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Methods for Character Identification in Movies: A Review

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Abstract: ***Now a day's character Identification from films is a very challenging task due to the huge variation in the appearance of each & every character. It will lead significant research interests and may have many interesting applications in today's life. It is a challenging problem due to the huge variation in the appearance of each character.***
In particular, character identification for movie used video and script. Face tracking and clustering from video and name of person extract from script. Many challenges for face clustering and face-name matching are present. In good situation and clean environment existing methods gives better result, but in a complex movie scene performance is limited because face tracking and clustering process generate a noise. In this paper, we discussed about the methods and techniques used for Automatic face identification of characters in movies.
Keywords: cast list, script, graph matching, Face clustering, graph matching, graph partitioning

I. INTRODUCTION

The explosion of movies and Television provides a huge amount of video data. This leads to the requirement of efficient and effective techniques for video content understanding and organization. With the big development of movie industry a large amount of movie data is being generated every day. When you watch a movie or TV, mostly you don't know the all characters names in movie video. In movie, audience focused on character and real name of character, Sometime people takes third person references for real character name identification.
In this paper, our focus is on discussing various methods for identifying and annoying characters in the movie and TVs, which is called movie character identification. The objective is to identify the faces of the character in the video and label them with the corresponding names in the cast. The textual cues, like cast lists, scripts, subtitles and closed captions are usually employed. In a movie, characters are the focus center of interests for the audience. Their occurrences provide lots of clues about the movie structure and content. Automatic character identification is essential for semantic movie index and retrieval, scene segmentation and other applications

II. APPLICATIONS OF CHARACTER IDENTIFICATION

A. Character-Centered Browsing

Character centered browsing means searching scenes of particular character in movie or serial. we have to enter the character name and search for tracks where that character comes in scene.

B. Relationship Mining

Relationship mining is used to determine the relationship between characters using association between characters and the social network analysis

C. Actor-Specific Spotlights Summarization

On which users can input the actor names to search and digest the film content Taking actor George Clooney as an example, we aim to extract the key shots for him from these films. After the multi-task joint sparse representation and classification, we obtain a set of tracks identified as George Clooney, among which, the tracks including speakers are taken as the key tracks.

D. Movie Label and Indexing

The objective is to label television or movie footage with the names of people in each frame of video. For poor image quality and motion blur of video this techniques is essential to improve the performance of video

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III. REVIEW ON METHODS

The character identification problem focuses on the relation between videos and associated texts in order to label the faces of character with the name. Following challenges may occur in movie character identification:

The ambiguity problem in establishing the relationship between names and faces

- The ambiguity can arise due to multiple speakers in the same scene.

The face identification in videos is more complex than that in images.

Video data problems may get arise like: a) Low resolution, b) Occlusion, c) non rigid deformations, d) large motion, e) complex background etc. makes the results of face detection and that of tracking undependable.

The characters appear quite differently during the movie like childhood face and aged faces.

Following section describes the methods for character identification in movies.

A. Cast2 Face Framework

In paper [2] authors describes the method for labeling the faces of the characters in a movie with cast. This method has three components: 1) gallery face set collection with cast analysis and web image search; 2) probe face tracks extraction and description; and 3) face tracks identification with robust multi-task joint sparse representation and classification. Figure 1 depicts the working mechanism of Cast2Face method.

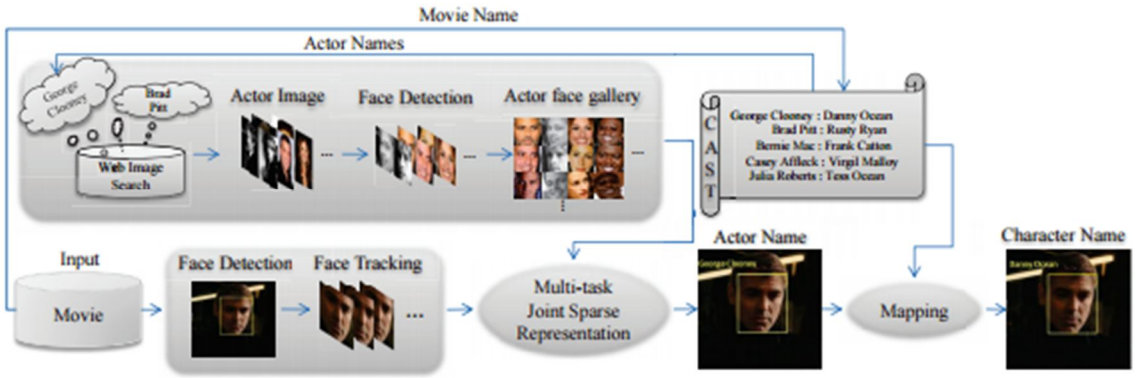

Figure 1. Framework for Cast2Face Method

In this method, the movie cast list which is easily available on the web or at the end of the movie is taken as one of input. For each character, by using the corresponding actor's name as a key word, retrieve from Google image search a set of images. Then they used the frontal face cascade detector [3] to detect faces appeared in each frame of the movie. A nine facial key points are included in the detected face region, including the left and right corners of each eye, the two nostrils and the trip of the nose and the left and right corners of the mouth. Then 128-dim SIFT [4] descriptor from each key point is extracted and concatenate them to form the face descriptor. After this they calculate the feature distance between a probe face track and the labeled exemplar faces, and then assign probe face track to the nearest neighborhood. The combination of subtitle/script alignment and speaker detection gives a number of ''exemplar" face tracks for which, with high probability, the single proposed name is correct [5].

B. Caption based Supervision

Matthieu Guillaumin, Thomas Mensink et.al. [6] implemented a method for automatic face naming. In this method first, images containing the name of the queried person are retrieved. In second step, a similarity graph over all faces detected in these images is constructed. Then an approximate search for the densest component of the graph is performed to select the faces belonging to the queried person. The main idea behind this is, constructing a graph over faces from some similarity or distance measure is to apply a threshold *Th* on the distances and to include an edge in the graph whenever the distance is smaller than *Th.* Then a k-nearest neighbourhood (kNN) definition and (ii) differentiating between neighbours using real-valued weights are used for a symmetric connectivity between faces. Euclidean distance is used over the 13 SIFT descriptor pairs as a distance measure, or count the number of matches for these 13 features for similarity measures. Authors also extend their work for multi-person naming by extending the graph-based approach by trying to find subgraphs Sn of the similarity graph for each name n as shown in figure 3.

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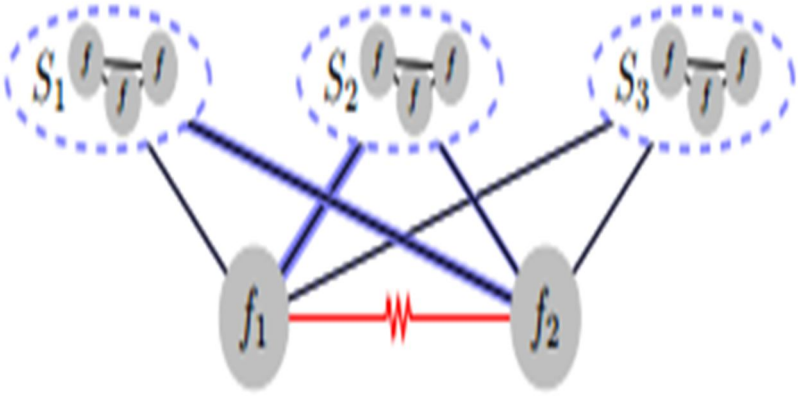

Figure 3 Example of a document with faces f1 and f2, and three names corresponding to subgraphs S1, S2 and S3. Given the sum ofedge weights (represented by width) that connect each face to the clusters, we search for the best admissible assignment.

As in the single-person case, the subgraphs associated with the names are initialized with all nodes where the name could be assigned. Then it require to iterate over documents and optimise eq. (1) per document. The iteration continues until a fixed-point is reached.

$$F(\{S_n\}) = \sum_n \sum_{i,j \in S_n} w_{ij}. \qquad (1)$$

C. Global Face-Name Matching

Yi-Fan Zhang, Changsheng Xu, Jian Cheng, Hanqing Lu [7] discussed the problem of finding faces in film using video and film script. In this method cluster the faces into groups corresponding to character and build face network according to face cooccurrences relationship. In the film script a name network is also built according to name co-occurrences relationship. The vertices of two graphs are matched by a hypergraph matching method. The script are obtained from the internet movie script database, for face track clustering define the similarity measurement between two face track, which is represented as,

S (Tm ,Tn) = μ, max i, j(S(fmi , fnj))

Where, Tm ,Tnare two tracks.S(fmi , fnj) is similarity between two track m and n.μ is normalization. SIFT descriptor is used for face covering overhead i.e. two eyes, nose and mouth. For clustering constrains K-means clustering is performed. Here number of cluster is set as the number of speaker names. Hypergraph constructed for ”m“ face track cluster is G (V, E) for face occurrences matric Oface= [Oij] m x n Where m is number of face , n is number of scenes, Oijis matrix of the face count i th character in j th scene. Also for name occurrences Oname= [Oij]m x n m is number of name, n is number of scenes, Oijis matrix of the name count i th character in j th scene. Hypergraph matching, two graphs

Gface= (Vf , Ef) and Gname= (Vn, En)

So, matching between Gfaceand Gnameis vertex to vertex

m: Vf⟶ Vnand edge to edge

m: Ef⟶ En matching.

Yi-Fan Zhang, Changsheng Xu, Hanqing Lu,and Yeh-Min Huang,[8] implement a character identification in feature length film using global face-name matching. To identified the faces of character in film and label them with their names. To investigate the problem of identifying character in film using video and film script. It implemented for character centered film browsing, which enables users to easily use the name as a query to search related video clips and digest the film content. For measuring face track distance Earth Movers Distance (EMD) is used and multiview face tracker used to detect and track faces on each frame of video. Constrained K-means clustering is performed on group of face track. To reduce the noise in clustering to refine the clustering result by pruning marginal point which have low confidence belonging to the current cluster. For face- name association build a name affinity network and a face affinity network in their domains i.e. script and video. Making the two networks i.e. face and name affinity network. Number of face cluster set a number of speakers Figure 4 shows flow of character identification using global face-name matching

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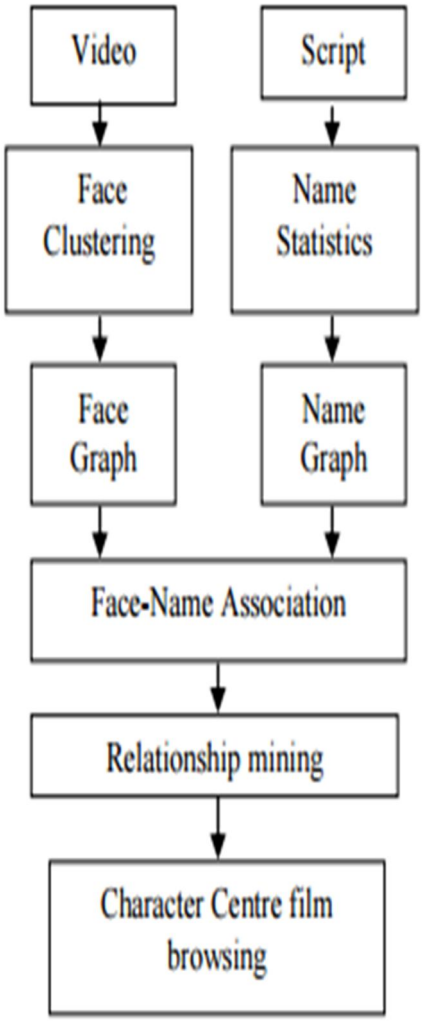

Figure 4: character identification using global face-name matching [8].

D. Graph based Character Identification

Jitao Sang, Changsheng Xu [9] implemented robust face-name graph matching for movie character identification system. Automatic face identification of character in movie or video is challenging problem due to huge variation in appearance and extrinsic parameter such as light, pose, complex background. The exiting methods gives a promising result in clean environment but the performance is limited in complex movie scenes due to the noise generated during the face tracking and face clustering process. The main objective of author is to identify the faces of character in the video and label them with the corresponding names in the cast list. As shown in figure 5 it implemented two schemes, difference in the pre-specification in number of cluster. Face tracks are clustered using constrained K-means, where the number of clusters is set as the number of distinct speakers. Co-occurrence of names in script and face clusters in video constitutes the corresponding face graph and name graph. We modify the traditional global matching framework by using ordinal graphs for robust representation and introducing an ECGM-based graph matching method. For face and name graph construction, the character co-occurrence in rank ordinal level [10], which scores the strength of the relationships in a rank order from the weakest to strongest. Rank order data carry no numerical meaning and thus are less sensitive to the noises. The affinity graph used in the traditional global matching is interval measures of the co-occurrence relationship between characters. While continuous measures of the strength of relationship holds complete information, it is highly sensitive to noises. For name-face graph matching, the ECGM algorithm[11] is used. In ECGM, the difference between two graphs is measured by edit distance which is a sequence of graph edit operations. The optimal match is achieved with the least edit distance. According to the noise analysis, appropriate graph edit operations are defined and adapt the distance functions to obtain improved name-face matching performance.

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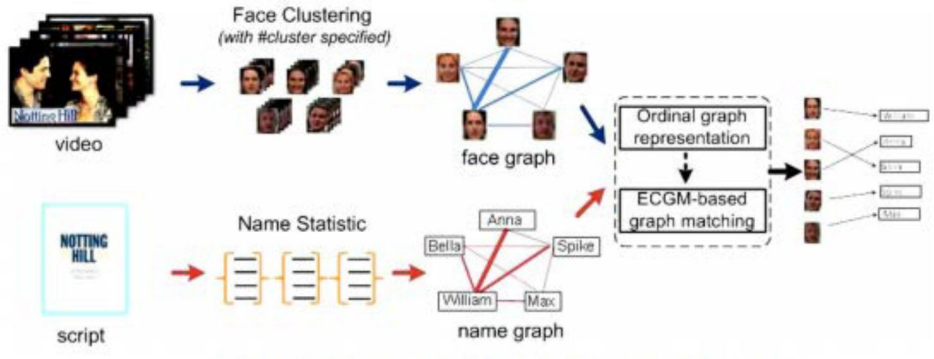
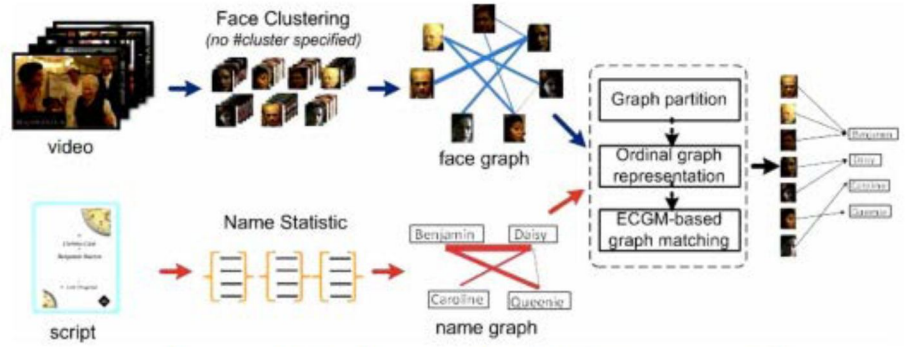


Framework of scheme 1: Face-name graph matching with #cluster prespecified.



Framework of scheme 2: Face-name graph matching without #cluster prespecified.

Figure 5. Graph matching for movie character identification using ECGM algorithm.

IV. CONCLUSION

Among all the methods, all are using different approach for face-name detection for character identification. That differs according to the information used for analysis and according to techniques that are employed to face clustering and name clustering.

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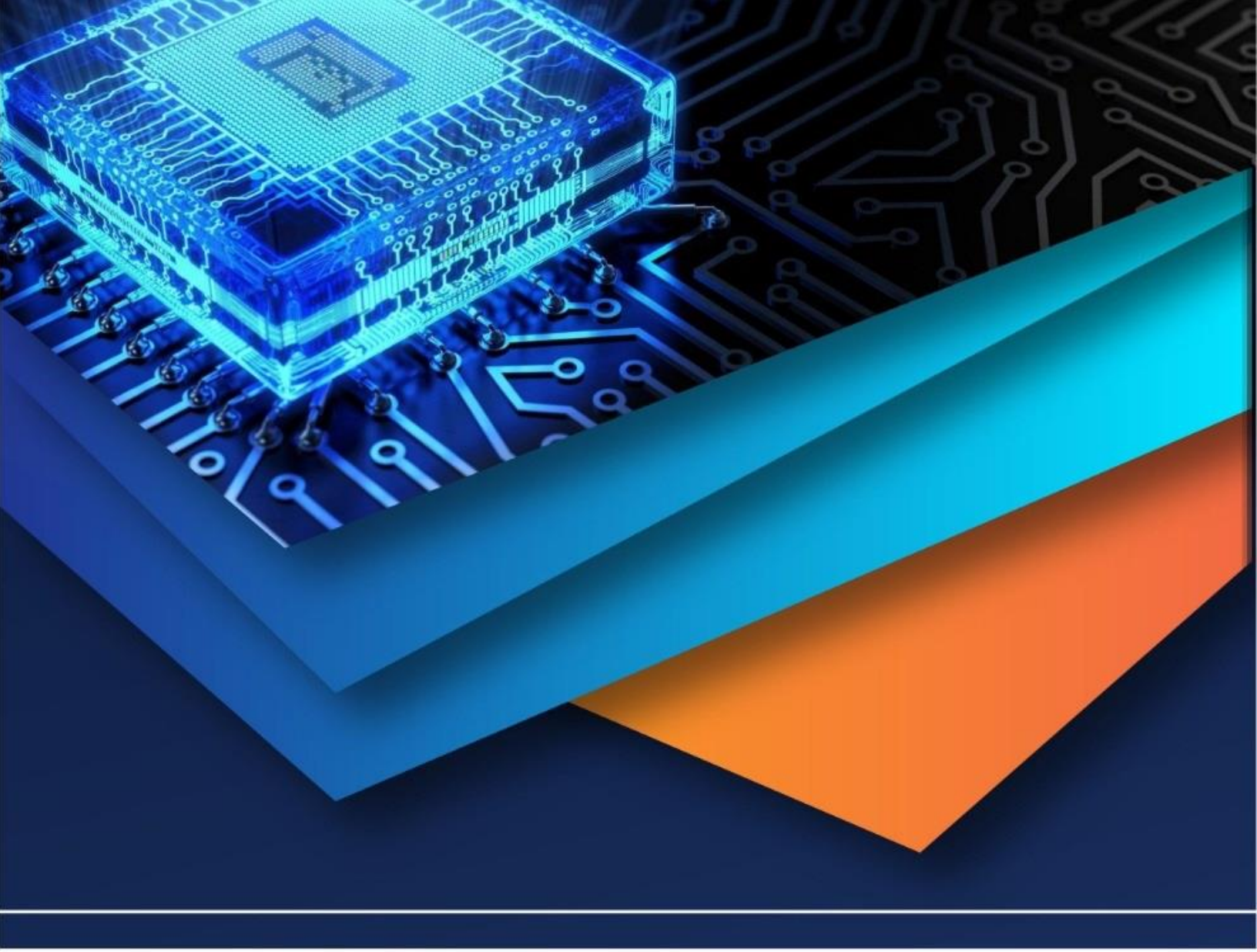

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