A Character Focused Iterative Simulation Approach to Computational Storytelling

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Abstract. My project aims at conceptualizing and implementing a computational storytelling system that derives creativity from an iterative cycle of simulation-based engagement and constraint-modifying reflection. It approaches this problem by first developing a computational model of stories that is grounded in narratological research, more specifically in mimetic, post-structuralist approaches centered around fictional characters. In the second stage, this narratological grounding will allow to measure and reason about the quality of a modeled story based on a formal notion called tellability. In the last stage, the parameter space that is set up by this representation can be explored in search for tellable stories, which are hypothesized to be of higher quality. Currently, the project is in the second stage.

1 Background

Storytelling research in the context of computational creativity is concerned with the study of algorithms that are capable of autonomously generating fictional narratives [9]. Usually, at least 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 flashbacks, flash-forwards and point of view (how it is told) [11]. My work focuses only on generating the former (plot).

Another useful dichotomy is introduced by Currie [7], who distinguishes two perspectives on narratives: The *external perspectives* understands narratives as artefacts 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 existents, events and dynamically changing according to fixed rules. I will adopt both views at different stages of my project.

2 Results: A Character Centered Plot Model

During the first stage of my project I performed a computational modeling of the internal perspective on plot, by employing Ryan's *possible-worlds framework* [13]. Her 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

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of propositions capturing their interior state: beliefs, wishes, obligations and plans. This is beneficial, because it allows me an implementation using a Multi-Agent Simulation (MAS) approach [14] based on the Belief-Desire-Intention (BDI) framework [12], which is also built on a possible worlds semantics. This combination of narratological and computational approaches yields the interesting insight that Ryan's implied character model in itself is not enough to generate the differing choices of action performed by characters in existing narratives (for more details see: [4]).

I could resolve this problem by extending the model with Palmer's [10] analysis of characters as (paper-) beings endowed with fictional minds which, in many regards, function like real minds. This analysis points out the central role of personality and affect in characters' decision taking. Following it requires implementing these narrative phenomena in the BDI agent architecture, which I do based on a cognitively inspired simulation of affect and personality, as suggested by [2] as well as [8]. My system implements emotions (short-term affect) as affective appraisals of internal and external events. All active 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 decays towards a default mood, which is computed based on it's personality traits, thus allowing to take into account both, stable action-dispositions as well as context, during decision taking. I demonstrate, that the resulting system is indeed capable of evoking in readers a perception of character-personality that is correlated with the one computationally modelled [6].

3 Current Status: Character-Based Tellability

Tellability is a measure that narratologists use to describe the internal quality of plot [1]. Following Ryan's theory [13], tellability depends highly on fictional character's embedded narratives. Embedded narratives capture characters' subjective experience of the unfolding plot, and are described by Palmer as "the whole of a character's mind in action" [10]. The architecture introduced above can be taken to simulate these minds and thus can serve as a basis for tellability analyses. Ryan suggests to perform such an analysis on the basis of a plot graph representation of embedded narratives. Such graphs can be used to identify functional plot units. She puts forward several principles—functional polyvalence, semantic opposition and symmetry—according to which plot units can interact in order to increase tellability. Currently, I am working on automatically identifying these principles in plot generation [5].

4 Next Steps: Iterative Simulation

Taking an external perspective, the introduced model is creating a narrative system whose properties are spanning a plot-space which can be explored in search of high tellability. The main parameters of such a system are the idiosyncrasies of the involved characters, the affordances of the story world and temporally

distributable happenings[1]. In the terms of the implementation above, these can be understood as: the number of involved characters; their corresponding personality parameters as well as initial goals and beliefs; the possible actions and non-agentive existents implemented by the environment; as well as environment-events that are scheduled to be executed at a certain point of the simulation. I intend to implement an iterative process that involves setting up an environment with agents, executing a simulation, analyzing the emerging plot in terms of tellability, adjusting the described parameters and repeating until a plot with acceptable tellability is found.

5 Contribution

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

My tentative answer to the first question is that a mimetic modelling of characters can be used to perform three distinct computational tasks that are involved in computational storytelling. It can, first, be employed to generate plot, which emerges from the interactions of characters and environment in a multi-agent simulation system. The resulting plot can, then, be submitted to an aesthetic analysis based on a set of formal properties of the included embedded narratives of the involved characters. Finally, a space of possible plots can be explored by automatically manipulating the acting characters by either: changing their personality, the events that happen to them, or their environment.

I suggest that this opens a way to resolve the *emergent narrative paradox* [3], which has been leveled as criticism against emergent storytelling systems. The paradox asks how plot, as an aesthetic organizational principle, can emerge from the unguided interactions of autonomous agents, which perform their action selection based on their internal states and reasoning processes. The repeated, incremental manipulation of characters, as suggested above, can be understood as high-level narrative organization with the goal of ensuring tellable stories while maintaining character autonomy.

In the context of interactive digital storytelling, my work addressed several relevant technical and theoretical issues: which narrative phenomena can be model to represent fictional characters; how emergent plot can be evaluated; and how autonomous agents can be steered to behave interestingly.

[1] Happenings are events that have patients but no agents, e.g. accidentental encounters or natural disasters. They are contrasted by actions: goal-directed events which necessarily have an agent [13].

The second question can be tentatively addressed by abducing from the insights gleaned by implementing Ryan's framework: computational models can help uncover the dynamic implications of the usually static, analytical models.

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References

1. Abbott, P.: Narrativity. In: Hühn, P., Meister, J.C., Pier, J., Schmid, W. (eds.) Handbook of Narratology. De Gruyter, Berlin (2014)
2. Alfonso, B., Vivancos, E., Botti, V.J.: An open architecture for affective traits in a BDI agent. In: Proceedings of the 6th International Conference on Evolutionary Computation Theory and Applications, Rome, Italy, pp. 320–325 (2014)
3. Aylett, R.: Emergent narrative, social immersion and "storification". In: Proceedings of the 1st International Workshop on Narrative and Interactive Learning Environments, pp. 35–44 (2000)
4. Berov, L.: Steering plot through personality and affect: an extended BDI model of fictional characters. In: Kern-Isberner, G., Fürnkranz, J., Thimm, M. (eds.) KI 2017. LNCS (LNAI), vol. 10505, pp. 293–299. Springer, Cham (2017). https://doi.org/10.1007/978-3-319-67190-1_23
5. Berov, L.: Towards a computational measure of plot tellability. In: Proceedings of the 10th International Workshop on Intelligent Narrative Technologies, pp. 169–175. AAAI Press, Snowbird, Utah (2017)
6. Berov, L., Kühnberger, K.U.: An evaluation of perceived personality in fictional characters generated by affective simulation. In: Proceedings of the Ninth International Conference on Computational Creativity, Salamanca, Spain (2018)
7. Currie, G.: Narratives and Narrators: A Philosophy of Stories. Oxford University Press, Oxford (2010)
8. Gebhard, P.: ALMA: a layered model of affect. In: Proceedings of the Fourth International Joint Conference on Autonomous Agents and Multiagent Systems, pp. 29–36. ACM (2005)
9. Gervás, P.: Computational approaches to storytelling and creativity. AI Mag. **30**(3), 49–62 (2009)
10. Palmer, A.: Fictional Minds. University of Nebraska Press, Lincoln (2004)
11. Prince, G.: A Dictionary of Narratology. University of Nebraska Press, Lincoln (2003)
12. Rao, A.S., Georgeff, M.P.: BDI agents: from theory to practice. In: Proceedings of the 1st International Conference of Multiagent Systems, pp. 312–319 (1995)
13. Ryan, M.L.: Possible Worlds, Artificial Intelligence, and Narrative Theory. Indiana University Press, Bloomington (1991)
14. Siebers, P.O., Aickelin, U.: Introduction to multi-agent simulation. arXiv preprint arXiv:0803.3905 (2008)