quantitative measures for stories in that these units and their components are *countable*,

by and large. But firstly we need to show that this model can distinguish between a story and a non-story in particular, between a story and a game.

### 3. Is It a Game or a Story?

Some authors distinguish between the two by the role of the people engaged (Newman, 2002) and the linearity of the events (Lindley, 2005). We're going to take a slightly different tack, and initially propose the theory that if people can explain what is going on in terms of at least one of Polti's units then the object that they are engaged with can be labelled a story. Since these dramatic situations are extracted from stories, this means that if there is a match, then people should be able to point to other stories (or genres) which share similar events, and perhaps argue that these objects are stories by analogy.

We now relate our theory to three levels of game abstraction: *definition*, *game genre* and in terms of an *instance Tetris*, following previous academic work (Ryan, 2001). At the level of *definition*, suppose we use a 10-point definition of game components (Avedon and Sutton-Smith, 1971): 1) purpose of the game, 2) procedure for action, 3) rules governing action, 4) number of required participants, 5) roles of participants, 6) results or pay-off, 7) abilities and skills required for action, 8) interaction patterns, 9) physical setting and environmental requirements, 10) required equipment. Clearly, game component 6 (results or pay-off), can be matched to Polti's unit obtaining, thus these categories are blurred.

At the level of *game genre*, suppose we consider Crawford's taxonomy of computer games (Crawford, 1984). His two main categories, skill/action games and strategy games, are equally blurred. A number of Polti's units are easily matched: the enigma (searcher), pursuit, obtaining, falling prey to misfortune, ambition, disaster, and daring enterprise. Thus games in these genres blur with stories.

At the level of *instance*, consider Tetris with respect to [Polti's situations](#). It's straightforward to find at least two matches: obtaining the player is continuously losing more and more ground and the enigma the player is continuously searching for a way to get rid of all the blocks. Murray's analogy for this "a perfect enactment of the over tasked lives of Americans in the 1990s-of the constant bombardment of tasks that demand our attention and that we must somehow fit into our overcrowded schedules and clear off our desks in order to make room for the next onslaught" (Murray, 1997), has been derided as a projection (Eskelinen, 2001). Nonetheless, this analogy matches Polti units, thus both are stories under the current theory.

Clearly our initial theory requires some work as we currently have interpenetrating categories at all levels of game abstraction. To attempt clarification we propose two simple sub-categories of story: *embodied* and *unembodied*. The distinction is that an embodied story generates characters in the mind of the audience of the story. Such a definition might be contestable and incomplete, but it does pave the way for dialogue. *Embodied* stories, which have characters, are trivially easy to match to Polti's units, since these units essentially describe situations of conflict between characters. On the other hand, *unembodied* stories require an imaginative reconceptualisation of the events in terms of characters to achieve a match. Such reconceptualisation requires more effort to match than embodied stories and must be achieved using some sort of individual (and thus contestable) justification.

How do these unembodied and embodied sub-categories impact our three levels of abstraction? At the *definitional* level, component 6 (where a result or pay-off is achieved) may impact characters, producing an embodied story, or vice versa. As an unembodied story, the stretching required to reconceive events and the necessary defence of such stretching might, on occasion, be too weak to warrant even considering these game in terms of Polti's units (or perhaps any other story model). Ultimately, if we agree that no characters

exist, and agree to look through Polti's lens, component 6 cannot be matched to obtaining. Suddenly the notions of game and story can be separated into distinct categories at this abstract level using a clearer notion of embodied stories. At the less abstract level of *game genre*, we argued that a number of Polti's units were matched. Similarly, analysis in terms of stories is fine when genres have characters.

Where does this leave *Tetris*? We proposed two matches: obtaining and the enigma. Neither of these matches generate characters in the mind of an observer, thus *Tetris* cannot be classified as an embodied story via our definition. Murray's interesting angle is from the broader philosophical viewpoint, which has been considered but excluded from our category of story. *Tetris* can thus be classified as an unembodied story the two characterless matches we made with Polti are not, in our opinion, as interesting as the tangential philosophical view.

In this section we have separated the categories of games and stories via analysis at three levels of game abstraction. We agree with Eskelinen that the presence of characters is key to justifying the application of story models to games but disagree that philosophical viewpoints on games equate to 'interpretative violence' (Eskelinen, 2001). We believe that such viewpoints are perceptive and worthwhile articulating but have no need to be artificially positioned in the category of narrative to claim legitimacy.

#### 4. Computer Games with "Characters" Have Stories

In the previous section we made a distinction that relied on the concept of a character without defining what characters are. Bringsjord previously proposed that computer generated characters should have a minimum of five properties of (philosophical) personhood: language, autonomy, creativity, phenomenal consciousness, and reasoning capacity, and argued that since artificial autonomy is impossible, computer generated characters are impossible (Bringsjord, 2001). Of course, it would be great if artificial intelligence advanced to the point where all would agree that a program had achieved personhood and we hope that one day it does. However, we think Bringsjord is unreasonably raising the bar for characters to necessarily require personhood. With characters, the notion of their personhood exists only in the mind of an observer of a story. The internal mental state of movie actors may not necessarily correlate to their external state.

Our specification for characters is far less ambitious than what Bringsjord has proposed. Rather than using philosophy as a basis, we developed our requirements directly from our story model. That is, we systematically identified a set of capabilities that characters should *appear* to have that would allow all of Polti's thirty-six dramatic units to be realised (Hall, 2002). These capabilities are summarised in Figure 1.

*Attributes*: All attributes of character A which have an effect external to themselves in the situation should appear to have their normal effect. For example, if one character can run faster than another, the former would normally win a foot race.

*Perception*: A should appear to normally perceive their situation perfectly. For example, if A perceives their situation incorrectly then they are much more likely to make mistakes.

*Mental state*: The normal mental state for A should appear to be that their aim is to satisfy their goals, and every emotion which A has towards other agents reflects a perceived relationship. For example, if their actions do not reflect their internal goals then their behaviour would be described (in pop psychology) as madness.

*Pursuit*: The position of A (being in a specific situation) should appear to be normally independent of the position of other objects, and A can move freely around in and between situations. For example, most As are not continuously pursuing something.

*Love:* As should appear to be normally emotionally neutral towards other As, unless special circumstances have caused them to exhibit the important directed emotions of love or hate. For example, if A1 is in love with another, the former will not appreciate the latter being removed from those circumstances.

*Family:* A should appear to not belong to a family with all other characters, and special conditions must occur for a family to exist. For example, members of the one family happily coexisting in the same situation should not be enemies.

*Friend:* A should appear to be normally friends with characters that they interact with, although specific interactions can cause them to become enemies. For example, if A1 is friends with A2 but enemies with A3, A1 will not appreciate A2 being friends with A3.

*Power:* A should appear to normally not have power over other A, although A may often be involved in power structures where they or others have power. For example, if A1 has power over A2, A1 does not expect A2 to try to gain power over A1.

*Exchange:* A should appear to normally not exchange objects with other actors. Transactions of objects do occur between situations, but not always according to the wishes of the A involved.

*Intention:* A normally tries to produce the outcomes they desire. However there are four possible reasons for action from the point of view of actors: choice, accident, necessity, or irrelevant. Irrelevant means that the source of the deterministic cause is not important.

Figure 1: Character capabilities

We believe that Bringsjord's call for game designers "to impel gamers to believe they are interacting with virtual people" is unnecessary. Dramatically compelling entertainment, by definition, must be able to be achieved via the realisation of Polti's dramatic situations. Computer games with characters with any of the above capabilities, who represent corresponding Polti units, are thus computer games with narrative by our account.

## 5. Using Polti Ratios to Evaluate and Improve Stories

In this paper we evaluate stories in terms of simple measures related to [Polti's dramatic situations](#). We use ratios because they are supposedly the most informative scale (Reich, 1995). We've already broadly defined a story as events in which people can identify at least one of Polti's dramatic situations. Intuitively, a small number of events,  $E$ , with a large number of Polti's units,  $P$ , correspond with the notion of an intensely dramatic story but a small number of Polti's units with a large number of events correspond to a dull story.

$$\text{Level of Drama(LoD)} = P/E$$

So how does this relate to games generally and computer games specifically? In most games, there is potential for  $E \rightarrow \infty$ , thus  $\text{LoD} \rightarrow 0$ . With *Tetris*, even with at least  $P=2$ , because  $E \rightarrow \infty$ , LoD is still zero. Note that, as time goes on, the blocks in *Tetris* fall faster so the game does become more exciting, but not in the sense of an escalating drama.

But the LoD allows a single dramatic situation to occur repeatedly. For example, the enigma can search for one thing, then another, then another (clues leading to more clues *ad infinitum*). We want another measure for the number of unique Polti's units  $U$  used in a story, which intuitively maps to the variety of dramatic situation.

$$\text{Variety of Drama(VoD)} = U/36$$

If most of Polti's 36 dramatic situations are used,  $\text{VoD} \rightarrow 1$  if few are used

VoD?0. To achieve VoD?1 the object in question must be categorised as an embodied story, since most of Polti's units require characters with particular capabilities (described previously). Furthermore, these characters have classical Aristotelian roles: major-protagonist and antagonist and minor-helper and hinderer (Aristotle 1973). The continuity of a single story requires major characters being involved in the majority of the dramatic situations for most of the events. Thus we create another measure for the continuity of characters' involvement in the set of unique dramatic situations  $U$ , using major characters  $M$  and minor characters  $C$ , and we weight minor characters by an (arbitrary) factor of 5 as a penalty.

$$\text{Involvement in Drama (IiD)} = U / (M + 5 * C)$$

Thus a story with a high number of characters has IiD0, but IiD?zero faster with an increase in the number of minor as opposed to major characters. For an unembodied story with zero characters, IiD=1/0 which is mathematically undefined. Thus we have another case for questioning whether people should talk about unembodied stories (some computer games) in terms of stories.

So now we have some simple crude quantitative measures for evaluating stories in terms of Polti's dramatic situations: Level of Drama (LoD), Variety of Drama (VoD), and Involvement in Drama (IiD). For these three measures, a higher score was regarded as better, in some sense, than a lower score. But how do these measures interact?

Considering this question leads us directly to the notion of story reconceptualisation. If we were to introduce a new character into the story, thus lowering our IiD, but potentially allowing us to raise our LoD and VoD, is the story better? Or, if we were to eliminate a character, potentially lowering our LoD and VoD, is the story better? Or, if we wanted to increase our VoD, what is the cost in terms of IiD? We will not be attempting to answer these questions because we think these trade-offs must be assessed by the author/designer.

However, in the extreme case, our measures lead to a limited notion of a *Polti-ideal* story. It practically cannot exist because  $P \rightarrow \infty$  (we have an infinite number of Polti's dramatic situations) but  $E=1$  (stories have to describe at least one event) thus  $LoD = P/E = \infty$ . In addition, we use all of the dramatic situations thus  $VoD = 36/36 = 1$ . Furthermore, we also require two main characters (protagonist and antagonist) to realise the majority of Polti's dramatic situations thus  $IiD = 36 / (2 + 5 * 0) = 18$ . In other words, the Polti-ideal story has infinitely high and maximum variety drama with the minimum number of events and characters.

What is the point of a Polti-ideal story? It simply gives us a target to aim at, allowing authors (in any story media) to consider what tweaks they could make to a story to improve these simple numbers in the direction of this ideal. Such a notion avoids proposing a way to compare two different stories that despite using different Polti units, have identical LoD, VoD and IiD. We rightly leave such comparison to story critics.

Now that we've got these measures, what can we do with them? The purpose of developing these ratios is to give us a way to abstract stories and then reconceive them. First, how do we apply these measures to a story in order to evaluate it? We propose the following five steps:

- 1 Identify as many Polti units as possible  $P$ .
- 2 Identify (roughly) the number of events  $E$ .
- 3 From  $P$ , identify the unique units  $U$ .
- 4 Count and categorise the characters as major  $M$  or minor  $C$ .
- 5 Plug all these numbers into the Polti ratios.

Second, how do we think about improving these ratios? To improve the

"dramaticity" towards the Polti-ideal story we want  $P$  and  $U$  to increase as much as possible while  $E, M$  and  $C$  are minimal. We propose the following five steps:

- 1 Eliminate irrelevant Polti's units with respect to the story.
  - 2 Propose additional units with justification to increase  $M$ .
  - 3 Consider the implications of proposing these units on the number of characters ( $M$  and  $C$ ).
- 1 Reach some sort of satisfactory trade-off between additional units and characters.
  - 2 Plug the new numbers into the Polti ratios and compare the abstract reconceived story with the original story.

We now give a worked example of exactly this sort of story reconceptualisation, taking an input story for a computer game, manually extracting our metrics, considering how to increase our LoD, VoD and IiD, and factoring in other constraints. We then present a later version of the story which has been created for this computer game.

## 6. Extended Application: *Street Survivor*

*Street Survivor* is an independent computer game, conceived and produced by independent film maker Kirsty Baird and funded by Big hART Inc, the City of Melbourne and the Australian Film Commission. It is a third person action adventure game for the PC that thrusts players into the role of Sonya, a recently homeless teenager, who spirals into a cycle of addiction, hunger, violence and crime as she flees from her past and searches for another kind of future.

The objective of *Street Survivor* is to fully engage the player in game play where symbolic information functions within an environment that is inspired by the experiences of young people who may find themselves homeless or in similar circumstances. See trailer below.

The target audience for *Street Survivor* is young people who are homeless or at risk of homelessness through the installation of the game in frontline youth service agencies. The game does not offer easy answers but provides opportunities for the player to make a range of choices under pressure. *Street Survivor* game is still being developed with the intention of producing

a testable prototype or complete small game.

The following is the original design and story for *Street Survivor* which was in the early stages of its development.

### 6.1 Street Survivor Version 1

Cinematic: Sonya's back story

I left home when I was 16. My mum had a new boyfriend and he used to hit her when he was drunk. If I tried to stop him, he'd lash out at me as well. I couldn't take it anymore the fighting... the noise. I knew of a guy called Paddo, an old friend of my mum's. I thought he might be able to help me out. Last I heard he was in the city somewhere. So I hit the streets.

#### Level One:

Location: The streets. Objective: To find a friend, to learn about and explore the environment Notes: First time on the streets. Prototype level.

This level is set on the streets at about 6pm on a cold night. Sonya reaches the city for the first time in search of an old family friend, Paddo. She is cold and desperate and sad but determined to find him. She asks around. She meets Ray and Crystal and explores the city. The player learns to click on objects and people and learns that this behaviour gives them health points or information that helps them through the level. The player also encounters the Dealer and learns that this character sends them into another world, a distorted world and that this decreases their health points and increases their habit points. At the end of this level, Sonya meets Paddo. Paddo offers her some "work".

The Dealer: In this level Sonya connects with the Dealer and has positive experiences. She goes into a distorted world which gives her health and alleviates her pain. This includes loss of keyboard controls. Some kinds of euphoria expressed visually and in the game mechanics.

Cinematic: Sonya is frightened by him and runs away from him into the encroaching night.

#### Level Two:

Location: Squat. Objective: Looking for somewhere to sleep the night/shelter

Sonya sees Ray again and again she asks him for help. This time he is drunk, he doesn't recognise her and he sends her to a (dangerous) squat. The squat is a huge abandoned building in the city. Once she is inside this squat it is like a house of horrors. It is very dark. She has to negotiate her way through the space which is full of long corridors, big rooms and stairways.

There are people in the squat but they are unhelpful towards her they scare her off, chase her, threaten her, protecting their space. She has to try to get through the space by avoiding these people. She spends the night fighting back

.

The Dealer: In this level when Sonya connects with the Dealer her experiences in that other world become darker and more threatening. The amount of health points that these experiences give her decreases. She runs the risk of overdosing, if her habit is too high and her health level is too low. She sees things in the distorted world that scare her. She has to fight.

Whilst she is in this level she encounters the Dealer again and again. Each time she encounters the Dealer the experiences she has in the distorted world get stronger and more full on. The squat morphs and warps and distorts and the unfriendly people in the squat pursue her and fight her.



**Level Three:**

Location: Back on the Streets. Objective: Money Notes: Downward spiral, full blown addiction, hanging out. Withdrawal.

If she survives the night she is back on the streets. It is morning. Cold. The city is busy with people. It is chaotic and confusing. She is very much the worse for wear, her clothing is dirty and torn, she looks more haggard than before. She has had her back pack stolen and has no possessions left and therefore has no money. She needs to score. She goes in search of the Dealer but he won't have a bar of her. He won't help her out unless she can find money to score. He won't give her any more free hits. She is weak, shaking and coming down. She goes to the fast food joint looking for someone who might help her. She finds Crystal there. Crystal sends her to Tan. Tan gives her a parcel for Paddo. Once she has the parcel she is under threat from new enemies. These are enemies that exist in the real world of the city thugs who are rivals of Paddo's. If she survives their attack she has no choice but to do the work that he offered her in level one.

The Dealer: She is withdrawing. She desperately wants to connect with the Dealer. She pursues him but she is weak and he is indifferent to her e.g. Habit meter is at dangerous level if it is too low or too high.

**Level Four:**

Objective: To survive the car chase. Location: Car on city streets. Notes: Car chase. Crime.

Suddenly she is driving a car through the city streets and the game play is now first person. A voice is yelling at her from the back seat. It is Tan. In the passenger seat a person is inert and bleeding. Tan is telling her to turn down certain streets and to keep driving. It is a frantic situation. If she crashes the car she dies. But she doesn't have to do what Tan says. If she doesn't take the turns he suggests she can finish the level without dying. The car eventually crashes into a dead end and a cinematic occurs. You always crash. The choice here is between dying and injury.

Extended cinematic: Car crash, injury, arrest. Hospital. Court system.

**Level Five:**

Location: Jail Objective: To detox. Notes: Realisation. Dream sequence. Doing time. Going through the motions.

Sonya is lying on a bed in a prison cell. She is asleep. She is dreaming. In her dream she is back on the streets of the distorted city she accesses through her interactions with the Dealer. A rapid and intense fight sequence takes place. During this fight sequence she recognises a distorted version of herself. She fights herself and wins. Requiem for a Dream visual sequence ie: different camera. You can't actually lose this level.

The Dealer: She "seeks" him out. She realises that he embodies her resistance to change.

End cinematic:

Something about home. Finding a home. Meeting a friend. Very short.

**6.2 Evaluation of *Street Survivor* Story Draft 1**

We now follow our own process for story evaluation on this original story design for *Street Survivor*.

1. Identify as many Polti units as possible *P*.

We try to identify all Polti's units level by level. In Level 1 Sonya plays out the enigma searching for Paddo, after falling prey to misfortune. She obtains experiences from the Dealer and work from Paddo. So  $PL1=3$ . In Level 2

Sonya switches targets to searching for somewhere to sleep. Her negotiation through the squat is a daring enterprise, and she continues to obtain experiences from the Dealer. Thus  $PL2=3$ . In Level 3 Sonya switches search target to the Dealer. She obtains from Tan, but this creates fresh enemies falling prey to misfortune. Thus  $PL3=3$ . Level 4 contains crime pursued by vengeance and branches to fatal impudence so  $PL4=2$ . In Level 5 Sonya fights herself enmity of kinsman and seeks the Dealer. Thus  $PL5=2$ . In the denouement Sonya finds a home and a friend, tying up the falling prey to misfortune in Level 1. The summation is  $P=13$ .

2. Identify (roughly) the number of events  $E$ .

We manually counted the events level by level. Note that we're not aiming for precise accuracy, just a rough estimate.  $EL1 = 6$ ,  $EL2 = 10$ ,  $EL3 = 7$ ,  $EL4 = 6$  and  $EL5 = 3$ . Adding all these up gives  $E=32$ .

3. From  $P$ , identify the unique units  $U$ .

Looking back through our list of  $P$  we identify unique units (the enigma, falling prey to misfortune, obtaining, daring enterprise, crime pursued by vengeance, fatal impudence, and enmity of kinsman). Thus  $U = 7$ .

4. Count and categorise the characters as major  $M$  or minor  $C$ .

The original story has a single main character Sonya ( $M=1$ ) and five minor characters Paddo, Ray, Crystal, Dealer and Tan ( $C=5$ ). Despite the Dealer's frequent contact with Sonya, it was a game constraint that the Dealer was not to be demonised as an antagonist, although Sonya's relation to the Dealer is certainly ambiguous.

5. Plug all these numbers into the Polti ratios.

*Level of Drama*( $LoD$ )=  $P/E = 13/32 \approx 0.4$

*Variety of Drama*( $VoD$ )=  $U/36 = 7/36 \approx 0.2$

*Involvement in Drama*( $IiD$ )=  $U/(M+5*C)=7/(1+5*5)=7/26 \approx 0.27$

Thus we ended up with total scores of  $LoD \approx 0.4$ ,  $VoD \approx 0.2$  and  $IiD \approx 0.27$ . So how do these numbers compare with the Polti-ideal story (where  $LoD \approx \infty$ ,  $VoD=1$  and  $IiD=18$ )? Firstly, the number of events counted (32) is contestable, given the scope the player of Sonya is allowed to explore, particularly in Level 1. Thus the level of drama might be much worse than 0.4. Secondly, the  $VoD$  is not so close to 1 that (in our opinion) it appears likely to be highly difficult to introduce new Polti units into the story. Also the  $IiD$  seems not so high that it will be difficult to improve.

### 6.3 Improving the Story Abstraction

We now follow our approach to reconceiving a story abstraction, to try to improve the "dramaticity" towards the Polti-ideal story essentially by increasing  $P$  and  $U$  and decreasing  $E$ ,  $M$  and  $C$  :

1. Eliminate irrelevant Polti's units with respect to the story.

There appear (from our point of view) to be eighteen dramatic situations which have little relevance to this story without significant modifications: vengeance taken for kindred upon kindred, disaster, revolt, rivalry of kinsman, ambition, conflict with a god, adultery, murderous adultery, involuntary crimes of love, slaying of a kinsman unrecognised, self-sacrifice, rivalry of superior and inferior, crimes of love, discovery of dishonour of a loved one, obstacles to love, an enemy loved, mistaken jealousy, and remorse.

2. Propose additional units with justification to increase  $U$ .

supplication and deliverance: Sonya requests that the Dealer actually assist her in some way by giving her the drug, so the drug has to have some positive side effect which somehow delivers her from someone else.

pursuit: To limit Sonya's dawdling exploration of the city, we propose a new character that continually chases her. Given the themes of family breakdown and violence we propose this new character is called the Step Father (elevating the boyfriend to main character status). This unit can be linked with the previous -the drug delivers her from the pursuit of her Step Father in some way. We proposed that without the drug, she cannot run fast enough to outrun the Step Father. On the drug she can outrun him, but the penalty of usage is eventual addiction followed by withdrawal or potential overdose.

crime pursued by vengeance: Sonya can cultivate new enemies as she seeks to satisfy her needs via crime.

abduction: The street has become Sonya's home -to remove her from the street for various reasons is contestably equivalent to abduction. The Step Father, if he catches Sonya, can abduct her in a sense.

enmity of kinsman: The Step Father is the antagonist.

loss of loved one and recovery of a lost one: Rather than Sonya simply finding a home and a friend at the end, it would be more dramatic if she found a family member. We proposed another family member, her sister, which is the constant target of her search throughout the game.

madness: The continual chasing of the Step Father and his background of violence can be attributed to some sort of mental breakdown.

So we are proposing to introduce nine possible Polti dramatic situations into the story.

3. Consider the implications of proposing these units on the number of characters (M and C ).

Clearly Paddo can be replaced by Sonya's sister, and this dramatic situation, rather than finishing at the first level, can be stretched throughout the game. We've introduced one main character, the Step Father, who applies ongoing tension to Sonya in the form of pursuit.

4. Reach some sort of satisfactory tradeoff between additional units and characters.

The Dealer maintains his ambiguous relation to Sonya as helper/hinderer. But we believe that he can flexibly absorb into his role the tasks of Ray, Crystal and Tan, who really act as target redirectors for Sonya's enigma. So we've decreased our minor characters by 3 and increased our main characters by 1 and we now have M=2 and C=1.

5. Plug the new numbers into the Polti ratios and compare the abstract reconceived .

$$\text{Variety of Drama (VoD)} = U/36 = (7+9)/36 \approx 0.44$$

$$\text{Involvement in Drama (IiD)} = U/(M+5*C) = 16/(2+5*1) = 16/7 \approx 2.29$$

Let us assume that we've achieved the above in roughly the same number of events. We don't know yet how many it will take in the story so we conservatively round it up to 40 from 32 (we need some flexibility to tie it all together).

$$\text{Level of Drama (LoD)} = P/E = (13 + 9)/40 \approx 0.55$$

Lets compare. In the first abstract version of the story we had total scores of IiD $\approx$ 0.27, LoD $\approx$ 0.4 and VoD $\approx$ 0.2. In our reconceived abstract story we have IiD $\approx$ 2.29, LoD $\approx$ 0.55 and VoD $\approx$ 0.44. All of these ratios are higher in the second version, closer to the Polti-ideal. A story based on these with this event budget should be more dramatic. We made a trade-off between VoD and IiD to introduce more dramatic situations we proposed a new character, the Step Father, but we were able to compensate for that by eliminating several peripheral minor characters.

After discussions, Baird worked to realise these dramatic situations within the actual story. The following is a later (but not the latest) version of *Street Survivor* which incorporates much of the above.

#### **6.4 Street Survivor Version 2**

*Street Survivor* revolves around the story of a young girl Sonya who has left a home disrupted by the violence of her Step Father. Sonya goes into the city in search of her sister, Amy, who has left home before her and disappeared.

The player enters *Street Survivor* on the second level of the game which takes place on the streets of a generic city. Sonya sets out in search of her sister, asking around for help. Unfortunately her search is interrupted by the appearance in the city of her Step Father. He pursues her relentlessly throughout the game, determined to take her home and to prevent her from finding Amy. He fears, quite rightly, that when Sonya finds Amy they will take their stories of his violence to the police and have him prosecuted.

Sonya takes a drug called Quick to avoid being captured by her Step Father. This drug is available in the city from the Dealer. The first time she meets the Dealer he gives her a hit of Quick for free but from then on she has to pay for it. Quick is addictive and by taking Quick Sonya develops a Habit. In level one of *Street Survivor*, Sonya becomes caught up in this web of conflicting needs she must avoid being captured by her Step Father by taking Quick which she must buy from the Dealer and to which she becomes addicted, whilst continuing her search for her sister and finding food to keep up her energy. If she is captured by her Step Father, he takes her back home and she has to escape again. Each time this happens, the game restarts on the first level which is a train station. Sonya is waiting for the train to take her back in to the city to resume her search for her sister. She can find herself on this level over and over again throughout the game each time she is captured by her Step Father. If she collapses from exhaustion, lack of food, cold or withdrawal she will also find herself back on the train station.

Whilst Sonya is in the first level of the game it gets dark. When night falls the third level of the game opens automatically. This level is about the need for shelter and finding a place to sleep. The game play takes place in a derelict building that is used by other homeless people as a squat. Sonya finds herself being attacked in this level by other people who are protecting their space or wanting to steal Quick or money from her. The Squat is full of obstacles to avoid, such as holes in the floor, and rickety stair cases. Sonya has to be very careful as she navigates through the building. She will move between levels 2 and 3 until she finds a blanket in level 2 which enables her to have a sleep and takes her into level 4.

By level 4 of the game Sonya, who is back on the streets of the city, has developed an addiction to Quick that is now controlling her. She is dominated by her need to buy Quick from the Dealer to escape from her Step Father but also to service the addiction she has established. She needs money to buy the Quick so she turns to crime, begging, mugging people and bag snatching. Her bad behaviour sees her develop more enemies and she becomes more and more vulnerable to withdrawal and overdose whilst still getting hungry, cold, and tired. She also needs to use clean water, syringe bins and must continue to ask around for Amy. She can go back to the Squat once in this level. In this level of the game Sonya develops her fighting skills as she spirals downwards into heavier addiction and worse behaviour. If she gets captured by her Step Father in this level she goes back home and then to the Train Station as before. If she collapses she gets rescued by a stranger who takes her to a safe place and then back to the Train Station.

Eventually Sonya takes on a task for the Dealer. She crosses town to deliver a parcel for him. In return she gets given a hit of Quick, she overdoses and this takes her into level 5, the last level of the game. Level 5 is set in a dream like hospital. Sonya meets and fights a version of herself. This version of herself is her nemesis, her alter ego once she gives up (stops fighting) and

gets beaten the game ends.

## 7. Conclusion

In this paper we made three contributions. First, we created a theory of stories which distinguishes between games and stories at several levels of game abstraction, based primarily on the existence of characters, whose capabilities are derived from Polti's thirty-six dramatic situations. Games that lack characters require considerable stretching to metamorphose into Polti's units, thus their analysis in terms of stories is contestable. Second, we developed measures of the "dramaticity" of stories called Polti ratios and proposed a Polti-ideal story to which all abstractions could be compared.

Finally, we developed a process for exploring abstractions of stories and demonstrated this process on the game narrative for the computer game *Street Survivor*. In our extended analysis, we counted relevant story components in *Street Survivor* version 1 then plugged these numbers into measures we called Polti ratios, to get some sense of how close this story was to a theoretically ideal but unrealisable story. Subsequently, we attempted to improve the "dramaticity" of a story by introducing novel Polti units without paying a cost in numbers of characters. We plugged these new numbers back into Polti ratios to assess movement towards the ideal story. We showed a later version of *Street Survivor* which incorporated our proposed changes.

While Version 2 of *Street Survivor* did appear to be more highly dramatic than Version 1, the ways in which a player would interact with the game remained largely constant. The reason for this was sheer momentum the game prototype was being developed while the game treatment was being developed whatever narrative we produced had to be able to be implemented atop working code due to tight budgets. In this case, game narrative could be considered independently of game playability because the game already implemented characters and we minimally modified these.

There are at least five questions to investigate in future work. Do people in general (with an understanding of Polti's units) detect exactly the same units in the same story? Can computer-aided tools assist people both with evaluation and the reconceptualisation of narrative? Can other models of computer games (e.g. game playability) be integrated with Polti ratios? To what degree can Polti ratios be used standalone for analysis and comparison of computer games? Finally, how can these crude measures be improved?

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### **Appendix 1: [The Thirty-Six Dramatic Situations](#)**

From Wikipedia, the free encyclopedia (4/9/2007)

*The Thirty-Six Dramatic Situations* is a descriptive list which was created by Georges Polti to categorize every dramatic situation that might occur in a story or performance. To do this Polti analyzed classical Greek texts, plus classical and contemporaneous French works. He also analyzed a handful of non-French authors. In his introduction, Polti claims to be continuing the work of Carlo Gozzi, who also identified 36 situations.

This list was published in a book of the same name, which contains extended explanations and examples. The original French-language book was written in the 19th century. An English translation was published in 1917 and continues to be reprinted to this day.

The list is popularized as an aid for writers, but it is also used by dramatists, storytellers and many others. Other similar lists have since been made, some more attuned to modern sensibilities, but Polti's guide remains one of the most popular and enduring.

#### **The 36 Situations**

##### 1. Supplication

§ a Persecutor a Supplicant a Power in authority, whose decision is doubtful.

##### 2. Deliverance

§ an Unfortunate a Threatener a Rescuer

##### 3. Crime pursued by vengeance

§ an Avenger a Criminal

##### 4. Vengeance taken for kin upon kin

§ an Avenging Kinsman Guilty Kinsman remembrance of the Victim, a relative of both

##### 5. Pursuit

§ Punishment a Fugitive

##### 6. Disaster

§ a Vanquished Power a Victorious Enemy *or* a Messenger

##### 7. Falling prey to cruelty/misfortune

§ an Unfortunate a Master *or* a Misfortune

##### 8. Revolt

§ a Tyrant a Conspirator

##### 9. Daring enterprise

§ a Bold Leader an Object an Adversary

##### 10. Abduction

§ an Abductor the Abducted a Guardian

##### 11. The enigma

§ an Interrogator a Seeker a Problem

12. Obtaining

§ (a Solicitor & an Adversary who is refusing) *or* (an Arbitrator & Opposing Parties)

13. Enmity of kin

§ a Malevolent Kinsman a Hatred *or* a reciprocally-hating Kinsman

14. Rivalry of kin

§ the Preferred Kinsman the Rejected Kinsman the Object of Rivalry

15. Murderous adultery

§ two Adulterers a Betrayed Spouse

16. Madness

§ a Madman a Victim

17. Fatal imprudence

§ the Imprudent a Victim *or* an Object Lost

18. Involuntary crimes of love

§ a Lover a Beloved a Revealer

19. Slaying of kin unrecognized

§ the Slayer an Unrecognized Victim

20. Self-sacrifice for an ideal

§ a Hero an Ideal a Creditor *or* a Person/Thing sacrificed

21. Self-sacrifice for kin

§ a Hero a Kinsman a Creditor *or* a Person/Thing sacrificed

22. All sacrificed for passion

§ a Lover an Object of fatal Passion the Person/Thing sacrificed

23. Necessity of sacrificing loved ones

§ a Hero a Beloved Victim the Necessity for the Sacrifice

24. Rivalry of superior v. inferior

§ a Superior Rival an Inferior Rival the Object of Rivalry

25. Adultery

§ two Adulterers a Deceived Spouse

26. Crimes of love

§ a Lover the Beloved

27. Discovery of the dishonour of a loved one

§ a Discoverer the Guilty One

28. Obstacles to love

§ two Lovers an Obstacle

29. An enemy loved

§ a Lover the Beloved Enemy the Hater



## 30. Ambition

§ a Ambitious Person a Thing Coveted an Adversary

## 31. Conflict with a god

§ a Mortal an Immortal

## 32. Mistaken jealousy

§ a Jealous One an Object of whose Possession He is Jealous a Supposed Accomplice a Cause *or* an Author of the Mistake

## 33. Erroneous judgement

§ a Mistaken One a Victim of the Mistake a Cause *or* Author of the Mistake the Guilty One

## 34. Remorse

§ a Culprit a Victim *or* the Sin an Interrogator

## 35. Recovery of a lost one

§ a Seeker the One Found

## 36. Loss of loved ones

§ a Kinsman Slain a Kinsman Spectator an Executioner

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