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Quality Evaluation of Computational Models for Movie Summarization

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1. Outline - Contributions

- Use of state-of-art-techniques for **salient event detection** and **movie summarization** using multicue information (i.e., audio, visual and text information)
- Investigate, through subjective and objective quality evaluation, how such systems can be improved
- The evaluation of computation models for movie summarization is usually based on the comparison of the system-detected observations and ground-truth data

➡ **MovSum Database:** an evolving multimodal video oriented database annotated with:

- **saliency (sensory and semantic events) & cross-media relations**

- Goal: the production of ***user-defined***, ***high-quality*** movie summaries that will heighten the human experience and consist of user-preferred content

2. *MovSum* Database (Movie Summarization Database)

Saliency annotation

7 movies (30 min long):

A Beautiful Mind, Chicago, Crash, The Departed, Gladiator, Lord of the Rings – the Return of the King, Finding Nemo

Sensory information: Audio, Visual and Audio-Visual saliency

- **Semantic information:** conceptually important stand-alone semantic events (e.g., important names, plot elements etc)

"Good to see you again old friend!"

- **Informative-segments:** segments important for understanding the narration-plot of the specific half-hour movie clip
- **Affective information:** intended and experienced emotions [3]

Additionally:

Expert summaries, in relation to the plot (ca. 5min)

Movie structure, incl. scene & shot segmentation

Percentage (%) of Salient Frames (labeled by at least two annotators)								
Layer	BMI	CHI	CRA	DEP	GLA	LOR	FNE	Mean
A	25.4	56.3	55.0	33.4	60.9	58.3	54.6	49.1
V	30.1	46.3	37.9	32.4	39.2	43.3	36.9	38.0
AV	27.4	47.7	43.1	37.8	69.6	50.7	39.7	42.3
AVS	63.2	76.6	64.8	71.8	68.5	72.7	67.6	69.3

Cross-media Relations

Based on the *COSMOROE framework* [4]
Movie: Gone with the wind (duration 1:44:15)

Equivalence: Different modalities express semantically equivalent information.

Type-Token:
Word: "dog", image:"dog"
Acoustic event: barking

Metonymy, part for whole
Word: "land",
image: part of the land

Complementarity: The information expressed in one medium is complement to the information expressed in another medium.

Agent-object Essential
Word: "scarlett, you look"
Image: a piece of paper

Exophora Essential
Word: "That"
Image: pointing at a dress

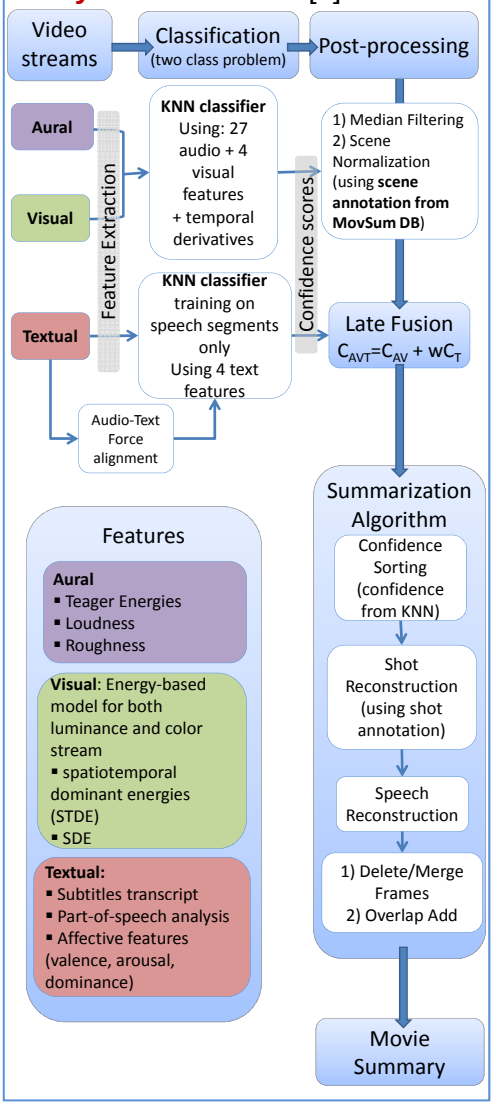
Independence: Each medium carries an independent message and their combination creates a coherent multimedia message
incl. *Contradiction, Symbiosis, Meta-Information*

Acoustic events annotation: incl. a) animal sounds, human sounds, natural/environmental sounds, machine sounds, general background sounds (music etc.)

Bell

Gallop

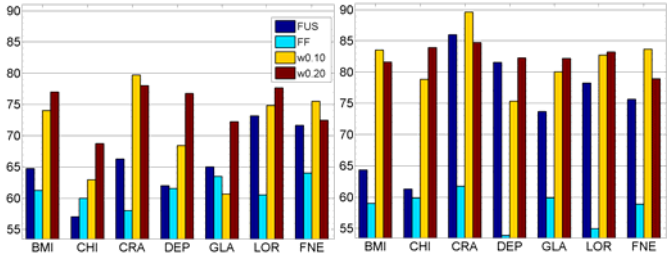
3. Movie Summarization System Overview [1]



4. Subjective Qualitative and Objective Experimental Results

Subjective Qualitative Evaluation setup

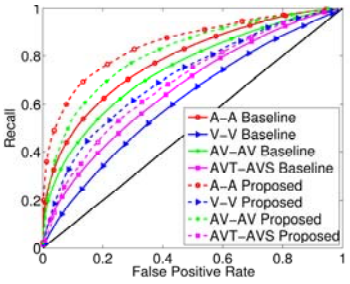
Summaries x5, ca. 6 min.
20 users
Evaluation on:
T_W0.1: text weight $T_W = 0.1$
T_W0.2: text weight $T_W = 0.2$
FUS: fusion method based on [2]
FF: fast-forward (sub-sampling 2 sec. every 10 sec.).



Results

- ➢ up to 80% for informativeness
- ➢ up to 90% for enjoyability
- ➢Different T_W is important and related to the movie genre
- ➢ Action movies need higher T_W
- ➢Boundary correction contributed to enjoyability:

a) smoother transitions and
b) semantically coherent events



Objective Machine Learning Results

- ➢ Proposed system outperforms the baseline [2] for all evaluation setups
- ➢Greater improvement for A-A

Improvements due to:

- ➢Advanced monomodal frontends, in all modalities
- ➢Carefully designed movie summarization algorithm that

a) corrects the boundaries and
b) Results in smoother transiotions

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