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A Review: Movie Character Identification Based on Graph Matching

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***Abstract*—** With the rapid development of movie and television industry a huge amount of movie and television data is being generated every day. To manage this data, efficient and effective technique is required, which understand the video contents and organize it properly, Character identification of movie is challenging problem due to huge variation in the appearance of each character and complex background, large motion, non-rigid deformation, occlusion, huge pose, expression, wearing, clothing, even makeup and hairstyle changes and other uncontrolled condition make the result of face detection and face tracking unreliable. .

Keywords- *Character identification, graph matching*

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I. INTRODUCTION

With the rapid development of movie and television industry a huge amount of movie and television data is being generated every day. To manage this data, efficient and effective technique is required, which understand the video contents and organize it properly. When you watch news videos, candidate names for the faces are available, but when you watch a movie or TV, mostly you don't know all the character's names in the movies or video. In movie and television serials audience focuses on character and its real name, Sometime people takes third person references for real character name identification. Automatic video annotation is one of such key techniques. It focuses on annotating characters in the movie and TVs, which is called movie character identification. The objective is to identify the faces of the characters in the video and label them with their names in the cast. The cast lists, scripts, subtitles and closed captions are usually exploited are known as textual cues [9].

Applications of Character identification:

Following are the applications of character identification

1. character-based video retrieval,
2. personalized video summarization,
3. Intelligent playback and video semantic mining,
4. Character Relationship mining
5. To identify characters in movies and label faces with their name.
6. To provide security at confidential area of banking sector.
7. To maintain employee attendance records and to restrict unauthorized person entry in MNC.
8. Webcam applications- Face detection in Face book, Security at ATM machine Authentication for PC and Other security applications [2].

II. CHALLENGES IN CHARACHTER IDENTIFICATION

The character identification is a tremendously challenging task in computer vision. The reasons are following.

1. The textual cues are weakly supervised .The ambiguity problem in establishing the correspondence between names and faces: the ambiguity can arise from a reaction shot where the person speaking may not be shown in the frames and in partially labeled frames when there are multiple speakers in the same scene
2. The face identification in videos is more difficult than that in images. Low resolution, occlusion, non rigid deformations, large motion, complex background and other uncontrolled conditions make the results of face detection and tracking unreliable. This brings inevitable noises to the character identification.
3. The characters appear quite differently during the movie. There may be huge pose, expression and illumination variation, wearing, clothing, even makeup and hairstyle changes. The characters in some movies go through different age stages, e.g., from youth to the old age.
4. The determination for the number of identical faces is not trivial. Due to the remarkable intra-class variance, the same character name will correspond to faces of huge variant appearances. It will be unreasonable to set the number of identical faces just according to the number of characters in the cast [9].

III. CHARACTER IDENTIFICATION METHODS

We can divide the existing movie character identification methods into three categories.

A. Cast list based

Cast list discovery problem: In the "cast list discovery "problem the faces are clustered by appearance and faces of a particular character are expected to be collected in a few pure clusters. Names for the clusters are then manually selected from the cast list. Ramanan et al. Proposed to manually label an initial set of face clusters and further cluster the rest face instances based on clothing within scenes the authors have addressed the problem of finding particular characters by building a model/classifier of the character's appearance from user-provided training data [5].

B. Subtitle or Closed caption, local matching based

Subtitle and closed caption provide time-stamped dialogues, which can be exploited for alignment to the video frames. The rest of the faces were then classified into these exemplars for identification. Time-stamped name annotation

and face exemplars are generated. They further extended their work by replacing the nearest neighbor classifier by multiple kernel learning for features combination. In the new framework, non-frontal faces are handled and the coverage is extended. The local matching based methods require the time-stamped information, which is either extracted by OCR (i.e., subtitle) or unavailable for the majority of movies and TV series.

C. Script/Screenplay, Global matching based

Global matching based methods open the possibility of character identification without OCR-based subtitle or closed caption. This is not easy to get local name cues; the task of character identification is formulated as a global matching problem. In the movies, the names of characters directly appear in the subtitle, while the movie script which contains character names has no time information. If the local time information is not presence, the task of character identification is formulated as a global matching problem between the faces detected from the video and the names extracted from the movie script. The comparison of the local matching, global statistics are used for name-face association, which enhances the robustness of the algorithms. [9]

IV. COMPARISON OF CHARACHTER IDENTIFICATION METHODS

Table 1

Cast List Based	**Local Matching Based**	**Global Matching Based**
Cast list textual resource used.	Subtitle or Closed caption textual resources used.	Script or Screenplay textual resources used
Faces are clustered by appearance of character	Faces are clustered into face exemplars which extracted from nearest neighbor classifier	Faces are clustered from extracted from video frames
No time stamp dialogue is required for alignment.	A time stamped dialogue is required for alignment.	No time information of character is required.
Names of character extracted from cast list of movie	Names are extracted from closed caption	Names are extracted from script of movie
Need manual labeling for clustering.	Time stamped information is used which extracted by OCR.	Face-name association is used for clustering.
The large intraclass variances, there is no quantative of clustering and classification performance.	It is more sensitive to face detection and tracking noise	The robustness of the algorithm is good
Easy to understand and implemented.	Not easy to understand and implemented	Not easy to understand and implemented.

V. ECGM-BASED GRAPH MATCHING

ECGM is a powerful tool for graph matching .The measurement of the similarity of two graphs, graph edit operations are defined, such as the deletion, insertion and substitution of vertexes and edges. Each of these operations is further assigned a certain cost. The costs are application dependent and usually reflect the likelihood of graph distortions. The more likely a certain distortion is to occur, the smaller is its cost. Through error correcting graph matching, we can define appropriate graph edit operations according to the noise investigation and design the edit cost function to improve the performance. For explanation convenience, we provide some notations and definitions taken from Let L are a finite alphabet of labels for vertexes and edges.

Notation: A graph is a triple g = (V, _, _), where V is the finite set of vertexes, _: V → L is vertex labeling function, and _: E → L is edge labeling function. The set of edges E is implicitly given by assuming that graphs are fully connected, i.e., E = V × V. For the notational convenience, node and edge labels come from the same alphabet 5.

Definition: Let g1 = (V1, _1, _1) and g2 = (V2, _2, _2) be two graphs. An ECGM from g1 to g2 is a bijective function f: ˆV1 → ˆV2, where ˆV1 ⊆ V1 and ˆV2 ⊆ V2. We say that vertex x ∈ˆ V1 is substituted by vertex y ∈ˆ V2 if f(x) = y. If _1(x) = _2(f(x)), the substitution is called an identical substitution. The cost of identical vertex or edge substitution is usually assumed to be zero, while the cost of any other edit operation is greater than zero. [9]

VI. RELATED WORK

VinayBettadapura [11] proposed the paper of the involuntary recognition of facemask expressions and has been an active study topic since the early nineties. The paper presents a time-line view of the advances made in this field, the applications of automatic face expression recognizers, the characteristics of an ideal system, the databases that have been used and the advances made in terms of their calibration and a detailed summary of the state of threat. Discusses facial parameterization using FACS Action Units (AUs) and MPEG-4 Facial Animation Parameters (FAPs) and the recent advances in face discovery, following and feature extraction methods.

Yi-Fan Zhang, ChangshengXu, Hanqing Lu and Yeh-Min Huang [13] approach the paper for Identification of characters in films, although very intuitive to humans, still poses a significant challenge to computer methods. In this paper, we investigate the problem of identifying characters in feature length films using video and film script. The contributions of our work include a graph matching method, an effective measure of face track distance and the relationship between characters is mined using social network analysis. The proposed framework is able to create a new experience on character-centered film browsing.

Enrique G. Ortiz, Alan Wright, and Mubarak Shah[10] ,they presents an end-to-end video face recognition system, addressing the difficult problem of identifying a video face track using a large dictionary of still face images of a few hundred people, while rejecting unknown individuals. A straight forward application of the popular ℓ1-minimization for face recognition on a frame-by-frame basis is prohibitively expensive, so we propose a novel algorithm.

OgnjenArandjelovi´c and Andrew Zisserman [8] proposed that the objective of this work is to recognize all the frontal faces of a character in the closed world of a movie or situation comedy, given a small number of query faces. This is challenging because faces in a feature-length film are relatively uncontrolled with a wide variability of scale, pose, illumination, and expressions, and also may be partially occluded. They develop a recognition method based on a cascade of processing steps that normalize for the effects of the changing imaging environment.

Mengdi XU, xiaotong Yuan, JialieShen and ShuichengYan [13] proposed this work to recognize all the frontal faces of a character in the closed world of a movie or situation comedy, given a small number of query faces. This is challenging because faces in a feature-length film are relatively controlled with a wide variability of scale, pose, illumination, and expressions, and also may be partially occluded. We develop a recognition method based on a cascade of processing steps that normalize for the effects of the changing imaging environment.

CsabaCzirjek [4] proposed the approach the content structuring is to build an index based on the reappearance of the main characters within the content. For news programs, this can be used for temporal segmentation into individual news stories based on the fact that the Anchorperson, the main character in this scenario signals the beginning of a news item. For movie content, this could provide enhanced random access browsing functionality to the end user. In this thesis we propose an approach to news story segmentation that uses low-level features and three different algorithms for temporal segmentation.

VII. CONCLUSION

Character identification is easy using face- name graph matching. A graph matching method has been utilized to build name-face association between name graphs and face graphs. 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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