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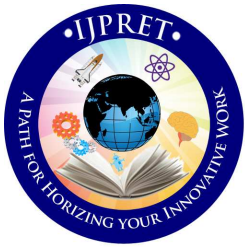

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A PATH FOR HORIZING YOUR INNOVATIVE WORK

A SURVEY ON QUALITY FACE EXTRACTION FROM VIDEO

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Abstract

Feeding low quality and low resolution images from inexpensive cameras to the face recognition system produces unstable result. So there is need to bridge the gap between these low quality images and face recognition system. Face detection is a computer technology that determines the locations and sizes of human faces in arbitrary (digital) images. It detects facial features and ignores anything else, such as buildings, trees and bodies. In this paper we discussed a survey of advanced face detection techniques in image processing and describe the major improvement in the face detection techniques for advanced image processing researches. For converting face from low to high resolution super resolution (SR) technique is used. SR technique contains reconstrcution based SR and Learning based SR techniques. In this paper we also focus on literature survey of methods of converting low quality face into high quality faces from videos.

I. INTRODUCTION

The face is primary focus of attention in our day to day life, playing a big role in identity and emotions. Computational models for face recognition are interesting because they can contribute to practical applications including criminal identification, security systems, image processing, film processing, and human-computer interaction. For example identification of human faces from low quality video such as CCTV footage is of great interest however it is also an extremely challenging task for computer based and automatic methods. For the first time, face recognition has received significant attention and became one of the successful subareas of the pattern recognition. Most of the algorithm works with still images. But compared with still images video can provide more information, such as spatio-temporal information. Therefore, video-based face recognition gained more attention recently. One of the real-world challenges of these systems is that they have problem working with low-resolution (LR) images. This is the reason that for example surveillance applications in public places like airports need human operators to identify suspected people. Therefore, having an automated system working with LR and low-quality face images is desirable. However, low-quality images do not have enough high-resolution (HR) details for facial analysis systems and using them directly in these systems is not reliable. Thus, there is a need for a mechanism for bridging this gap between LR images and facial analysis systems. Super-resolution (SR) is one of such mechanisms for obtaining an HR image from one or more LR input images. SR algorithms are broadly classified into two classes: reconstruction-based SR (RBSR) and learning-based SR (LBSR).

II. FACE DETECTION

Face detection is the first stage of a face recognition system. A lot of research has been done in this area, most of that is efficient and effective for still images only. So could not be applied to video sequences directly. In the video scenes, human faces can have unlimited orientations and positions, so its detection is of a variety of challenges to researchers. Face detection is

a two-step procedure: first the whole image is examined to find regions that are identified as "face". After the rough position and size of a face are estimated, a localization procedure follows which provides a more accurate estimation of the exact position and scale of the face. Localization procedure gives spatial accuracy which is achieved by accurate detection of facial features.

Generally there are three types process for face detection based on video. At first, it begins with frame based detection. During this process, lots of traditional methods for still images can be introduced such as statistical modeling method, neural network-based method, SVM-based method, HMM method, BOOST method and color-based face detection, etc. However, ignoring the temporal information provided by the video sequence is the main drawback of this approach. Secondly, integrating detection and tracking, this says that detecting face in the first frame and then tracking it through the whole sequence. Since detection and tracking are independent and information from one source is just in use at one time, loss of information is unavoidable. Finally, instead of detecting each frame, temporal approach exploits temporal relationships between the frames to detect multiple human faces in a video sequence. In general, such method consists of two phases, namely detection and prediction and then update-tracking.

Face detection Technique: Analysis

Here we define the surveyed different face detection techniques and their advantages and future improvement.

Technique	Advantages	Future improvement
Geometrical face mode	This algorithm is relatively less sensitive to illumination than pixel-based methods and less affected by illumination change because of a pre-processing step that corrects	The future research will focus on performance improvement algorithm for complex images such as a faces with moustache and glasses [1].

	distortion of illumination.	
PCA Based Geometric Modelling for Automatic Face Detection	Fast in computation because of filtering. Time complexity to identify face is O(1). Fusion of PCA based geometric modelling and SCM (skin color Model) method provides higher face detection accuracy and improves time complexity.	The technique could be improved using more complex geometric structure can be used for better understanding of the important facial features and threshold values [2].
Automatic and Robust Detection of facial Features in Frontal face images	The proposed method is used for nostrils detection and it is also found to be accurately detecting the all kind of frontal images tested.	Future work can be done by extending the proposed approach in tilted face images. The work can also be extended for expression recognition and automatic tracking of features in videos [3].
Face Detection Using Probability-Based Face Mask Pre-filtering and Pixel-Based Hierarchical- Feature Ada boosting	The two stages both provide far less training time than that of the cascade Adaboosting and thus reduce computation complexity in face detection tasks.	The simplicity and computation efficiency of this approach is not good candidate for real-time surveillance system; it needs to improve in future [4].
	Important conditions for the face detection problem that can be identified easily by	For future improvement, the technique need more face detection algorithms will be

User Oriented Language Model for Face Detection	users are investigated and the architecture for the language model based on these conditions was developed.	analysed and added for more practical and better usability of the language model [5].

III. CONVERTING LOW RESOLUTION FACE INTO HIGH RESOLUTION FACE

The face is one of the most important remote biometrics and is widely used in many facial analysis systems, like face

recognition, human–computer interaction, and so on. One of the real-world challenges of these systems is that they have problem working with low-resolution (LR) images. This is the reason that for example surveillance applications in public places like airports need human operators to identify suspected people. Therefore, having an automated system working with LR and low-quality face images is desirable. However, low-quality images do not have enough high-resolution (HR) details for facial analysis systems and using them directly in these systems is not reliable. Thus, there is a need for a mechanism for bridging this gap between LR images and facial analysis systems. Super-resolution (SR) is one of such mechanisms for obtaining an HR image from one or more LR input images. SR algorithms are broadly classified into two classes: reconstruction based SR (RBSR) and learning based super resolution (LBSR).

Super-resolution (SR):

The SR task [6] is cast as the inverse problem of recovering the original high-resolution image by fusing the low-resolution images, based on reasonable assumptions or prior knowledge about the observation model that converts the high-resolution image to the low-resolution ones. The fundamental reconstruction constraints for SR is that recovered image, after applying the same generation model should reproduce the observed low resolution image. SR algorithms can be categorized into four classes. Interpolation-based algorithms register low resolution images (LRIs) with the high resolution image (HRI), and then apply non-uniform interpolation to produce an improved

resolution image which is further deblurred. Frequency based algorithms try to dealias the LRIs by utilizing the phase difference among the LRIs.

Reconstruction based super resolution (RBSR):

RBSR algorithms usually work with more than one LR input image. These LR inputs must have intra-image sub-pixel misalignments. The algorithm uses these misalignments to reconstruct the missing HR details of the inputs. These misalignments are considered in a registration step before starting the reconstruction process. The first RBSR system was a frequency domain algorithm proposed by Tsai and Huang. They used the shifting property of Fourier transform and the spectral aliasing to reconstruct the HR details of the output. Spatial domain solutions for RBSR were later developed. Several methods have been proposed for spatial domain RBSR. These methods mainly differ in three points: the used registration algorithm, the used method for obtaining the final response of the system and the regularization method. The registration algorithm in the first spatial domain RBSR system by Irani and Peleg can handle 2-D shifts and in-plane rotations of the LR input images [7]. Their registration method has been widely used in SR systems. However, the main limitation of that registration algorithm is the fact that it can only handle very slight motions between the inputs. It means that this algorithm cannot be directly used in real world scenarios. For obtaining the final response of the system, Irani *et al.* used an iterative back projection.

Other RBSR methods include: non-uniform interpolation (NUI) based approaches [8], projection onto a convex set (POCS) methods [9], maximum likelihood (ML) methods [10], and maximum *a posteriori* (MAP) methods [11].

Learning Based super resolution (LBSR):

LBSR algorithm learns the relationship between the high resolutions (HR) images and their corresponding low resolution (LR) versions. They use the knowledge to predict the missing HR details of LR inputs. The relationship between HR and LR images can be learned in different ways: resolution pyramid, neighborhood embedding,

manifolds [12], compressed sensing, sparse representation, neural networks [13].

Baker and Kanade expressed this relationship in terms of image gradient for frontal images. They used a pyramid based algorithm to learn a prior on the derivatives of the HR image as a function of the spatial location in the image, and information in the higher level of the pyramid. The results of this system are reported for both cases of single image and multiple images. Arandjelovic and Cipolla extended generic shape illumination manifold framework to perform SR across pose and scale by offline learning of sub sampling artifacts. Yang *et al.* Constructed a dictionary of sample patches and found a sparse representation of a given LR input image based on the atoms of the dictionary. Then, they used compressed sensing to recover HR details of the input image. Miravet *et al.* used a neural network for learning the relationship between HR and LR training images [13]. This system works with the pixel values of the LR inputs.

IV.CONCLUSION

Facial analysis applications require high quality frontal face images, but typical surveillance videos are of poor quality. Therefore, there is a need for a mechanism to bridge between low quality, low resolution face images from video sequences and their applications in facial analysis system. Super-resolution is one of these mechanisms. The techniques specified in this paper deals with the real-world problems of super-resolution systems working with surveillance video sequences. Before applying super resolution technique we have seen different face detection techniques, their merits and future enhancement. By applying RBSR we get high quality face from low resolution video sequences. By applying LBSR technique we get more rich quality face. In this way we can get more clear face from low resolution video sequences.

V. REFERENCES

1. Kang-Seo Park, Rae-Hong Park, and Young-Gon Kim, “Face Detection Using the 3×3 Block Rank Patterns ofGradient Magnitude Images and a Geometrical Face

2. Model", 2011 IEEE International Conference on Consumer Electronics (ICCE), pp. 793-794.

3. Padma Polash Paul and Marina Gavrilova, "PCA Based Geometric Modeling for Automatic Face Detection", 2011 International Conference on Computational Science and Its Applications, pp. 33-38.

4. Anima Majumder, L. Behera and Venkatesh K Subramanian, "Automatic and Robust Detection of Facial Features in Frontal Face Images", 2011 UKSim 13th International Conference on Modeling and Simulation, pp. 331-336.

5. Jing-Ming Guo, Chen-Chi Lin, Min-Feng Wu, Che-Hao Chang, and Hua Lee, "Face Detection Using Probability- Based Face Mask Pre-filtering and Pixel-Based Hierarchical-Feature Adaboosting", EEE SIGNAL PROCESSING LETTERS, VOL. 18, NO. 8, AUGUST 2011, pp. 447-450.

6. Daesik Jang, Gregor Miller, Sid Fels, and Steve Oldridge, "User Oriented Language Model for Face Detection", ISSN- 978-1-61284-035-2, IEEE 2010, pp. 21- 26.

7. Y. Huang and Y. Long, "Super resolution using neural networks based on the optimal recovery theory," J. Comput. Electron., vol. 5, no. 4, pp. 275–281, 2007

8. M. Irani and S. Peleg, "Improving resolution by image registration," Graph. Models Image Process., vol. 53, no. 3, pp. 231–239, 1991.

9. S. Lertrattanapanich and N. K. Bose, "High resolution image formation from low resolution frames using Delaunay triangulation," IEEE Trans. Image Process., vol. 11, no. 12, pp. 1427–1441, Dec. 2002.

10. A. J. Patti and Y. Altunbasak, "Artifact reduction for set theoretic super resolution image reconstruction with edge adaptive constraints and higher-order interpolants," IEEE Trans. Image Process., vol. 10, no. 1, pp. 179–186, Jan. 2001.

11. M. E. Tipping and C. M. Bishop, "Bayesian image super-resolution," Adv. Neural Inform. Process. Syst., vol. 15, pp. 1303–1310, 2002.

12. L. Zhang, H. Zhang, H. Shen, and P. Li, "A super-resolution reconstruction algorithm

for surveillance images," Signal Process. vol. 90, no. 3, pp. 848–859, 2010.

13. O. Arandjelovic and R. Cipolla, "A manifold approach to face recognition from low quality video across illumination and pose using implicit super-resolution," in Proc. ICCV, 2007.

14. C. Miravet and F. B. Rodriguez, "A two-step neural-network based algorithm for fast image super-resolution," Image Vis. Comput., vol. 25, no. 9, pp. 1449–1473, 2007.

15. [D. Glasner, S. Bagon, and M. Irani, "Super-resolution from a single image," in Proc. ICCV, 2009.

16. Rashmi Gupta and Anil Kishor Saxena, "Survey of Advanced Face Detection Techniques in Image Processing" in International Journal of Computer Science and Management Research, Vol.1,Issue 2,September 2012

17. Kamal Nasrollahi and Thomas B. Moeslund, "Extracting a Good Quality Frontal Face Image from a Low-Resolution Video Sequence" in IEEE Trans, Vol.21, NO. 10, OCTOMBER 2011.