Narrative Improvisation: Simulating Game Master Choices

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Abstract. Any computer game with a strong story has difficulty balancing the tension between narrative and agency. Strong narrative usually results in weak agency, and strong agency can weaken narrative structure. Narrative improvisation, adapting the story based on player reactions, is a difficult task for a game designer. Narrative improvisation, however, is regularly practised by the human game masters (GMs) of tabletop roleplaying games. As the first stage of building a game master agent (GMA), this paper examines the moment in which GMs decide if and how to alter their storyline due to player action. GMs were interviewed to discover their reactions when players make unexpected choices. Ten themes emerged from analysis of the interviews, we examined these themes to determine the thought processes that took place in the GMs' minds, and we represented the processes as flow charts. These decision charts are a first step in the construction of a GMA that could assist in the development of more responsive interactive narrative in computer games.

Keywords: Agency · Emergent narrative · Game master agent (GMA)
Interactive narrative · Narrative generation · Roleplaying game (RPG)

1 Introduction

When creating stories for computer games, designers must make the choice between favouring narrative and favouring agency. Balancing story progression and narrative is difficult because they are often at odds [20]. Narrative, for our purposes, means the art and science of telling a story; it includes construction of the plot around a main conflict, development of characters that make a meaningful contribution to the story, and the use of an appropriate structure. Agency, in game design terms, is the level of control players feel while they are in the game world, and the degree to which they consider their choices have a real impact on it [14, 15, 22].

Writers can craft structured stories that players can inhabit; branching storylines that players can choose between; and open worlds full of elements that players can use to create their own stories. However, each of these narrative techniques has trade-offs. The first technique leaves players with limited agency within the game world. The second results in the players having some agency, but their choices are limited and must be foreseen by the writer. The third provides strong agency, with players able to

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make their own story from game elements, but is unlikely to result in the type of pleasing story arc that could be constructed by a writer [16].

2 Background and Related Work

Many researchers have pursued the dream of a storytelling engine which can adjust to match player input, thus achieving both agency and narrative.

2.1 Attempts to Achieve Narrative Generation

Researchers have proposed a range of methods including grammar-driven models such as those of Vladimir Propp [18] and Alfred Correira, some of which can backtrack if the story encounters a conflict [23]. There are simulative algorithms like Klein's Automatic Novel Writer [8] with instruction packages for specific situations, and problem-solving algorithms such as TALE-SPIN [12] in which characters have knowledge lists and goals which update the story as characters try to fulfil them.

Another model is object-oriented narrative, in which the game world is composed of characters, locations, items, and actions, each of which has functions, conditions, reactions, and plot elements. When the player interacts with the objects, they construct their own narrative. In Façade, 'the… performance of the characters… are written as a vast collection of *behaviours,* which are short reactive procedures representing numerous goals and sub-goals for the characters' [11].

Narrative can be generated from the point of view of characters within the story. The Merchant of Venice Interactive Narrative [17] uses Shakespeare's play to create different stories for each character. Antonio might be a carefree risk taker who borrows money from Shylock with no thought for the consequences, or he might borrow the money because he is a loyal friend. Shylock might be a patient victim who extends a favour to Antonio, or he might be intent on revenge.

A narrative engine like UNIVERSE [23] picks a goal, selects a plot point from its library, executes it, and repeats for each sub-goal until it finds the most effective, and the generation system KIIDS [6] can store new plot points for later use. The BRUTUS [2] model builds narrative around a theme, setting up a betrayer, a betrayed, character goals, locations, and an action of treachery. Characters from the database are assigned these roles, and their attributes are used to determine the reasons for the betrayal.

Stories can also be seen as a constellation of possible worlds. There is the factual world of the story, as well as 'knowledge worlds, hypothetical worlds, intention worlds, wish worlds, worlds of moral values, obligation worlds and alternate universes' [23]. There are also overlapping worlds of knowledge, obligations, wishes, and fantasies for each character. Curveship [13] is an example of this model.

Narrative mediation 'gives a centralized author agent control of character actions. The system generates a linear narrative representing the ideal story to tell the user and then considers all the ways that the interactive user can interact with the world and with the other characters' [21]. It keeps the players following the story, and intervenes when they interfere with it [7], 'surreptitiously replacing a user action with a similar action, or failure mode, with different effects' [21].

A drama manager or story director builds a narrative arc around game events [4] and can treat characters as both autonomous entities and elements of the story [9]. A drama manager tracks player actions and relates them to a plot graph, testing for viability. It is 'an intelligent, omniscient, and disembodied agent that monitors the virtual world and intervenes to drive the narrative forward' [10] using beats (key story points that can be ordered to assemble a narrative) and schemas (structures and databases of character goals, knowledge, and actions) to make the tale progress. 'If schemas fail then that schema is revoked and the director searches for a new schema that better suits current status in the drama.' [1].

All these systems struggle to balance agency and narrative. Altering the story when a player makes a choice that conflicts with it, which we will call narrative improvisation, is currently only resolved successfully by human storytellers.

2.2 Roleplaying Games

There is already a game category that practises narrative improvisation: tabletop roleplaying games (RPGs) such as the well-known Dungeons & Dragons [5]. In RPGs, game masters (GMs) are the moderators and storytellers of the gaming experience. It is their task to describe the world that the players encounter and to arbitrate the players' actions within that world. RPGs are successful realisations of narrative improvisation because the GM can invent additional information when necessary. Greg Costikyan, designer of Paranoia, Toon, and Star Wars: The Roleplaying Game says: 'Only [in] the… game style, tabletop, do we escape the demands of linearity – and we do so, ultimately, only by relying on the creativity of a live gamemaster' [3].

Experienced GMs frequently encounter situations when players change the planned narrative by their actions or by their focus of interest. In a roleplaying game, GMs improvise and adapt their stories at a moment's notice, creating new characters, character arcs, and plot arcs on the fly. 'The Game Master (GM) is a special kind of player; he is the "interactive storyteller". He designs all the elements of the story and he manages all the possible events that can occur in its development, improvising the dialogue contributions of non-player characters, resolving players actions, etc.' [16]. 'The gamemaster provides the world and the story, as well as controlling any character not controlled specifically by players' [4]. He 'acts as a storyteller for the other players guiding them through an interactive drama, an adventure world full of monsters and NPCs played by the GM' [1]. GMs are 'in charge of keeping the narrative flowing, providing dynamic feedback to the actions of the player avatars, using e.g. on-the-fly updates…The GM is in these situations responsible for providing plot hooks and combines these as the play progresses' [24].

Elements of RPGs have been present in computer games since the dawn of the medium, and researchers have studied RPGs for clues about how to improve interactive narratives. However, one area that has received little attention is the thought process GMs engage in when players make unexpected choices. How and why do GMs adapt their story in response to player input? We will use the answer to this question to inform the development of a Game Master Agent (GMA) which could achieve a significant level of narrative improvisation.

3 Game Master Agent

A human GM acts in the same way as a drama manager, controlling narrative pace and direction, providing beats that fit along a plot graph, and fitting player actions to the story. But GMs also react to player input, profile players, and ensure that players drive the narrative. This paper is concerned with creating an agent to perform a specific subset of gamemaster functions – deciding when and how to alter a story.

3.1 Phases

The development of the GMA will be in four phases, of which this paper is the first. **Phase One** involves graphing when an existing storyline needs to be changed due to player desires and actions. What are the triggers for GMs deciding to change a story? What signals do players give that show they are engaged or not engaged with the current plot? How does a GM determine what story elements the player is interested in? **Phase Two** will be the development of a GMA narrative improvisation system in a game engine. The GMA, which will run alongside another systems (such as a drama manager) will monitor player choices and make the decision when to adapt or change the storyline. It will make minor changes and signal when it is necessary to invent new plots, but will not yet create them. **Phase Three** will involve graphing how new plots are generated, and **Phase Four** will be the inclusion of new plot generation into the narrative improvisation engine.

3.2 Interviews

Some GMs craft layers of arcing and overarching plotlines in advance, and some create elements that can be woven together as the players interact with them. But all GMs will prepare some level of narrative and anticipate how the players might move through it. They will create certain clues, elements, and sources of information to guide players that we will refer to as plot hooks. GM expectations of player choices will sometimes not be met, and the actions of the players may disrupt a planned plotline. To investigate how GMs are able to achieve narrative improvisation, we conducted a series of semi-structured interviews with GMs who have been running roleplaying games for at least five years, with a minimum average of ten gaming sessions per year. The RPGs include tabletop roleplaying games, live action roleplaying (LARP) games, and RPGs conducted online with the participants in different locations. We sought qualitative data about: the reasons why changes happen; how GMs choose whether to change the story; the GMs' thought processes when they change the story; how GMs get player feedback; and how GMs structure their stories, as well as general advice for interactive storytelling. We believed this would give us a starting point for exploring GM decisions. The interviews were conducted on Skype, Hangout, or telephone, and were recorded using XSplit [25] software.

3.3 Thematic Analysis

We elected to use the technique of thematic analysis (finding patterns in data and distilling key concepts) to study GMs responses. Conversation and discourse analysis (studying the structure of speech) might have yielded information about GM norms and relationships with the players, but was less relevant to GM choices. Using grounded theory (which minimises interpretation) was considered but our questions might have biased the results. We deemed thematic analysis to be most appropriate.

We transcribed the interviews with NVivo [19] data analysis software and looked through the responses, picking out keywords, phrases, and ideas that were repeated by the GMs. We then divided this feedback into broad categories. Four areas emerged: reasons why story changes become necessary; how players demonstrate interest in game elements; methods GMs use to decide new storylines; and recommendations for world building and crafting emergent storytelling;

The third and fourth categories relate to how GMs create new stories, and this data will be used in **Phase Three** of building the GMC. The first and second categories relate to **Phase One**. We examined these concepts and reorganised them, conflating similar ideas into common themes. A concept was deemed worthy of being included as a theme if it was reported by more than one GM.

4 Findings

Ten themes emerged from the first phase, each of which a reason for GMs to consider changing the story. We created flow charts for each of these themes.

4.1 Reasons Why Story Changes Become Necessary

According to the GMs interviewed, changes may be made to a storyline when players do the following (in order from most common to least common):

1. Miss plot hooks (clues the GM provides to lead players further into the story);
2. Forget details of plot hooks;
3. Misinterpret plot hooks;
4. Concentrate on side plots (sub-plots not directly connected with the main plot);
5. Exaggerate background elements (unimportant people, places, and objects);
6. Succeed too early in ‘solving the problem’;
7. Show they prefer a change of tone (feeling and style of play);
8. Show inattention to the plot;
9. Show lessened engagement with the plot; and
10. Show intense personal interest in a story element.

4.2 Decision Flow Charts

In consultation with the GMs, we laid out the decision-making process for each of these reasons as a set of icons, graphing the mental processes that a GM went through.

Players Wandering Aimlessly. When the players are not following the provided plot hook and seem to be aimless, there are four likely reasons: *Forget Details*, *Miss Plot Hook*, *Inattention to Plot*, or *Lessened Engagement*. If the players are attempting to engage with elements of the provided plot hook but not following them successfully, they may have forgotten some of the key information (*Forget Details*). If the players are engaging with elements in the world and seem to be trying to follow the story but ignore the plot hook, they may have been distracted and missed the hook (*Miss Plot Hook*). Alternatively, the players may not be attending to the story at all, but are still showing interest in the environment and the characters (*Inattention to Plot*). In the last case most GMs will probably allow the players to move at their own pace, and explore the world at their leisure. But at some point the GM will have to decide when to remind the players of the story, especially if there is a time limit built into it.

GMs respond to these three situations in a similar manner. The GM reaches a choice point, having to decide whether to reintroduce the plot hook. If other hooks exist that could lead the players to the same conclusions, the GM can choose to wait. Perhaps the players will follow one of the other hooks, or perhaps at a later date they will remember this clue and follow it. The danger here is that the players may mistake or forget the other clues as well. If there are no other plot hooks available, the GM may need to direct the players back to the clue and perhaps give a stronger hint that it is important. The GM can remind the players of the information they discovered earlier, or can create a new method for imparting that information, which might involve creating a new clue, character, or other delivery mechanism. GMs state that it is simple to reintroduce missed plot hooks, but warn that there is a danger in doing this too often. If the players realise they are being led to the solution, they will lose much of their sense of achievement and will not feel they have earned their victory. The GM must choose whether to keep dangling new hooks in front of the players from time to time, or letting them roam freely.

If the players are not following the plot hook and are also not giving attention to the environment and characters, then they may have lost interest in the story and will need to be re-engaged (*Lessened Engagement*). This lessened engagement could be for several reasons, and may not relate to the nature of the story. The players might be hungry or tired, or there might be distracting events occurring in the real world. Alternatively, they may not be connecting with events or themes of the story. For whatever reason, they are losing interest in the game events. Again, GMs have reached a choice point. They could call a halt to the game for a while. But if not, do they force player attention to the plot in some way, or do they throw in a new situation to energise the players? Ideally the new situation relates to the plot and can guide players back into the story while energising them, but if that is difficult to do, GMs can use an unrelated scene. Often GMs will have a few stock elements to use in situations such as this – set action pieces like a bar fight or a ninja attack which can occur if player energy is low. Once the players have been livened up, the GM will wait to see if they now follow the plot hooks (Fig. 1).

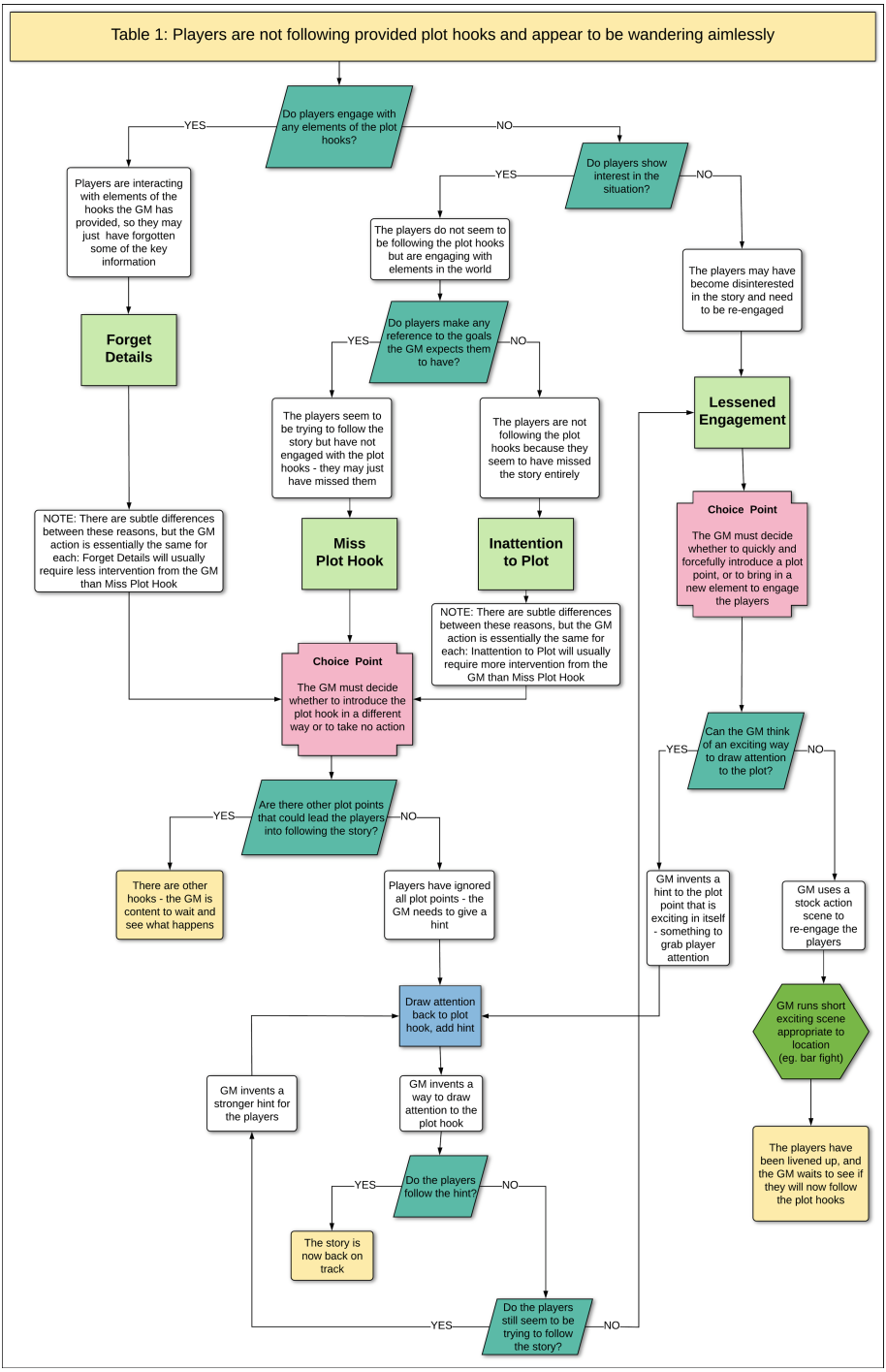

Fig. 1. Players wandering aimlessly

Players Pursuing Unrelated Goals. When players are actively pursuing goals that are unrelated to plot hooks, there are usually four reasons: *Concentrate on Side Plot, Misinterpret Plot Hook, Exaggerate Background Elements,* or *Personal Interest.*

If the players are ignoring a plot hook for the main story but are following hooks that relate to a side plot, then they may have a stronger interest in that sub-plot or think that it is the main plot (*Concentrate on Side Plot*). The GM will need to decide whether the side plot can be made to play a larger part in the main story. If not, the GM can use the side plot as the main narrative, abandoning the original idea or relegating it to a side plot, or can try to draw attention back to the main plot in the same manner as with *Forget Details, Miss Plot Hook,* and *Inattention to Plot.*

If the players seem to be actively pursuing a different goal but are still asking questions about the main story idea, they may think small elements of the plot are more important than the GM intended them to be (*Exaggerate Background Elements*) or they may have misunderstood a plot point and interpreted it as meaning something else (*Misinterpret Plot Hook*). Either way, the players now have a theory of their own. Players sometimes imagine that background elements or characters are more important than they are, and investigate them under the assumption that they are integral to the story. The GM intended these elements to be window dressing, but for some reason the players have fixated on them and spend time investigating them and speculating about them. The players now expect them to be part of the story. At this point the GM must decide whether the elements are interesting enough to be added into the existing narrative. The GM might need to flesh out characters that originally had a one-line description and incorporate them into the plot, or find a way for an object that caught the players' eyes to be linked to the unfolding drama. If the players' object of interest does not fit within the story, the GM must decide whether to disabuse them and guide them back to the plot, or to change the story completely to accommodate it. If players misinterpret a plot hook and invent their own theory, the GM may decide the players are not wrong at all, and change what the hooks meant, since the players will never know this was not the intention all along.

Sometimes players do not follow the main story because they are interested in specific elements of the world. An element resonates with them personally and holds greater appeal than important narrative elements. The GM is unlikely to anticipate this beforehand, since it is personal to the players. The GM needs to decide what further interactions with this element will look like, and what mechanics are involved. The choice point is whether to include the expanded element in the story or whether to recreate the story around it. Alternatively, does the GM allow the players to have fun with this experience but then create consequences for neglecting the main plot? Personal interest can be disruptive to multiplayer gaming, since it may only relate to one or two of the players. If they are the ones driving the story along because of this interest, the GM needs to monitor the engagement of the remaining players (Fig. 2).

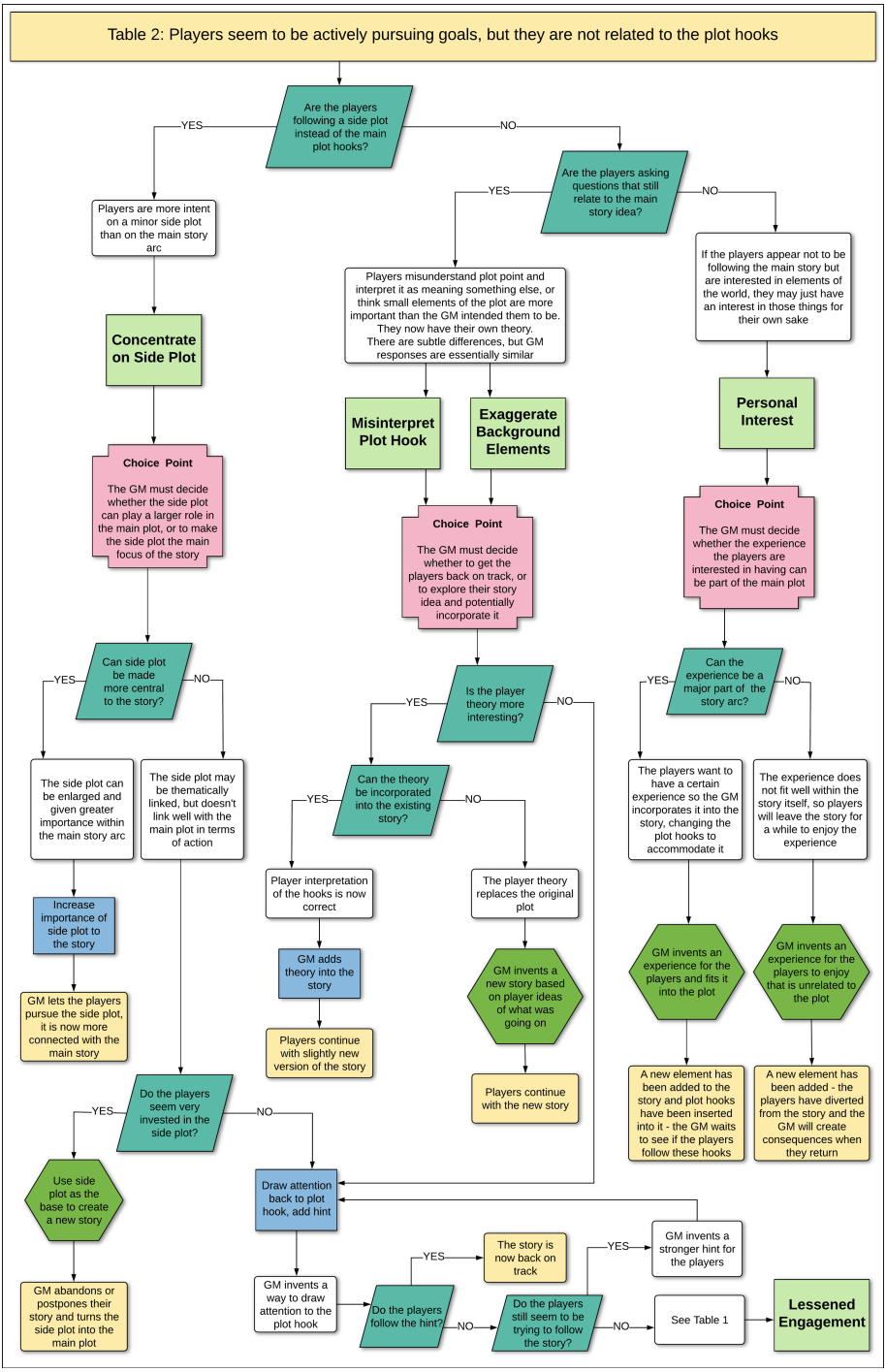

Fig. 2. Players pursuing unexpected goals

Players Being Too Successful. Though skill or luck, players may solve a problem faster than the GM expected, for example they might quickly kill off an enemy who was intended to be the main adversary for the whole adventure. The most common way to resolve this is to introduce a new layer on top of the solved problem – a hidden influence that has been acting behind the scenes. In the example above, the dead enemy is found to be the disciple of a greater villain who has now been revealed. GMs suggest that this can be done quite seamlessly, feels believable to the players, and is ultimately satisfying as part of a greater narrative. The choice point is whether to stop the story earlier than anticipated and begin another one, or to extend this story by introducing a further layer (Fig. 3).

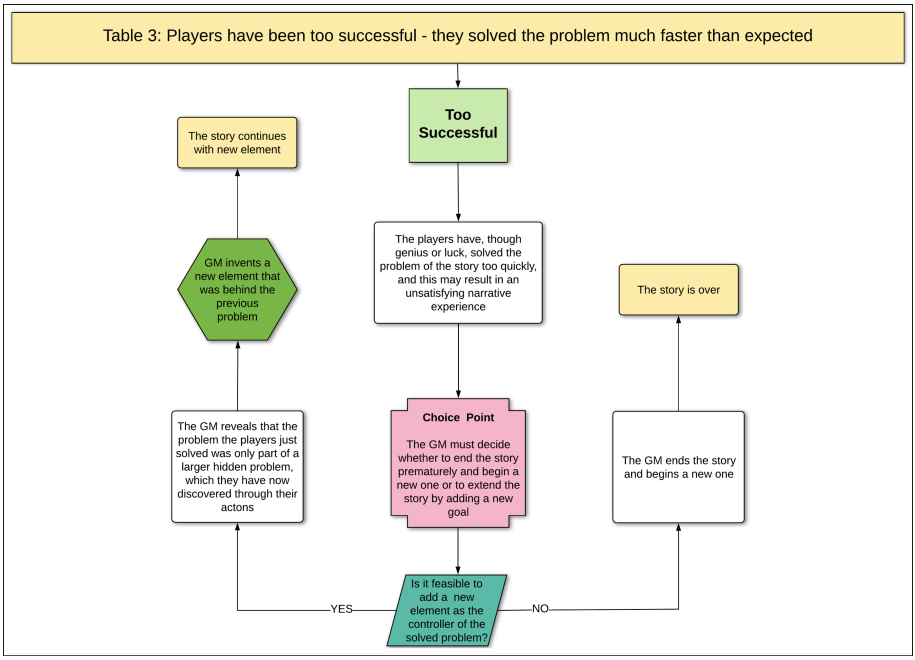

Fig. 3. Players being too successful

Change of Tone. Sometimes the tone of the game can change, and players are now enjoying a different style or genre, to which the original plot is no longer appropriate. If the GM decides to return to the original style of play, they must use language that stresses the intended tone, hoping to influence the players to return to the former style. If the players seem to be enjoying the new tone too much to change back, the GM must either change the language and action of the current story to match the new tone, or to invent a new story that suits the new tone better. One GM described a game which was designed as a mystery, an investigative thriller. The players did not seem interested in this, but reacted well when they needed to sneak into a guarded location. Responding to this, the GM made the game much more action-orientated with shootouts, heists, and chases (Fig. 4).

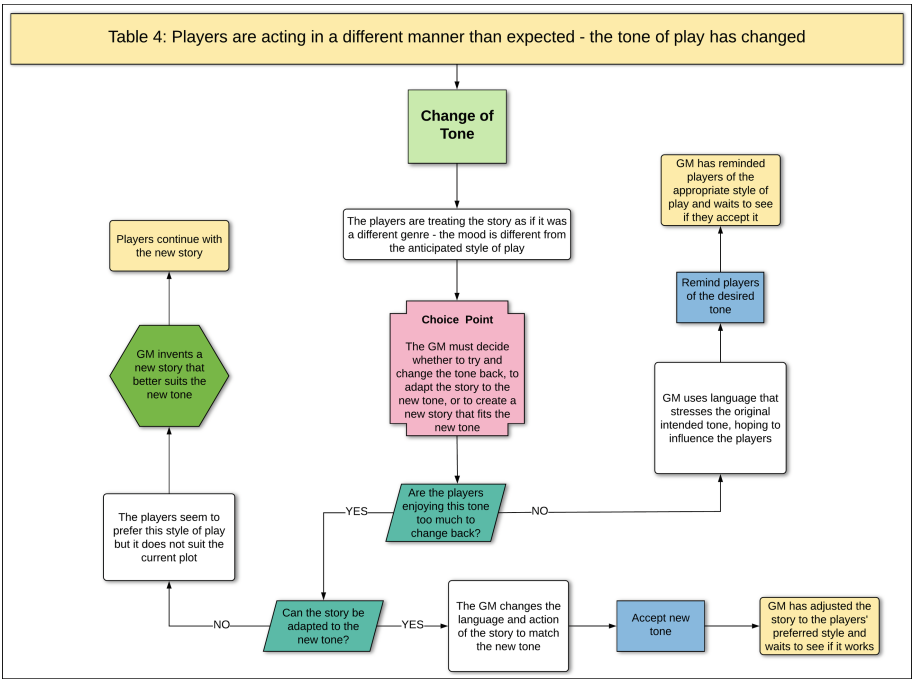

Fig. 4. Change of tone

4.3 How Players Demonstrate Interest

Establishing how players influence GMs to change their narratives would be useless unless we also understood how the players make their desires known. This is why Questions 9 and 10 dealt with how GMs can tell what players are interested in. According to the GMs, players show their interest in the following ways:

1. Asking questions. Players ask more questions about objects of interest;
2. Interactions. Players will have more interactions with objects of interest;
3. Discussion. Players will talk about in-game events between sessions;
4. Showing emotion. Players will show stronger emotion when they are engaged;
5. Body language. Players will show interest or lack of interest non-verbally;
6. Keeping playing. If players are enjoying themselves, they will play longer; and
7. Revisiting. Players will voluntarily choose to revisit areas or NPCs.

Some responses were deemed to be out of the scope of this study. Although it is possible for a computer to read non-verbal signals or tones of voice with facial motion capture and voice analysis, this is not our research focus.

5 Discussion and Implications

Our results suggest that this approach to designing a game master agent is promising, and points the way to further research and to the construction of such an agent.

5.1 Results of the Study

Having established ten reasons why story changes may become necessary (4.1) and seven ways in which players demonstrate interest in game elements (4.3), we created flow charts representing GM decision options for each of these reasons (Appendix 1). These flow charts were tested by consulting them during roleplaying game sessions and using them as a basis for the GMs deciding when to adjust the story. GMs reported that the charts were successful indicators of when and how a narrative could be altered due to player actions.

5.2 Implications of the Study

The GM decision charts demonstrate how a GMA can be designed from first principles. The flow charts, although simple at this point, are fair representations of how GMs make decisions about changing the narrative. If consulted while a roleplaying game is being run, the charts are capable of interpreting player choices, differentiating between them, and suggesting a solution. Together with the data about how players show their interest, the flow charts can be used to make these decisions. When a player is not following plot hooks, consulting the charts will find a possible reason for that behaviour, and guide the response of the GM. This will vary from adding an element to the story or reminding players of a plot hook, to making the decision to create new plot hooks or new plots if that would better satisfy perceived player needs. This evidence suggests that the flow charts are a good basis for creating a GMA.

5.3 Further Research

Phase Two of our research will use the flow charts to create a GMA in a game engine that will act as GM, prepared to adapt at any time. The action and themes of the story must change to suit player choices, and the experience must be structured in a dramatically-satisfying manner. We will create a scenario and the system will use the data from the GM interviews to make choices based on player actions and reactions. We will then conduct testing to determine how successfully the flow charts are being implemented. Players will play through the scenario with their experience managed by either the GMA or by a human GM. If conducted online, the players need not know which. The players will be asked to rate their experience during the game, and how satisfied they felt in the story that unfolded. If player satisfaction with the narrative generation system even approaches their satisfaction with a GM-controlled narrative, then the experiment will be deemed successful. **Phase Three** will be to analyse GM strategies for story creation and world building, and to graph how new plots can be created by the GMA. **Phase Four** will be to incorporate this data into the narrative improvisation system. Once again, this will be tested to determine whether the GMA can deliver players a similarly satisfying narrative to that provided by a human GM. We believe that the game master agent, and the results from this research, will make a meaningful contribution to the development of narrative improvisation.

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