Statistical Analysis of Film Style

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Context

There is currently a lot of interest in using large databases of digital movies for proposing and testing statistical theories of film styles and aesthetics. The cinemetrics site [1] contains thousands of statistics of shot directions collected by researchers in film analysis. This line of studies was initiated by Barry Salt [2,3] who noticed that shot durations in a movie can usually be modeled with a single log-normal distribution. That model has also been used to represent the distribution of sentence lengths in literary texts. Furthermore, Barry Salt and other researchers have proposed that the parameters of the log-normal law for a movie can be used as a stylistic signature for the director, period and genre of the movie.

Objectives

In this Master's thesis, we would like to review this prior work and extend it in several novel directions:

- Verifying the log-normal law hypothesis. Recently, Cutting et al. presented an extensive study of the evolution of shot durations over the period 1930-1985 [4]. Using that dataset, we would like to better understand how the log-normal distribution observed by Salt is distributed temporally in each movie. Indeed, a movie is usually composed of scenes with differences in tempo (faster action scenes, slower mood and dialogue scenes). Using statistical test theory, we would like to investigate the different distributions observed per scene, per category and per movie; and how they can be used to recognize movie directors, film editors and movie genres, using methods borrowed from the area of "stylometry" [5,6].
- Explaining the log-normal law hypothesis. The log-normal distribution is NOT compatible with the common assumption made in the video processing community that movies are generated by Markov processes [7,8] and we would like to propose other generative models for movies, such as semi-Markov models [9] or stochastic, context-free grammars [10] that better explain the observed distributions, provide a better understanding of film styles and aesthetics, and help building better video processing algorithms.

This topic is offered to a Master's student with an excellent background in mathematics and computer science, leading to a PHD on the same topic.

References

[1] http://www.cinemetrics.lv/

[2] Barry Salt. Film Style and Technology: History and Analysis (2 ed.). Starword. 2009.

[3] Barry Salt. Moving Into Pictures. Starword. 2006.

[4] Cutting, DeLong and Nothelfer, "Attention and the evolution of Hollywood film", Psychological Science, 2010, vol. 21, PP. 440-447.

[5] Hughesa, Grahamb, Rockmorea. Stylometrics of artwork: uses and limitations. Computer Vision and Image Analysis of Art, edited by David G. Stork, Jim Coddington, Anna Bentkowska-Kafel, SPIE Vol. 7531, 2010.

[6] Daniel Keim and Daniela Oelketerature. Fingerprinting: A New Method for Visual Literary Analysis. IEEE Symposium on Visual Analytics Science and Technology, 2007.

[7] John S. Boreczky and Lynn D. Wilcox. A Hidden Markov Model Framework for Video Segmentation Using Audio and Image Features. ICASSP, 1998.

[8] Xu, Ma, Zhang, Yang. An HMM-Based Framework for Video Semantic Analysis. IEEE trans. Circuits and Systems for Video Technology, Nov. 2005.

[9] Shun-Zheng Yu. Hidden Semi-Markov Models, Artificial Intelligence, 174, pp. 215–243, 2010.

[10] Eugene Charniak. Statistical Language Learning, Cambridge: MIT Press (1993).