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Character Focused Narrative Models for Computational Storytelling

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My thesis aims at conceptualizing and implementing a computational model of narrative generation that is informed by narratological theory as well as cognitive multi-agent simulation models. It approaches this problem by taking a mimetic stance towards fictional characters and investigates how narrative phenomena related to characters can be computationally recreated from a deep character model grounded in multi agent systems. Based on such a conceptualization of narrative it explores how the generation of plot can be controlled, and how the quality of the resulting plot can be evaluated, in dependence of fictional characters. By that it contributes to research on computational creativity by implementing an evaluative storytelling system, and to narratology by proposing a generative narrative theory based on several post-structuralist descriptive theories.

Background

Computational storytelling research is concerned with the study of algorithms that are capable of automatically generating fictional narratives. The main computational means to this end are "strong story" planning-algorithms and "strong autonomy" agent-based simulations, combined with manual knowledge base engineering (Ware and Young 2014; Compton, Kybartas, and Mateas 2015). Usually, two components of a narrative are distinguished. A content plane, which is a causally ordered series of events, potentially happening in parallel at multiple locations (what is told); and an expression plane, which is the linear representation of events in a text, using stylistic devices like flash-backs, flash-forwards and point of view (how it is told) (Prince 2003; Gervás 2009). In accord with the narrative theories used in my work the first will be called *plot* and the latter *discourse*. Most computational storytelling research has been focused on plot (Harmon and Jhala 2015; Compton, Kybartas, and Mateas 2015), which I shall follow suit.

Another useful dichotomy is introduced by Currie (2010, p. 49ff), who distinguishes two perspectives on narratives: The *external* perspectives understands narratives as artefact intentionally produced by an author to solve a set of narrative problems, while the *internal* perspective understands them as describing a (fictional) story world, consisting of events and following rules. I will adopt both views at different stages of my project.

An open point of contention in narratology is the role of fictional characters in plot (Jannidis 2013; Meister 2014). The synthetic view is that characters are mainly defined by their function (e.g. hero, helper or opponent); that is that characters are subjugate to plot. This view is challenged by the mimetic stance that characters are defined by fictional mental states and personality traits. From such a perspective plot can be seen as an emergent feature of the interaction of characters in a story world. As will become apparent, my project is deeply committed to this second view.

A Character Centric Model of Narrative

At the current stage my doctoral project is concerned with the computational modeling of an internal perspective (Currie 2010) on narrative, building on Ryan's possible-worlds conceptualization of plot-dynamics (Ryan 1991). Ryan's theory describes the emergence and the properties of plot based on the goal-directed actions of fictional characters, which are structurally described by a set of propositions capturing their interior state: beliefs, wishes, obligations and plans. I attempt to implement this theory using a Multi-Agent Simulation (MAS) approach (Siebers and Aickelin 2008) based on the Belief-Desire-Intention (BDI) framework (Rao and Georgeff 1995). Such a combination of narratological and computational approaches yielded two first insights: (1) Ryan's character model in itself is not enough to generate the differing choices of action performed by characters in natural narratives; (2) Computational models of narrative generation have not yet sufficiently addressed post-structuralist mimetic character conceptions (Gervás 2009; Kybartas and Bidarra 2017; Cavazza and Pizzi 2006) and can benefit from taking into account concepts like embedded narratives (Ryan 1991; Palmer 2004).

Following Palmer's (2004) analysis I address both problems by refining the employed character model with a cognitively plausible simulation of emotions and personality as suggested by Alfonso, Vivancos, and Botti (2014) as well as Gebhard (2005). In my implementation, emotions (short-term affect) are taken to perform affective appraisal of internal and external events. All occurring emotions are aggregated into a mood (long-term affect), which in turn influences decisions taken during the BDI reasoning cycle.

An agent's mood always converges towards a default mood, which is computed based on it's personality traits. I demonstrate that the resulting system is capable of spanning a plot-space that can be explored using personality traits as parameters (Berov 2017a, forthcoming).

Several important narrative phenomena pertaining to characters—for instance deception and double-deception (Ryan 1991, p. 158ff), which involves reasoning about other characters' reasoning; or fine grained social interactions like group decision taking and interpersonal thinking (Palmer 2004, p. 218ff), which involves speech-acts and non-verbal communication—still remain to be addressed.

Character-based Tellability for Storytelling

Once a sufficiently expressive computational model of the internal perspective has been implemented, the project is intended to address the external perspective on narrative (Currie, 2010). In computational terms, this involves setting up a story world, executing a simulation (corresponding to the system outlined above), analyzing the emerging plot in terms of tellability and potentially adjusting the initial simulation conditions to create a more desirable plot. This results in an evaluative feedback loop and the intended system could thus be described as a computationally creative storytelling system in the sense of Gervás (2009), which performs a search through the plot-space spanned by the above-mentioned character model. To realize this goal, the parameters controlling plot-generation, and the concept of tellability, need to be computationally formalized.

From my current perspective, the main parameters in such a simulation system are happenings[1] and the parameters behind fictional characters (as outlined above). Tellability is a measure that narratologists use to describe the quality of plot (Ryan 1991; Abbott 2014). Following Ryan's theory, tellability depends highly on fictional character's embedded narratives. Embedded Narratives capture character's subjective experience of the unfolding plot, and include beliefs, wishes, obligations, emotions as well as (potentially not-actualized) plans. Palmer (2004, p. 183) describes embedded narratives as "the whole of a character's mind in action". The extended BDI architecture used to model fictional character above provides access to these phenomena and thus can serve as a basis for tellability analysis. Ryan suggests to perform such an analysis on the basis of a "recursive" (sic.) graph representation of plots and embedded narratives. Such graphs can be used to identify functional plot units (Lehnert 1981), and Ryan puts forward several principles—functional polyvalence, semantic opposition, symmetry and diversification—according to which plot units can interact in order to increase tellability. I suggest how to computationally approach this theory elsewhere in this book (Berov 2017b), however, a full formalization is still subject of future research in the scope of my project.

[1]Happenings are accidental events that have patients but no agents, e.g. accidents or natural forces. They are defined as opposed to actions, which are goal directed events which necessarily have an agent (Ryan 1991).

Related Work

An in-depth discussion of storytelling systems and how they relate to the present project is outside the scope of a short abstract. The following just brushes over the question how some computational narrative systems conceptualize fictional character. Characters can be taken as mere aggregates of actions (Pérez y Pérez and Sharples 2001), as a source of intention-based (Riedl and Young 2004) or plan-based (Ware and Young 2014) consistency for plot; or as affective (Aylett et al. 2006; Pizzi and Cavazza 2007), social (Chang and Soo 2008) or taxonomy-based (Laclaustra et al. 2014) rational agents. Characters' states have been also (implicitly) used as a means of non-deterministically exploring a plot-space (León and Gervás 2014), and as a source of a narrative's aesthetic appeal (Pizzi and Cavazza 2007).

Contribution

In conclusion, my doctoral project addresses the following fundamental research questions: (1) How can the dynamics of plot be modeled computationally from an internal as well as an external perspective, and what are the parameters that allow an interaction between these two perspectives. (2) How well can a descriptive narratological theory be operationalized using a generative model, and what can such an approach contribute back to the descriptive theory.

My tentative answer is that in both cases the focus is to be put on the workings of fictional characters. Computational approaches should model character's embedded narratives as a bridge between plot-generation and tellability analysis. Such models in turn can be used to enrich descriptive theories of plot with a teleological awareness of how fictional minds are constructed. This would close a gap between plot and discourse analysis that, in my opinion, was recently created by Palmer's insightful work (2004), which describes the reconstruction of fictional mind from discourse, but leaves open how it was constructed for plot in the first place.

From a computational side my doctoral project is concerned with the automatic generation of narratives. In the context of digital entertainment the envisioned system can be seen in two ways. On the one hand its grounding in MAS would allow it to function as an interactive storytelling system, where users can take control of one or several agents an by that affect the generation of plot. This corresponds with providing users an internal perspective on the narrative. On the other hand the system would also allow providing users with an external perspective. In that case user input can be used to set up (parts of) the simulation, which is then executed automatically by the system. Under such circumstances the system functions as a human-computer co-creativity tool (Davis 2013).

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References

Abbott, P. 2014. Narrativity. In Hühn, P.; Meister, J. C.; Pier, J.; and Schmid, W., eds., *Handbook of Narratology*. Berlin: De Gruyter.

Alfonso, B.; Vivancos, E.; and Botti, V. J. 2014. An open architecture for affective traits in a BDI agent. In *Proceedings of the 6th International Conference on Evolutionary Computation Theory and Applications*, 320–325.

Aylett, R.; Louchart, S.; Dias, J.; Paiva, A.; Vala, M.; Woods, S.; and Hall, L. 2006. Unscripted narrative for affectively driven characters. *IEEE Computer Graphics and Applications* 26(3):42–52.

Berov, L. 2017a. Steering plot through personality and affect: an extended BDI model of fictional characters. In *KI 2017: Advances in Artificial Intelligence: Proceedings of the 40th Annual German Conference on AI*. Dortmund, Germany: Springer International Publishing. Forthcoming (accepted).

Berov, L. 2017b. Towards a computational measure of plot tellability. In *10th International Workshop on Intelligent Narrative Technologies*. AAAI Press. Forthcoming (accepted).

Cavazza, M., and Pizzi, D. 2006. Narratology for interactive storytelling: A critical introduction. *Technologies for Interactive Digital Storytelling and Entertainment* 72–83.

Chang, H.-M., and Soo, V.-W. 2008. Simulation-based story generation with a theory of mind. In *Proceedings of the Fourth AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment*, 16–21.

Compton, K.; Kybartas, B.; and Mateas, M. 2015. Tracery: An author-focused generative text tool. In Schoenau-Fog, H.; Bruni, L. E.; Louchart, S.; and Baceviciute, S., eds., *Interactive Storytelling*, number 9445 in Lecture Notes in Computer Science. Springer International Publishing. 154–161.

Currie, G. 2010. *Narratives and narrators: A philosophy of stories*. Oxford University Press.

Davis, N. 2013. Human-Computer Co-Creativity: Blending Human and Computational Creativity. In *Ninth Artificial Intelligence and Interactive Digital Entertainment Conference*.

Gebhard, P. 2005. ALMA: a layered model of affect. In *Proceedings of the Fourth International Joint Conference on Autonomous Agents and Multiagent Systems*, 29–36. ACM.

Gervás, P. 2009. Computational approaches to storytelling and creativity. *AI Magazine* 30(3):49–62.

Harmon, S., and Jhala, A. 2015. Revisiting computational models of creative storytelling based on imaginative recall. In *Interactive Storytelling*. Springer. 170–178.

Jannidis, F. 2013. Character. In Hühn, P.; Meister, J. C.; Pier, J.; and Schmid, W., eds., *the living handbook of narratology*. Hamburg: Hamburg University.

Kybartas, B., and Bidarra, R. 2017. A survey on story generation techniques for authoring computational narratives. *IEEE Transactions on Computational Intelligence and Artificial Intelligence in Games*.

Laclaustra, I. M.; Ledesma, J. L.; Méndez, G.; and Gervás, P. 2014. Kill the dragon and rescue the princess: Designing a plan-based multi-agent story generator. In *5th International Conference on Computational Creativity*.

Lehnert, W. G. 1981. Plot units and narrative summarization. *Cognitive Science* 5(4):293–331.

León, C., and Gervás, P. 2014. Creativity in Story Generation From the Ground Up: Non-deterministic Simulation driven by Narrative.

Meister, J. C. 2014. Narratology. In Hühn, Peter; Meister, Jan Christoph; Pier, John; and Schmid, Wolf., eds., *the living handbook of narratology*. Hamburg: Hamburg University.

Palmer, A. 2004. *Fictional Minds*. U of Nebraska Press.

Pérez y Pérez, R., and Sharples, M. 2001. MEXICA: A computer model of a cognitive account of creative writing. *Journal of Experimental & Theoretical Artificial Intelligence* 13(2):119–139.

Pizzi, D., and Cavazza, M. 2007. Affective storytelling based on characters' feelings. In *Intelligent Narrative Technologies: Papers from the AAAI Fall Symposium*, 111–118.

Prince, G. 2003. *A Dictionary of Narratology*. U of Nebraska Press.

Rao, A. S., and Georgeff, M. P. 1995. BDI agents: from theory to practice. In *Proceedings of the 1st International Conference of Multiagent Systems*, 312–319.

Riedl, M. O., and Young, R. M. 2004. An Intent-Driven Planner for Multi-Agent Story Generation. In *Proceedings of the Third International Joint Conference on Autonomous Agents and Multiagent Systems - Volume 1*, AAMAS '04, 186–193. Washington, DC, USA: IEEE Computer Society.

Ryan, M.-L. 1991. *Possible Worlds, Artificial Intelligence, and Narrative Theory*. Indiana University Press.

Siebers, P.-O., and Aickelin, U. 2008. Introduction to multi-agent simulation. *arXiv preprint arXiv:0803.3905*.

Ware, S. G., and Young, R. M. 2014. Glaive: A State-Space Narrative Planner Supporting Intentionality and Conflict. In *Proceedings of the Tenth Artificial Intelligence and Interactive Digital Entertainment Conference*.