Narrative flow: a formal approach of character network generation for non-linear narratives

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1 Introduction

Character networks are used in various fields to aggregate information, synthesize narratives and highlight specific aspects in the structure of a story (e.g. Moretti (2011), Amancio (2016), Gil et al. (2011) or the survey by Labatut and Bost (2019)). By nature, a character network is a collection of characters and interactions, and it is easily built from a linear narrative. But if the narrative offers choices or bifurcations which shape the story in different ways, building a character network raises specific challenges (as stated by Rochat and Triclot (2017) for video games).

Video games or gamebooks are a good example of narratives which often leave some degree of freedom to the player (Domsch, 2013). To study their scenario and the relations between the characters with the help of a character network, those choices need to be taken into account. This paper aims to sketch a generic model called the *narrative flow*, describing both linear and non-linear narratives[1] (the former being a special case of the latter, in which there is exactly one way of browsing the narrative), and to show how this can then be mapped to a character network. This will also help the generation of automated character networks, as the whole mapping process from that narrative flow to the network can be performed similarly for any type of media source.

2 Narrative flow, narrative traversal

A *narrative unit* is a building block of a narrative. The exact definition depends on the medium and the desired granularity. A story can be segmented in many different partitions of narrative units. In a novel, a typical choice of narrative unit would be a sentence or a paragraph.

[1]The goal here is to oppose linear and non-linear narratives, but the most common term for the latter is *interactive narratives*, as in the works of Ryan (2009) or Riedl and Bulitko (2013).

A narrative unit can be enriched with a set of implicit and explicit *features*, i.e. pieces of information regarding the unit which can then be used in further analysis of the work. Common examples of features include characters, locations and time. Medium-related properties, such as page number, are also relevant to keep track of a mapping to the original content.

A *narrative flow* is a directed graph which describes the ordering of a set of narrative units. There is a large amount of possible narrative flows related to a narrative, depending on the chosen granularity of units.

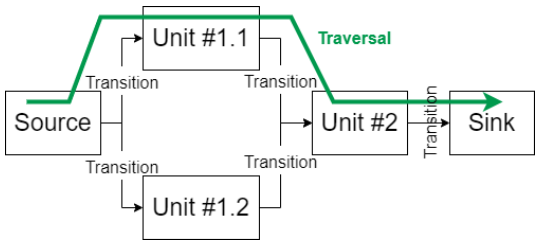

Figure 1: Structure of a narrative flow and a traversal.

A *transition* links one narrative unit to the next, creating a narrative sequence. Each transition has a probability of being chosen, and the sum of all outgoing probabilities of a unit must be 1.

A linear story has no bifurcation in its narrative: every unit of related narrative flows has indegree and outdegree of at most 1. In that case, narrative units could be merged to produce a narrative flow with one single unit. On the other side, when the story contains bifurcations, the related transitions must be preserved in each narrative flow: units linked by a single transition can be merged, but the "highest-level" narrative flow must still display all bifurcations.

Without loss of generality, we assume that the narrative flow has only one unit with indegree (resp. outdegree) 0, called *source* (resp. *sink*). A *narrative traversal* is a path from source to sink. More

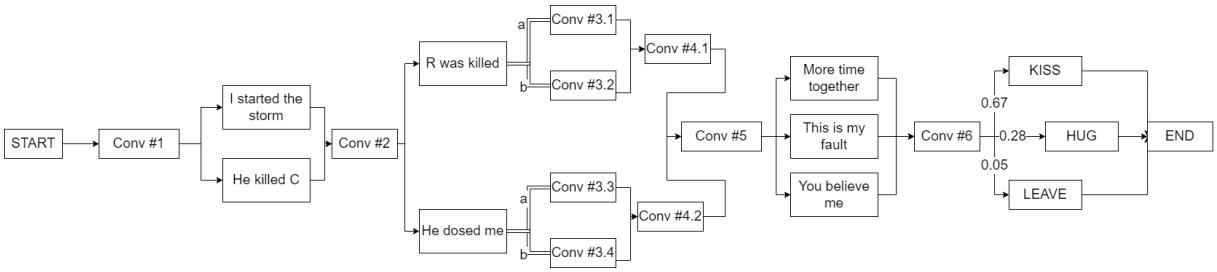

Figure 2: Narrative flow of the "Conversation with Warren" in Episode 5 of *Life is Strange*.

concretely, a narrative traversal represents the way a story is experienced from beginning to end (see figure 1). A linear story will have a single traversal, whereas an interactive story may feature more. If the graph contains at least one cycle[2], there is an infinite number of possible traversals.

3 Aggregation function and character network generation

To gather all features on a specific traversal, we need an *aggregation function*. The definition of this function depends on various factors (nature of the story, type of interactions, format of features, etc.).

In our case, we focus on character networks based on co-occurrences. Each narrative unit is thus assigned a list of co-occurrences between all characters present in this unit. Then, the aggregation function will gather all those co-occurrences in a single list, allowing us to build a character network (where the nodes are the characters of the story, and the edges represent their co-occurrences).

For non-linear narratives, each traversal will result in a possibly different character network. To study those, we could gather them in a new network. A computational way would be to run a large amount of random traversals, generate the related networks and create a network where the weight of an edge would be the average of the weights of that same edge across all generated networks. But a more theoretical approach could also be designed, to find the limit of that network when the number of traversals tends to infinity. Both scenarios are currently explored and will be developed further.

[2]One example of cycle would be dialogues with non-player characters in a video game, when we are free to interact with them as many times as we wish and they produce the same answer endlessly.

4 Concrete example: Life is Strange

To illustrate those definitions, we consider the video game *Life is Strange*, developed by Dontnod Entertainment and released in 2015. This story-driven game is known to have important choices in which the player has a real impact on the scenario. A game script has been provided by the community and can be found online[3]. Another nice feature which motivated the choice of this game for our example is the availability of the percentage of players who took each option for the most crucial choices (as designed by the developers): these statistics are shared during the game and can also be found on the same website.

Figure 2 shows a narrative flow of the "Conversation with Warren" in Episode 5. Each narrative unit is as big as possible while preserving all the choices. Double lines (e.g. leading to Conv #3.1) represent choices which follow from a previous decision (a or b, in that case, both depending on some actions made (or not) in earlier chapters). By default, the outgoing transitions of a narrative unit are equiprobable. The last three choices (written in capital letters) belong to the list of crucial choices for which probabilities are given, which is why we were able to set 0.67, 0.28 and 0.05 on the respective transitions.

As this example shows only a dialogue between two characters, the character network is identical in every traversal. But we are currently working on building a narrative flow for the whole game, which will allow us to produce character networks and analyse them further.

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