Affective Character Network for Understanding Plots of Narrative Multimedia Contents

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Abstract. It is important to understand the stories from narrative multimedia contents (e.g., movies), and to exploit the stories for smart services (e.g., video summarization and personalized multimedia recommendation). In this paper, we extend CharNet (Character Network) to Affective CharNet (Affective Character Network) by annotating emotional relationships between characters. More importantly, we propose a novel method on analyzing Affective CharNet for extracting the plots from the narrative multimedia contents.

Keywords: Character Network, Affective Computing, Narrative Analysis, Social Network Analysis, Emotional Social Network

1 Character Network

The goal of this study is to understand the stories (more properly, plots) of narrative multimedia contents by using Affective CharNet (Affective Character Network). To model and analyze stories and plots of narrative multimedia contents, various studies have been conducted with social network analysis (e.g., RoleNet [7], CharNet [4], and CoCharNet [6, 5]). Common contribution of these heuristics-based studies are based on social networks between characters. They have measured the strength of social ties between characters based on frequencies of co-occurrences and dialogues of characters. Based on the intensities of social relationships, they classified characters into main characters, minor characters, and extras.

Definition 1 (Character Network). *A character network N can be represented as*

$$N = \langle CH, R \rangle \tag{1}$$

where C is a set of characters in the story, and $R \subseteq |C| \times |C|$.

However, they are not able to clearly reflect the plots or storylines. The plot is defined as a sequence of events which are described in contents and logically

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related with each other. As an example, CoCharNet (our previous study [6]) can partially represent external shapes of stories. The social relationships are simply accumulative based on frequencies of co-occurrence or dialogues. Even though social relationships are discovered, it is hard to represent events between characters over time. Thereby, CoCharNet needs to be extended to analyze dynamic changes of social relationships.

Another issue on the previous studies is that they assume that all the social relationships among characters are homogeneous. Jung et al. [1] also tried to annotate emotional states of characters on CharNet. However, they are not able to reflect dynamic changes of emotional relationships, since they only have considered emotional states of characters on average.

2 Affective CharNet for Extracting Plots

By considering emotional relationships between characters, the character network N can be extended to an affective character network.

Definition 2 (Affective Character Network). *An affective character network AfN can be represented as*

$$AfN = \langle CH, E, R \rangle \tag{2}$$

where C and R is a set of characters in the story and a set of emotions, respectively. The social relationships are represented as $R \subseteq |C| \times |E| \times |C|$.

To annotate dynamic changes of emotional relationships and detect events between characters, we apply the following two approaches.

- first, segmenting contents based on co-occurrence of characters, and
- second, detecting events based on radical changes of emotional relationships.

Based on these approaches, plots are exploited by following procedures.

- segmenting contents and annotating emotional relationships between characters at each segment,
- detecting the events described in contents by searching radical changes of emotional relationships,
- and modeling plots based on the events and characters involved in the events.

Prior to annotating emotional relationships on CharNet, we have to extract emotional states of characters at each segment. Data sources to extract emotional states are different form kinds of contents. If they are visual contents, we can apply facial expressions. In other case, if they are textual contents, we can use emotional words. Preliminarily, we have manually annotated emotional states as a 1-dimensional value from -1 to 1. If the value is close to -1, it means negative emotional states. In opposite case, it means positive ones.

To transform emotional states into emotional relationships, we have made three assumptions that emotion of a character will be directed to characters

– which have high connectivity with him/her,
– which are included in same social groups with him/her, and
– which have connection with him/her.

Fig 1 is an example of the Affective CharNet, where ch_a indicates an a-th event and $E_{a,b}$ means emotional relationship of ch_a toward ch_b.

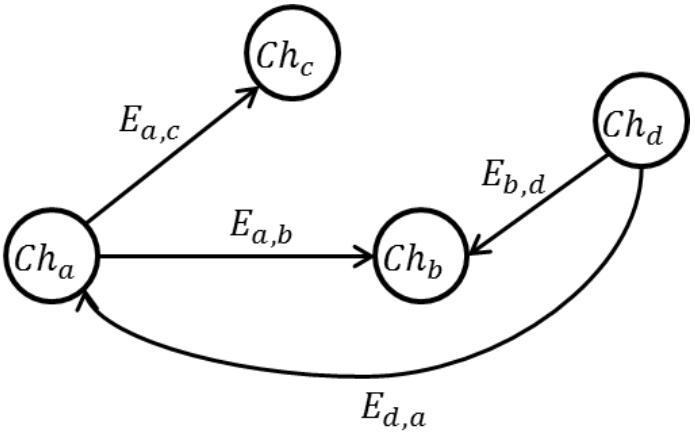

Fig. 1. An example of affective CharNet

To model and visualize plots of the narrative multimedia contents, we locate detected events in order which is described in contents. Also, by annotating characters involved in each event, we make the model enable to represent logical linkages between characters. Fig. 2 is an example of the proposed computational model of the plots, where e_i indicates an i-th event.

3 Conclusion

In this study, we propose a method to annotate emotional relationships on CharNet. Also, we extract and model plots of narrative multimedia contents. It is meaningful in terms of the first try for computational analysis of plots.

However, this is a manifesto paper with some preliminary research with many practical limitations. We have planned the following work in future.

– Most importantly, we need to conduct experimental study to prove the proposed methods.
– More refined method to extract emotional relationships is needed.
– An appropriate way to evaluate accuracy and efficiency of the proposed method is necessary.

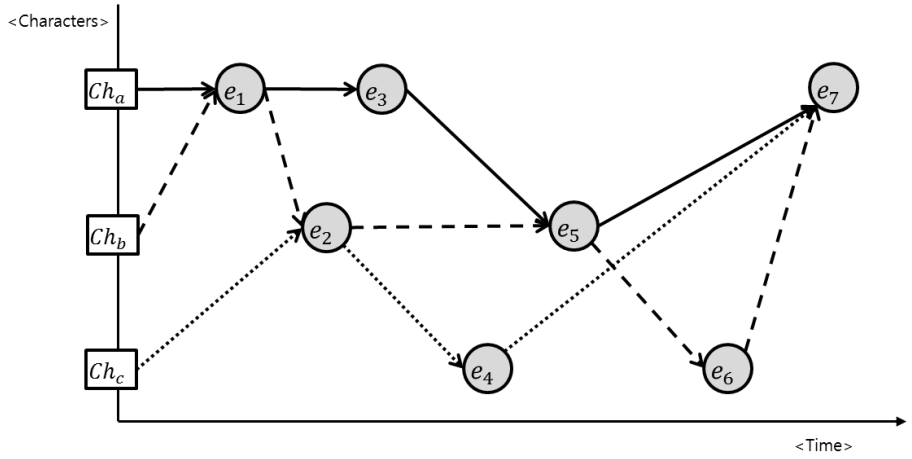

Fig. 2. An example of the computational model of plot

- Storification [2] process will be considered to personal recommendation services.
- Transmedia ecosystem [3] will be considered to show the relationships among the narrative contents.

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