Extraction and Description of the Narrative Structure from TV-Series

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Content

- Objective
- Background
- Related work
- Terms and Definitions
- Narratives
- Pipeline
- Annotation

Objectives of Thesis

- Originality
- Automatically extracting the narrative structure from TV Series
- Solution :
  - Finding a way to answer the question Who, Where, What, When and How all together.
- Barrier
  - Semantic Gap between what is extracted and the storyline convoyed

Background

- Narratives : exited since stone age
- Narrative structure: Story and Discourse (Plot)
  - Lots of people have studied narratives and narratology as literature
    - **Aristotle** : Beginning, Middle, and an End
    - **Propp** : analyzed the basic plot components of folk tales and presented a model of narratives based on narrative functions and character roles
      - 31 elements, into 4 spheres (introduction, the body of the story, the donor sequence and the hero's return)
      - seven character types (Villain, Dispatcher, Helper, Princess, Donor, Hero, False hero)
    - **Tezveton Todrov** : Five steps
      - Equilibrium ,Disruption, Realization, Restored order, equilibrium again
      - Narrative into *histoir* and *discours*
    - **Claude Lévi-Strauss** : binary opposites (E.g. good vs evil, man vs woman, peace vs war, wisdom vs ignorance, etc)
      - Narratives are organized around the conflict of between such opposites

Related Work

- **Finlayson** focused his job on **Annotated Folktale's Narrative Structure Learning**
- **Valls-Vargas** thesis on **Narrative Infromation Extraction with Non-Linear NLP**
- **D.K. Elison** focused his **Modelling Narrative Discourse**
- Finlayson and Valls-Vargas worked on the Propps' folktales and propp,s morphology
- **M. Barbier** worked on **Automatic Summarization of Narrative Video**
- **B. Xavier** also focused on **Automatic video summarization: case TV-Series**
- **N. Mostofazadeh** thesis was on **From Event to Story Understanding**

Related work

- **N. Chambers el al** Learn Narrative Schemas and Narrative Event Chain
- **M. Regneri** et al tried to learn event scripts from list of actions, their technique is a variation of the multiple sequence alignment technique
- Analysis of emotional arcs. **By Andrew J. et al.** (The emotional arcs of stories are dominated by six basic shapes)
  - Stories from Gutenberg's fiction collection
  - Seven narrative structures ()
- Social Network Analysis (SNA) of TV Drama Characters via Deep Concept Hierarchies (DCH) by Nan, **Chang-Jun et al**.
  - Purpose: analyze the r/ship of characters
  - DCH inspired the process of child
  - SNA capable of capturing visual-linguistic concept

Related work

- Extraction and Analysis of Dynamic Conversational Networks from TV Series by **Xavier et al**.
  - Study SN of interactions
  - Character interactions are well structured into stable communities
- MPST: A corpus of movie plot synopses with tags by **Sudita Kar et al**.
  - Social tagging of movie reveals information (genre, plot structure, etc)
  - Flow of emotions
- Learning Video Story Composition Via RNN by **Zhong et al**.
  - Compose a video-story from a group of video clips
  - RNN learns Coherence between video-clips
  - Sub-modular ranking to improve video story composition

Terms and Definitions

- **Narrative**: a way/technique/art to tell or present a story, idea, concept and etc
  - The way how a character's life is disrupted by an event or change in his/her situation.
- **Narrative structure**: the content of a story and the form used to tell the story (Story and Plot respectively)
- **Narrative Complexity:** The intertwinedness of the narrative due to many reasons
  - Number of characters
  - Number of narrative threads
  - Etc

Terms and Definitions

- **Narrotology:** Study the logic, principles and practice of narratives
  - Cognitive: human intellectual and emotional processing
  - Thematic: semiotic formalization of sequence of actions told in narratives
- **Computational Narratives**: How to algorithmically represent, understand, and generate stories.
  - Links the daily human activities (narratives) and the computing world (machines computations).
  - Modeling existing narratives

Terms and Definitions

- **Scene(s_j^i):** set of sentences/Dialogues/Shots, that which focus on one specific unit/content of a story or events and can happen on the mostly same location and with same person or set of same people.

$$s = \{\tau_1, \tau_2 \ldots, \tau_t\} \text{ or } s = \{v_1, v_2 \ldots, v_v\}$$

where τ is a texts and v is the shots in a scene.

- **Event**: is a sentence or couple of sentences or a visual happening that disrupt the characters.
  - It create a big issue between characters.
  - It has high sentiment measure value. It could be positive or negative sentiment

$$e = \{t_1, t_2 \ldots, t_e\} \text{ or } e = \{v_1, v_2 \ldots, v_e\}$$

where t is a sentence and v is the shots in a an event

Terms and Definitions

- **Episode(E):** a video/subtitle/audio focuses on one full story which lead for a new story or continuation of a story

$$E= \{s_1 ,s_2 \ldots s_n \}$$

Where n is the number of scenes in an episode

- **Temporal Scene Segmentation (**$S(s, \delta)$**)**: a set of pair of a scene and its elapsed time based on temporal segmentation of an episode with non overlapping starting and end time.

$$S(e) = \{(s_1 , \delta_1), (s_2 , \delta_2), \ldots, (s_c ,\delta_c)\} \text{ where } \delta_s =[t_s (s), t_e (s)]$$

i.e. $s_i \cap s_j = Ø$ and $\delta_i \cap \delta_j = Ø$ where δ is time span of a scene and $t_s(s)$is the start time, and $t_e(s)$ is the end time

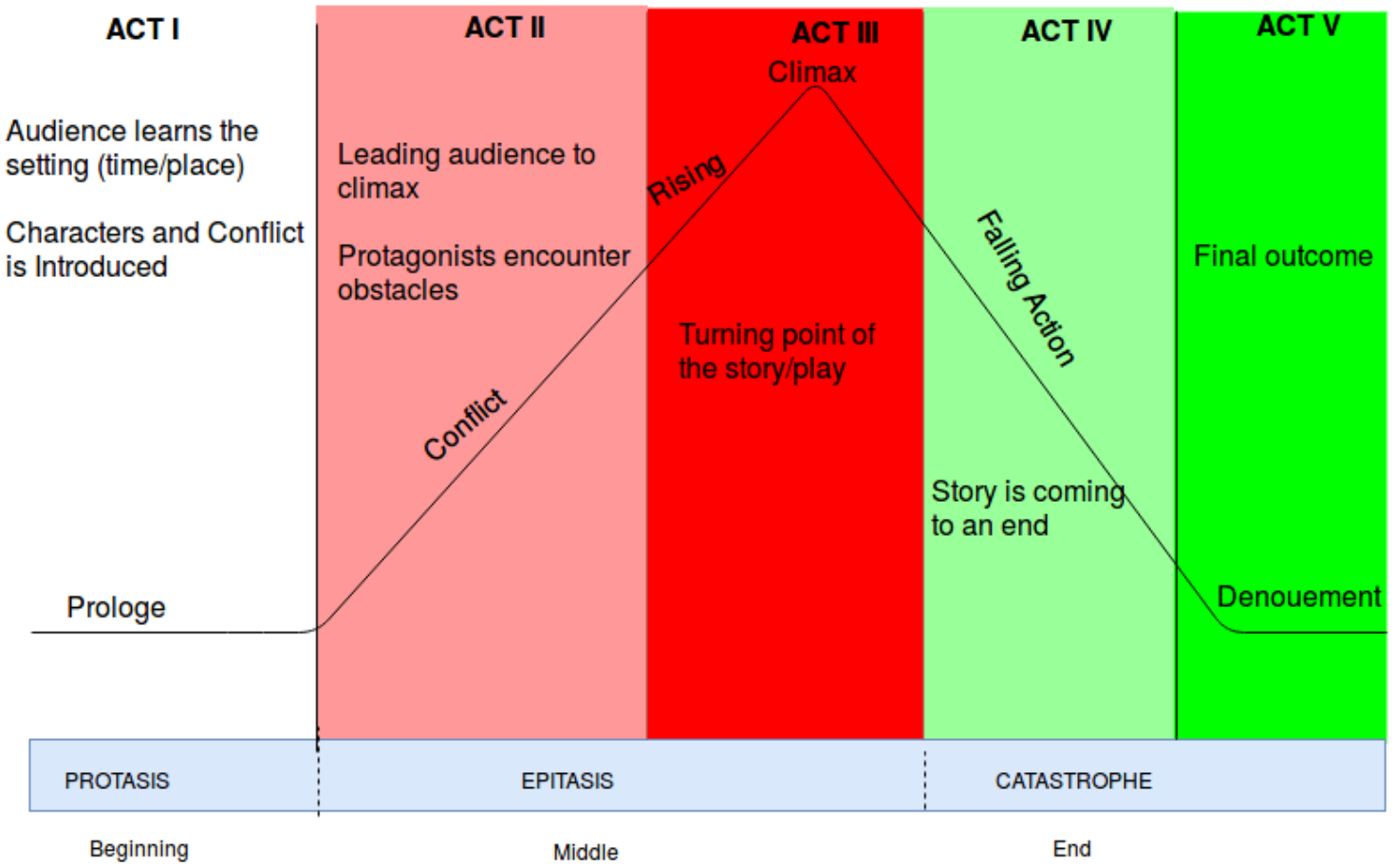
- **Scene Linking**: The story/unit similarity or degree of connectivity of two or more scenes (i.e, $s_j^i \rightarrow s_j^k$, scene i is linked with scene k)

Why Narratives?

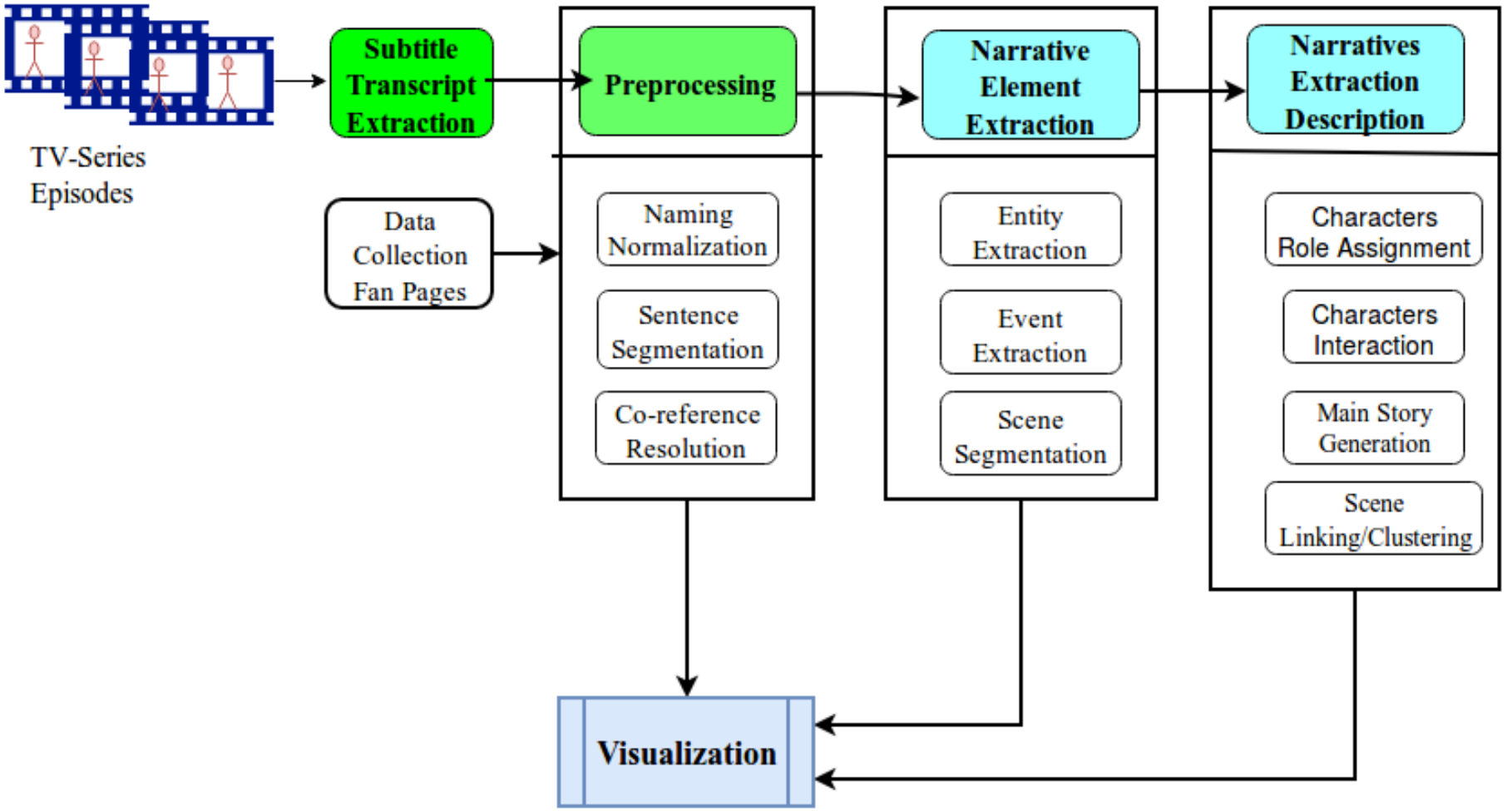
- They include higher level themes related to deeper human emotions
  - ➔ Trust and honesty,
  - ➔ Love and friendship
  - ➔ Good and evil,
  - ➔ Valuing people and tackling challenges
- Ability to capture audiences (narrative hook)

Narrative Structure

- Patterns of drama in a play(Movie or Episode)
  - Three-Act structure (Aristotle)
  - Five-Act structure (Shakespeare was famous by this)



Pipeline


TV-Series Episodes
Subtitle Transcript Extraction
Data Collection Fan Pages
Preprocessing
Naming Normalization
Sentence Segmentation
Co-reference Resolution
Narrative Element Extraction
Entity Extraction
Event Extraction
Scene Segmentation
Narratives Extraction Description
Characters Role Assignment
Characters Interaction
Main Story Generation
Scene Linking/Clustering
Visualization

Examples: Event

Book

Bran's fingers started to slip. He grabbed the ledge with his other hand. Fingernails dug into unyielding stone. The man reached down. "Take my hand," he said. "Before you fall."
Bran seized his arm and held on tight with all his strength. The man yanked him up to the ledge.
"What are you doing?" the woman demanded. The man ignored her. He was very strong. He stood Bran up on the sill. "How old are you, boy?"
"Seven," Bran said, shaking with relief. His fingers had dug deep gouges in the man's forearm. He let go sheepishly.
The man looked over at the woman. "The things I do for love," he said with loathing. He gave Bran a shove.

Are you completely mad?
- He saw us.
- It's all fight, it's all right.
- It's all right.
- He saw usl
I heard you the first time.
Quite the little climber, aren't you?
- How old are you, boy?
- Ten.
Ten.
- The things I do for love.

Subtitle

Examples: Event

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- Ten.
Ten.
- **The things I do for love.**

Segmentation

Algorithm 1 Scene Segmentation

```
1:  procedure SCENE_SEGMENTATION(S)                ▷ S: sequence of labels
2:  tempList ← S[0 : 2]          ▷ initialize tempList by the first 2 labels from S
3:  sepPos ← []                                    ▷ separator position of a scene
4:  count ← 0
5:      if len(S) <= 2 then
6:          return: sequence too short
7:      else
8:          for i in range(2,len(S)) do
9:              if S[i] = tempList[−1] then
10:                 continue
11:             else if S[i]intempList then
12:                 tempList.pop(0)
13:                 tempList.append(S[i])
14:             else
15:                 count ← count + 1
16:                 if len(tempList) < K then          ▷ K is the window size
17:                     tempList.append(S[i])
18:                 if count = C then          ▷ C: Number of different speakers
19:                     sepPos.append(i − C)
20:                     count ← 0
21:     return sepPos                ▷ returns the separating positions of scenes
```

Segmentation

- Take Shots threading
  - Sequence of shots
  - Sequence of labeled shots
- The average results
  - As binary boundary (0000100001) where 1 is boundary
  - As cluster labels (0000111112)

Episode	K,c	Wind diff	Pk	Recall	Precision	Purity	Coverage	NMI	Scene Auto	Scenes Man
Average	**8,6**	**0.72**	**0.41**	**0.189**	**0.132**	**0.963, 0.704**	**0.945, 0.753**	**0.793**	**32**	**28**

Scene Linking

- Identifying scenes that are similar is important for understanding and defining independent parallel stories
- There are many ways to do this, but here are my ideas
  1. In case of Video:Taking the last few shots of scene s_j^i and the the shots at the beginning of next scene s_j^{i+1} and compare them for similarity
     1. Color histogram and object identification using different ML techniques
  2. In case of Text: Taking the last few sentences of s_j^i and the few starting sentences of s_j^{i+1}
     1. Sentence embedding (doc2vec) and compare for similarity
     2. Summarizing the two scenes and compare the summaries

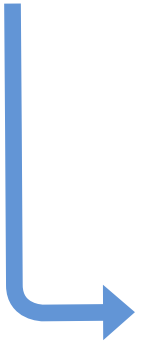
Linking Categories

- Different ways of linking here is based on Rémi Bois et al.
  1. Flash back/Flash forward : a scene flashbacks another scene or predicts an event in other scene
  2. Summary/Development : an even in a scene progresses or develops in other scene/s
  3. Action/Reaction: an event in a scene gets response on another scene
  4. Similarity/Near duplicate: scenes discussing the same event or story

Scene Linking

Pardon me, ser.
Do I frighten you so much, girl? Or is it him there making you shake? He frightens me too. Look at that face.
I'm sorry if I offended you, ser. Why won't he speak to me?
He hasn't been very talkative these last 20 years. Since the Mad King had his tongue ripped out with hot pincers.
He speaks damn well with his sword though.
Ser Ilyn Payne, the King's Justice. The Royal Executioner. What is it, sweet lady?
Does the hound frighten you? Away with you, dog.
You're scaring my lady. I don't like to see you upset.
The sun's finally shining. Come walk with me.
Stay, Lady. **26**

Progress/Development Linking



I probably shouldn't have any more. Father only lets us have one cup at feasts.
My princess can drink as much as she wants. Don't worry. You're safe with me.
I'll get you
Aryal
Owl, What are you doing here? Go away.
Your sister? And who are you, boy?
Mycah, my lord.
He's the butcher's boy.
He's my friend.
A butcher's boy who wants to be a knight, eh? Pick up your sword, butcher's boy. Let's see how good you are.
She asked me to, my lord. She asked me to.
I'm your prince, not your lord, and I said pick up your sword.
It's not a sword, my prince. It's only a stick.
And you're not a knight. Only a butcher's boy. That was my lady's sister you were hitting. Do you know that?
Stop it
Arya, stay out of this.
I won't hurt him… much.
Aryal
Filthy little bitch
No, no, stop it, stop it, both of you You're spoiling it. You're spoiling everything
Aryal Nymerial Aryal Nymerial
No. No. Please don't.
Arya, leave him alone. My prince, my poor prince, look what they did to you. Stay here. I'll go back to the inn and bring help.
Then go Don't touch me **27**

Cont..

(Man) Grenn, show him what you farm boys are made of. If that were a real sword, you'd be dead. Lord Snow here grew up in a castle spitting down on the likes of you. PYP, Do you think Ned Starks bastard bleeds like the rest of us?
(Shouts) (Coughs)
Nextl (Grunting) Nextl (Grunting)
Well, Lord Snow, it appears you're the least useless person here. Go clean yourselves upl
There's only so much I can stomach in a day.
A charming man.
I don't need him to be charming. I need him to turn this bunch of thieves and runaways into men of the Night's Watch.
And hovfs that going, Commander Morrnont?
Slowly. **A raven came...for Ned Starks son.**
Good news or bad?
both

Action/Reaction

You broke my nose, bastardl It's an improvement. If we threw you over the Wall, I wonder how long it would take you to hit. I wonder if they'd find you before the wolves did.
What are you looking at, halfrnan?
I'm looking at you. Yes. You've got an interesting face. Hmm, very distinctive faces. All of you.
And what do you car'e about our faces?
It's just… I think they would look maNeIlous dmorating spikes in King's Landing. Perhaps I'll write to my sister, the queen, about it. We'll talk later, Lord Snow.
Everybody knew what this place was and no one told me. No one but you. My father knew and he left me to rot at the Wall all the same.
Grenn's father left him too… outside a farmhouse, when he was three. Pyp was caught stealing
a wheel of cheese. His little sister hadn't eaten in three days. He was given a choice his right hand or the Wall. I've been asking the Lord Commander about them. Fascinating stories.
They hate me because I'm better than they are.
It's a lucky thing none of them were trained by a master-at-arms like your Ser Rodrik.
I don't imagine any of them had ever held a real sword before they came here.
Oh… Your brother Bran.

Annotation

- Here are some annotation that will help me
  - Speaker identification
  - Scene boundary
  - Scene category (for Linking)
  - Scene Story (Related story of a scene having in mind the big stories of the TV-series)
  - Events and their categories
    - ACE identified seven types of entities:
      - Person, Organization, Location, Facility, Weapon, Vehicle and Geo-Political Entity (GPEs).F
    - 8 types of events and many sub events by ACE annotators
      - Justice, Personnel , Contact , Conflict ,Business , Transaction, Movement and Life

Cont..

- Characters` roles
- Reference resolution
- Short summary of each scene
- Shot narrative description
  - Short introduction/beginning of the episode
  - Short description what happens in the middle
  - Short description on how it ends
- Etc

Difficulties

- No enough references on TV-Series
- Subtitle may not be enough
- Actions taking in a video may not be well represented
- Meaningful gestures may not be captured
- Concept drift
- Annotated data may not be enough

References