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New methods of analysis of narrative and semantics in support of interactivity

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ABSTRACT

Our work has focused on support for film or television scriptwriting. Since this involves potentially varied story-lines, we note the implicit or latent support for interactivity. Furthermore the film, television, games, publishing and other sectors are converging, so that cross-over and re-use of one form of product in another of these sectors is ever more common. Technically our work has been largely based on mathematical algorithms for data clustering and display. Operationally, we also discuss how our algorithms can support collective, distributed problem-solving.

1. Introduction

Papadimitriou [25] succinctly provides a wide range of examples of where storytelling is or should be central in teaching. He ends with an example from author Umberto Eco, termed "salgarism" by the latter, the "telltale symptoms" of which are "incongruity and discontinuity between story and embedded information". In our work we seek to find algorithmically such patterns or trends in the data. We do this, it must be noted, not just on a word level, or a sentence level, or a paragraph level, but rather in close association with some level or levels of information resolution. Regarding the latter (level of information resolution), it will be observed in this article that it is based on clusters of words, which may or may not be taking order or sequence of word placement into account, and, secondly, which are typically based on a hierarchical clustering so that resolution scale in this context can be associated with level in such a hierarchy.

When one considers multiple platforms, encompassing media, format, and form and extent of interactivity, Murray [19] raises the question of what platform and/or delivery mechanism is superior. In answering this, she points to our often very simplistic understanding of story. Instead, to explore commonality across delivery platform, it is necessary, she notes, to capture meaning, i.e. semantics.

We will next look at recent work in the area of games-related authoring software, which is also a prime objective of our work.

More traditional forms of authoring software have been largely focused on identifying and using interactions between, characters, events, authors and the like (see [16]). More recent approaches to narrative synthesis include Louchart et al. [16] for whom there is a "narrative paradox" in the imputed distance between plot and interaction, insofar as plot implies abstracting away from, and in a sense pulling against, the interactive environment. This leads to a focus on process of creating a plot narrative, rather than the structure of the story. As Louchart et al. [16] note: "In EN [emergent narrative] we try to remove the need to 'think in terms of plot', because the notion of plot ... has a problematic tension with the role of the interactor." In our work, instead, we focus precisely

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on the structure of narrative, and show how readily we can reconcile this approach with an interactive environment (cf. Section 5 below). Kriegel and Aylett [15] refer to bottom-up collaborative authoring based on such an approach as remaining "incoherent and chaotic", which is not the case with our approach.

Aylett's emergent narrative (EN) approach is developed too by Swartjes and Theune [27], which is based on branching and causal networks in the context of an "overall space of possible stories". Authors can modify or accept the choice of story elements and prolongations proposed by a story generator (referred to as, respectively, debugging or co-creation). In concluding, Swartjes and Theune [27] question whether their own approach is capable of scaling. Further work in the symbolic artificial intelligence tradition can be seen in Swartjes and Theune [28]. In our approach, on the other hand, our main possible limitation on scaling is due to (computationally cubic order) eigen-reduction, which, because this is carried out on very sparse matrices, is unlikely to be a limitation (for computational work on large sparse matrices, see e.g. [20].

In this article, rather than looking at narrative applied specifically to games we are looking to use algorithmic techniques, that are also very relevant for games, to find and depict the narrative thread in screenplay, by defining the times when a screenplay becomes most like and most different from itself. We use screenplay as our testbed or environment.

A so-called "linear" story consists of conflicts or moments of decision, and it is our contention that using textual narrative to identify the deep structure of a screenplay will be extremely helpful in thinking about the development of serious games. A screenplay in fact is written to maximize the number and impact of those nodal narrative points which are, or will be, experienced by the audience in real time.

A problem of the tree structure model prevalent in game narratology (cf. discussion above, e.g. [27,28], is that it does not recognize that the experience of any audience member will be to experience their individual journey as a single pathway regardless of how many possible pathways they might have taken.

Indeed the notion of foregrounding story over plot is not just a function of the interactive environment. Stephen King, the novelist, whose work has inspired more successful original films than perhaps any other writer working today, has written that "plotting and the spontaneity of real creation aren't compatible" [14]: 164). Plot, he calls "a dullard's first choice. The story which results from it is apt to feel artificial and labored". So instead of starting with plot, King puts his characters in a situation and likes to "watch them try to work themselves free".

The dramatic narrative, including a novel or filmscript, is devised to model those moments of choice, and to involve the audience as an active collaborator in imagining the story, which involves all the future outcomes desired and feared by the audience and not just the narrative choices which actually occur in the script or film. See Ganz [10] for further discussion of this.

By developing a toolset or processing environment, that allows narratives to be represented numerically, we are finding the possible patterns of narrative desired or created by the audience. Some of this work has been accomplished up to now by measuring reaction but it has not been done by analyzing the text itself and using these analysis outcomes to create heuristics for narrative in a form can be recognized by a machine. These heuristics could also well create parameters for narrative in serious games and, for example, be subsequently used to close down narrative options at certain stages of a game.

2. Analysis and synthesis, episodization and narrativization

We have explored film and TV scripts in the converging world of cinema, television, games, online or virtual societies, with applications in entertainment, education and many other areas. In this context, our primary focus has been on the tracking of narrative. Further new application domains, and our work to date in these domains, are reviewed in this article.

We explore (i) features or attributes of narrative that we can determine and measure, based on semantic analysis, using the movie Casablanca; (ii) segmentation–"episodization" is the term used in Aristotle's Poetics – and its use, illustrated by cases from the CSI Las Vegas television series; and (iii) narrative synthesis, including both a new technical approach to this, and our experience with a collaborative narrative creation "sandpit" environment.

We can consider both *analysis*, i.e. breaking up of text units, and *synthesis*, i.e. assembling texts into a larger text unit.

In [1] the component parts of a play, for example, are considered. Under the title of "Outlines and episodization", it holds, according to Aristotle: "Stories ... should first be set out in universal terms ... on that basis, one should then turn the story into episodes and elaborate it." He continues: "... reasoning is the speech which the agents use to argue a case or put forward an opinion". It is interesting how the decomposition into episodes is related to agents who provide sense and meaning to the component parts. This is a theme which we will return to below. It may be noted, cf. White [30], that Aristotle's perspectives on story and narrative retain importance to this day.

In narrativization we seek to build a story-line from an arbitrarily large number of texts. We can achieve a fixed target story-line size or length. There is traceability of all component parts of the story-line (which, we may note, is potentially important for propagation and preservation of digital rights). By integrating story transitions with heuristics for structuring story we allow additional story sub-plot embedding, and the placement of other relevant information. Furthermore, by appropriate mapping of story transitions, we can allow interactive reading and other adaptive usage frameworks.

3. Role of machine learning and data mining in filmscript analysis

We have initially chosen to look at filmscript as a particular kind of text, both as a text in itself which is broken up into discrete units, with considerable amounts of easily recognizable metadata attached to each scene, but also as a text which is intended to achieve itself in a different visual form which will be experienced chronologically and in real time.

A filmscript, expressing a story, is the starting point for any possible production for cinema or TV. See the short extract in Fig. 1. TV episodes in the same series may each be developed by different scriptwriters, and later by different producers and directors. The

[INT. CSI - EVIDENCE ROOM -- NIGHT]

(WARRICK opens the evidence package and takes out the shoe.)

(He sits down and examines the shoe. After several dissolves,
WARRICK opens the lip of the shoe and looks inside. He finds something.)

WARRICK BROWN: Well, I'll be damned.

(He tips the shoe over and a piece of toe nail falls out onto
the table. He picks it up.)

WARRICK BROWN: Tripped over a rattle, my ass.

Fig. 1. Example of a scene from a script. This is a short scene, scene 25, from the CSI (Crime Series Investigation, Las Vegas) TV series. This is the very first, 1X01, Pilot, original air date on CBS October 6, 2000. Written by A.E. Zuiker, directed by D. Cannon. Script available in full from TWIZ TV (Free TV Scripts and Movie Screenplays Archives), twiztv.com.