CHAPTER 2

LITERATURE SURVEY

2.1 INTRODUCTION

Face recognition has gained a significant position among most commonly used applications of image processing furthermore availability of possible technologies in this field have donated a great deal to it. The field of biometrics has gained supreme attention and has taken its place as the most reliable choice for recognition during the recent years because of the availability of feasible technology after extensive research in this field and loopholes in other systems of identification (M. Ao et al. 2009). Nevertheless, efforts are still in hand to develop a more user-friendly system meeting requirements of security systems, yielding more accurate results, to protect our assets and secure our privacy. Ambiguities exist in traditional methods of recognition as they authenticate people and grant them access to virtual and physical domains examining an individual’s behavioral and physiological traits and characteristics in order to realize their purpose (Ming-Hsuan 2008). A significant benefit of face recognition is that it can be carried out without physical contact. Database for face recognition systems varies from static controllable photographs to uncontrollable videos (P.J.Philip et al. 2009). This restraint imposes a large collection of technical challenges for such systems in image processing, analysis, and understanding. In Face Recognition, there are different challenges that cost a great deal during the various stages of face recognition thus affecting the recognition rate. For solving these issues a general statement of the issue can
be resolved, formulated and observed first. Any face recognition system comprises three main parts of that are pre-processing, feature selection and classification (Seo et al. 2011).

Human beings are capable of recognizing hundreds of faces by learning throughout their whole life span and identify and recognize easily familiar faces even after separation of some years. This skill and ability is fairly apt in human beings that it is hardly affected even after the lapse of the period and various changes in visuals due to viewing aging, expressions, distractions and conditions such as beards or change in hair styles and glasses (Unar et al, 2014). The ability of humans to deduce intelligence or facial appearance character can be suspected but face recognition is an essential and important element of the ability of perception system of a human and is a usual assignment for all humans. Building a system similar to human perception system is still an active area of research (K.W.Bowyer et al, 2006). However, it yields successful results only under restricted conditions. An ideal and better face recognition method and technique should consider classification issues as well as demonstration and representation. Face recognition has started to become a vital and an essential concern for many applications such as security system, card verification, credit criminal identification, video surveillance, person identification; people tagging, Database Investigation and Pervasive Computing (Y.Adini et al, 2009). In the last several years, abundant algorithms and methodologies have been recommended for recognizing a face from an image. In these methodologies computers have focused on detecting and recognizing features and traits of individuals such as the nose, head outline, eyes, mouth and describing a face shape and model by the size, position, and relations between these traits and features. Several researchers have noticed that the recognition rate of faces is high, if 3D faces are used (X.Zou et al, 2007).
The process of recognizing human faces from images and videos is definitely a hard nut to crack. Though there are several approaches to carry out this mission, none is capable of accomplishing it with 100% accuracy because of the numerous challenges that is faced by this system (D.Huang et al, 2009). These factors can be divided into 2 categories as Intrinsic and Extrinsic factors. Intrinsic factors comprises of the physical condition of the human face e.g. aging, facial expressions etc. that affects the system whereas extrinsic factors are those that turn out to be a reason to change the appearance of the face e.g. lightening condition, pose variation, long distance and night time imaging (H.Han et al, 2013). This research exclusively focuses on one important challenge of face recognition, i.e. long distance and night time imaging in surveillance environment.

By means of the extensive utilization of surveillance video cameras, the inevitability to perform robust face recognition in surveillance videos is on high demand for usage in access control, security monitoring, etc. But then again, still it is very perplexing for the existing face recognition algorithms to work precisely in real-world surveillance data that consist of wide range of variations (Maeng et al, 2012).

The approaches for face recognition can be broadly classified into three groups such as general algorithms, 2D techniques, and 3D approaches. Each category can be further classified into the following (Chihaouie et al, 2015): General Algorithms are divided into two as Holistic approaches and Local Approaches. Principal component analysis Fisher discriminant analysis, Artificial Neural Network, Line edge maps and Directional Corner Point are the methods that can be categorized under Holistic approaches. Local Approaches includes Template matching, modular PCA, Elastic bunch graph matching and local binary patterns.
Two Dimensional (2D) techniques are again classified into Real View-based Matching, Transformation in image and Feature space. Beymer's method and panoramic view are characterized under real view-based matching (Jameel, 2015). The methods under transformation in image space are Parallel deformation, pose parameter manipulation, Active appearance models, linear shape model and Eigen light-field. Transformation in feature space covers Kernel methods (kernel PCA, kernel FDA), Expert fusion, correlation filters, Local linear regression and tied factor analysis.

Three Dimensional (3D) approaches for face recognition are classified as Generic shape-based models, Feature-based 3D construction and Image-based 3D construction. Generic shape-based models cover approaches such as the Cylindrical 3D pose recovery, Probabilistic geometry assisted face recognition and Automatic texture synthesis (Bevilacqua et al, 2006). Feature based 3D construction covers Composite deformable model, Jiang's method, multi-level quadratic variation minimization. Methodologies that come under Image-based 3D construction are Morphable model, illumination cone model and stereo matching (S. J. D. Prince et al, 2008).

All the approaches presented above have already been tested on different datasets and addressed only one or two challenges, which in turn makes us to highlight which one is the best based on the recognition rate (X.Chai et al, 2007). Therefore, the larger the number of the addressed problems/challenges is, the higher is the flexibility to real time applications and the same stands as the focus of our research work.

The face recognition system is not a single process. The functioning of every module is more important to achieve the expected target. The rest of this chapter is organized as follows: (a) face detection (b) pre-processing and (c) feature extraction. The works available for all the above
illustrated sub-modules are discussed in this chapter. This chapter covers several articles from different reputed journals and conferences for literature review and has discussed the various existing methods of face recognition. Advantages and disadvantages of these various works are also discussed briefly in order to identify the suitability of these techniques for in achieving a better recognition rate.

2.2 LITERATURE SURVEY ON FACE DETECTION TECHNIQUES

Face detection is being one of the most premeditated topics in computer vision literature, not just because of the challenging nature of face as an object, but also due to the innumerable applications that require the application of face detection as a first step (H.A. Rowley et al, 1998). For the period of the past 15 years, incredible progress has been made due to the obtainability of data in unrestricted capture circumstances through the Internet, the effort made by the community to improve publicly available benchmarks, as well as the progress in the development of robust computer vision algorithms (Devendra Singh et al, 2012).

Human faces detection in color images can be carried out using an approach presented by Sharif M. et al, (2012) that utilizes HSV color space. This approach in real time video works in two steps. At first statistical model to get H (Hue) and S (Saturation) ratios for skin region is applied. Second, to get approximation of face location in an image with respect to the detected skin is on the basis of defined ratios for scene width and height region (Lienchart R et al, 2002). Lastly to verify the face from the preceding roughly detected skin region, an eye template matching algorithm is applied. With equitably acceptable performance, presented model has been tested in real time environment. A novel face detection technique is presented by Salih and Muhittin (2009), based on accelerated GPU object detection system which can efficaciously detect 90.8%
faces from real time environment (high resolution video ranging from 640×480 to 1920×1080) without forfeiting accuracy. Real-time face feature detection based on conditional regression forests on low quality images is presented (Marciniak et al, 2011) T. The system is tested on labeled faces in the wild database which contain 5749 individuals’ facial images and achieve 87.5% accuracy, that display improved results as compared to previously designed face features detection systems. Likewise, the contributors presented a human face retrieval framework for video database, by applying fast Haar-like features based algorithm and Kanade-Lucas-Tomasi (KLT) tracker. The approach is instigated using Open CV and it achieves 94.17% accuracy.

An innovative approach for face area localization is proposed by Dibakar (2010), which strategizes the detected face based on analyzing human body shape characteristics and skin colour information, which successfully detects about 97.5% face correctly. A trustworthy face detection technique is proposed by (W. Chen et al, 2006) which depends on skin colour detection in colour images, with 2D Gaussian modal and histogram. The system did not require any training that significantly condenses computational cost. In order to gain efficiency and robustness, fusion strategy is considered, that gives accurate results with 0.904 probability on Stottinger dataset. Zhu et al, (2004) suggested a Face Detection and Pose Estimation technique employing Tree structured and shape model, besides system is trained under fully supervised circumstances. The system is substantiated on multi-view point, illumination and expression conditions, with around 750,000 images of 337 people. The system achieves 99.9% accuracy, when allowing ±15º error tolerance on MultiPIE database.

Similarly, an efficient face recognition technique is presented by Guillaumin (2011), by exploiting caption based supervision. The approach works in a two stage process: at first face retrieval from video frames is accomplished and then correct association of face from database is established.
Human face recognition for real time attendance system was suggested by Susheel et al (2010). He presented that the system works in two main stages: first, face detection based on AdaBoost with Haar cascade is used and in second, face recognition based on fast and simple PCA and LDA is executed. The system is tested on 500 images and after face detection the images are stored in JPEG format in 100 x 100 matrix size for face recognition. This approach achieves accurate results for general purpose online attendance system. Wood et al (2006) proposed a robust face detection based on lighting-variable adaboosting, which is adaptive for fluctuating illuminations and also depends on multiple features such as global and local intensity variations. The system is tested on standard datasets Caltech-101, that successfully achieve overall 95% accuracy in different lighting levels.

Robert Viola and Michael Jones (Paula Viola et al, 2001) have defined the machine mastering approach concerning the visual object detection that has the ability of processing photos enormously in a greater speed and accomplishing high recognition rates. The work done by them has been distinguished by simply three important contributions. Their first contribution was the introduction of any new imprint representation referred to as the Integral Image permitting the features exploited by the detector to get calculated rapidly. The next contribution was the learning algorithm which is based on a concept known as AdaBoost. This strategy selects a small amount of precarious visible features at a larger extent and reassures tremendously useful classifiers. The third was gradually utilizing more complex classifiers inside a “cascade”, thus allowing the background regions of the image to get swiftly thrown away while bombing out more calculation on promising object-like areas. Even though the Viola Jones algorithm was proposed almost a decade ago, the algorithm still stands the best accepted both commercially and scholastically.
2.3 LITERATURE SURVEY ON PRE-PROCESSING TECHNIQUES

The basic purpose of pre-processing in long distance and night time face recognition is to enhance the outdoor captured of images containing varying lighting conditions, varying distances, depreciation of image quality due to the longer distance between the camera and subject, random noises and modality differences. In an uncontrolled environment, the subject may not be aware of the surveillance scenario and the recognition process will be done automatically. In such a case of face recognition, the automatically detected person at a distance is matched against a database of images to recognize the person. The procedure of recognizing a person is nevertheless dependent on image capturing device like the video surveillance cameras. The odds of correct recognition are influenced by the quality of image captured. Quality of image is in turn dependent on the efficiency of the camera, distance between person and the camera, lighting condition and also whether the person looks at camera etc. In all these cases, preprocessing the captured image might give better results in recognition.

A number of pre-processing techniques have been discussed in the literatures to standardize the face images and to eliminate the differences in appearance. Goswami et al (2012) uses a sequential chain, retinex and self-quotient pre-processing techniques for establishing a normalization in the face images. Bourlai and Cukic (2013) employ techniques like the contrast limited adaptive histogram equalization, retinex, self-quotient, and difference of Gaussians filtering. Maeng et al. (2012) has used the histogram equalization and Gaussian smoothing as pre-processing techniques and thereby focusing on the consequence of distance on heterogeneous face matching scenario. Kang et al. suggested an image restoration method influenced by the Linear Local Embedding (LLE) to recuperate high-quality face images from corrupted probe images. Zhu et al. (2004) proposed a transductive method named as transductive
heterogeneous face matching (THFM) to decrease the domain difference that occurs as a result of heterogeneous data and learns the discriminative model for targeting people concurrently. Ancong Wu et al (2008) put forth deep zero-padding for training one-stream network towards inevitably sprouting domain-specific nodes in the network used for cross-modality matching. Dahua Lin et al (2002) articulated an algorithm where two transforms are instantaneously cultured to convert the samples in both modalities respectively to a mutual feature space.

It is very interesting to know that the researchers state the problem of illumination variation between face images of different persons to be smaller than the variations between face images of the same person under different illumination. Also it is defined that illumination creates larger variation in face images than pose (Adini et al. 1997). A most simple and highly used method that is applied at preprocessing stage of face recognition in order to eliminate illumination variation is Histogram Equalization (HE) that helps in enhancing the overall contrast of an image (Gonzalez et al. 1992). Many modulations of histogram normalization techniques like uniform histogram distribution, normal histogram distribution, log normal histogram distribution and histogram truncation are put forth by different researchers as a pre-processing or post processing techniques for illumination normalization. Jobson et al. (1997) extended the retinex theory to Single Scale Retinex approach, that strengthens the local contrast and also the brightness of face images. In this the illumination preprocessing scheme works grounded on gamma correction technique. Wang et al. (2013) anticipated self-quotient image (SQI) to develop the fluctuating lighting conditions in face recognition (O. Arandjelović,2013 and H.Wang et al. 2004 ). Another approach to photometric normalization is Local Normalization which is proposed by Xie and Lam (2006), to diminish the effect of uneven lighting conditions to get the equivalent face images under the normal lighting. Chen et al. (2006) discarded a appropriate percentage of DCT coefficients in
zigzag pattern in order to curtail the variation of face images from the same individual under different lighting conditions and then inverse DCT transform was done to get the final illumination normalized images.

2.4 LITERATURE SURVEY ON FEATURE EXTRACTION AND MATCHING TECHNIQUES

Feature extraction represents the relevant information contained in an image such that the process of classifying the face image is made easy by a strict procedure. Feature extraction is carried out subsequently after the pre-processing stage in face recognition system (F. Ferri et al, 1994). In most cases of face recognition and image processing, feature extraction is a distinct form of dimensionality reduction. Feature selection is a serious issue to the whole system since the matching process cannot be efficient enough recognize from poorly selected features (H. Frigui et al, 1999). The important criteria for feature extraction is as follows: Features must contain the required information to distinguish between classes; they must be insensitive to inappropriate variations in the input, and should also be limited in number, in order to enable efficient computation of highly discriminant functions. Features can also be termed as descriptors. The process of feature extraction involves extraction of relevant features from faces to form feature vectors (A.K. Jain et al, 1997). These feature vectors are then used by the matchers to compare the input image with that of the target output. This makes the work of the matcher simple to compare between different classes by looking at these features as it allows a fairly easy distinction (C. Lee et al, 1993). Feature extraction methods can be grouped into three main categories: global features; local features, statistical features; geometrical features.
Global features represent the image as a whole to generalize the entire image. Contour representations, shape descriptors and texture features can be categorized under global features (T. Ojala et al, 2002). Few examples of global features are Shape Matrices, Invariant Moments (Hu, Zerinke), Histogram Oriented Gradients (HOG) and Co-HOG. Generally, global features are used for low level applications like object detection and classification (Tsai et al, 2002). Global features give the overall information in an image when compared to local features. This may not be needed in all cases, as many applications require only specific or relevant data from the image.

Local features represent the key points in an image. Usually, local features represent the texture pattern in an image (A. Ben-Hur et al, 2003). Some examples of local descriptors are Scale Invariant Feature Transforms (SIFT), Speeded Up Robust Features (SURF), Local Binary Pattern (LBP), Binary Robust Invariant Scalable Keypoints (BRISK), Maximally Stable Extremal Regions (MSER) and Fast Retina Keypoint (FREAK). Local features are commonly used for high level applications like object recognition (T. Hastie et al, 2000). Local features are region specific and they mostly highlight only the relevant data and they are likely to eliminate redundancy.

Statistical features are compact representation of certain quantitative features in an image, derived from a statistical distribution of points (C. Chatterjee et al, 1997). A wide selection of statistical feature descriptors can be used for feature extraction, that ranges from simple descriptive statistics to complex transformations (P.A. Chou et al, 1991). Some examples of statistical feature extraction techniques are mean and standard deviation computations, frequency count summarizations, Karhunen-Lôeve transformations, etc. The following are few statistical features: arithmetic mean; standard deviation; kurtosis; skewness; entropy and percentiles. These quantitative features extracted from the image are structured into a fixed length feature vector.
Statistical features enable high speed and low complexity and also are invariant to style variations to some extent.

Geometrical features represent local and global properties of characters and are highly tolerant to distortions and style variations (Cheng-Lin Liu, 2007). They are topological features that are used to encode certain knowledge about the contour of the image and they require some knowledge as to what type of components build up the image (Oivind Due Trier et al, 1996). Geometric features present segments, perimeters and areas face images formed by the detected points.

Image matching is the task of establishing correspondences between two images of the same scene/object. Image matching is a high-level machine vision technology that tries to match the features of the input image with that of a predefined gallery data (Nilamani Bhoi et al, 2010). Mostly, the approaches used for image matching comprises of detecting a set of interest points that are associated with image descriptors from image data. Once the features are extracted from two or more images, the next step is to establish some preliminary feature matches between these images. The performance of a matcher solely depends on the efficiency of the selected features. For good accuracy, it is recommended to use several feature descriptors at the same time.

2.5 INFERENCE FROM THE LITERATURE SURVEY

Facial Recognition (FR) has become an important technology to handle the tremendous growing need for identification and verification since last century. There are large numbers of commercial, security and forensic applications requiring the use of face recognition technologies. The key advantage of facial recognition is that it requires no physical interaction on behalf of users. Most face recognition systems depend on the usage of face images captured in the visible range of the electromagnetic spectrum, i.e. 380-750 nm. However, in real-world scenarios (military and law enforcement) it is
necessary to deal with harsh environmental conditions characterized by unfavorable lighting, pronounced shadows and long distance. Such an example is a night-time military environment, where human recognition based solely on visible spectral images may not be feasible. In order to deal with such difficult FR scenarios, multi-spectral camera sensors are very useful because they can image day and night. Thus, recognition of faces across the infrared spectrum has become an area of growing interest. The infrared (IR) spectrum is divided into different spectral bands based on the response of various detectors, i.e. the active IR and the thermal (passive) IR band. The active IR band (0.7-2.5µm) is divided into the NIR (near infrared) and the SWIR (short wave IR) spectrum. NIR has the advantage that it can capture face images at large standoff during night time which contains sufficient information for face recognition. However, the literatures show that there is a great need for improvement in the area of long distance and night time face recognition, which is the main goal of this project.

The challenges with regards to long distance and night time facial recognition technologies are: expensive long range IR cameras, image quality (e.g., image resolution, compression, blur, and noise), time span (facial aging), occlusion, and demographic information (e.g., gender, race/ethnicity, or age), variations in pose, expression, including illumination that depends on the operational environment, below par performance of FR algorithms and software packages. The existing face recognition systems have addressed some of the challenges through new image acquisition set ups, cross spectral and cross distance type face databases and face recognition algorithms. However, the problems related to image quality, image variations and recognition accuracy still exist, which are the main objectives of this project work to be addressed.

The proposed face recognition system will be much useful to military and law enforcement agencies. It can be installed in checkpoints at base camps and other places targeted by suicide bombers. It is expected to provide identification/verification of (i) felony or misdemeanor, (ii) persons affiliated
with a terrorist organization, or (iii) a match of persons reported to a law-enforcement agency as missing. The closely related literatures with respect to this research have been summarized in Table 2.1.

2.6 CONCLUSION

This review benevolence the various literatures pertaining to different stages of long distance and night time face recognition. A number of authors have experimented on face recognition systems under controlled
Table 2.1 Summarization of Literatures related to Long Distance and Night Time Face Recognition

<table>
<thead>
<tr>
<th>Author &amp; Publication details</th>
<th>Image Acquisition Setup</th>
<th>Database</th>
<th>Pre-processing</th>
<th>Feature Extraction</th>
<th>Matching</th>
<th>Merits &amp; Demerits</th>
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<tbody>
<tr>
<td>Kang et al, 2014.</td>
<td>Canon 600D DSLR with telephoto lens and RayMax300 illuminator</td>
<td>LDHF 100 subjects, 1m, 60m, 100m &amp; 150m.</td>
<td>Geometric and Photometric Normalization, Image Restoration</td>
<td>combination of three filters (DoG, CSDN and Gaussian) + descriptors (SIFT, MLBP)</td>
<td>RS-LDA</td>
<td>150m, still images, cross-spectral and cross distance matching, rank 1 accuracy at 60, 100m &amp; 150m is 82%, 69% &amp; 28%</td>
</tr>
<tr>
<td>Bourlai et al, 2012.</td>
<td>Canon EOS 5D Mark II, Canon PowerShot SX110, Goodrich SU640 and the XenICS Xeva-818, FLIR Systems, NIR Camera with PTZ platform</td>
<td>VIS, SWIR, MWIR and NIR 30, 60, 90, 120m;</td>
<td>Geometric and Photometric Normalization (CLAHE, SSRlog, SSRatan)</td>
<td>LBP, LTP</td>
<td>PCA, PCA+LDA, BIC, ML, MAP</td>
<td>intra-spectral, cross spectral and cross distance, identification rates at rank 1 - .998, .996, .968, .952 (IS), .988, .985, .939, .922 (CS &amp; CD)</td>
</tr>
<tr>
<td>Bourlai et al, 2012.</td>
<td>NIR Camera with PTZ platform</td>
<td>unknown</td>
<td>geometric normalization, masking, histogram equalization, pixel normalization</td>
<td>LBP, LTP</td>
<td>PCA, PCA+LDA, BIC, ML, MAP</td>
<td>Baseline - G8 identification rate 100%, intraspectral &amp; cross distance – LDA (CMC) with 80% training set.</td>
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<tr>
<td>Sources</td>
<td>Equipment Details</td>
<td>Methods</td>
<td>Results</td>
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<tr>
<td>Maeng et al, 2011</td>
<td>NIR camera, telescope and NIR illuminator, NFRAD-DB 1m, 60m</td>
<td>NFRAD-DB, histogram equalization, and Difference of Gaussian (DoG) filtering, SIFT &amp; MLBP</td>
<td>FaceVACS, DoG-SIFT and DoG-MLBP, still images, illumination pattern, DoG-SIFT high performance (CMC)</td>
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<tr>
<td>Yao et al, 2007</td>
<td>camcorder, telescope, eye piece, UTK-LRHM wavelet transform</td>
<td>Face recognition engine used (FaceIt, VeriLook)</td>
<td>SR+WL, only visual images, SR+WL produced better results than original (CMC)</td>
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<tr>
<td>Goswami, 2010</td>
<td>turntable consisting of several pillars holding adjacent NIR-VIS cameras at different eights, 2103 NIR and 2086 VIS images of 430 subjects</td>
<td>Photometric Normalisation (Sequential Chain Preprocessing (SQ), Single Scale Retinex (SSR), Self Quoitent Image(SQI)), LBP Dimensionality reduction: LDA</td>
<td>Nearest Neighbor classifier with two types of distance measures (Chi-squared Histogram Distance, Normalised Correlation), LDA, LDA+CCA, Cross-spectral, only short distances, VIS--&gt;NIR outperforming NIR--&gt;VIS, cross-distance not done, combination of SQ best pre-processing</td>
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<tr>
<td>Rara et al, 2009</td>
<td>Not specified</td>
<td>FRGC</td>
<td>Not specified</td>
<td>MAP-MRF, AAM</td>
<td>Moment based recognition, PCA, Procrustes</td>
<td>upto 33m, 2D Procrustes outperforms 3D version, identification rate stable for 3 &amp; 15m, highly unstable for 33m.</td>
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<tr>
<td>Li et al, 2013</td>
<td>one WFOV video camera and two NFOV cameras with IR filter and powerful IR illuminators.</td>
<td>Human subjects inspected at 20 to 30m distance</td>
<td>Global motion estimation, local motion estimation, undesired motion removal, and image deblurring.</td>
<td>PCA</td>
<td>PCA</td>
<td>intra-spectral matching, stabilization and deblurring increased detection score form 0.58 to 0.64, no false alarm, recognition score increased from 0.12 to 0.79</td>
</tr>
<tr>
<td>Medion et al, 2009</td>
<td>two-camera system consisting of an inexpensive large field of view video camera and a narrow focus high-resolution camera.</td>
<td>3D &amp; 2D face data</td>
<td>Not specified</td>
<td>Adaboost classifier</td>
<td>3D matching engine</td>
<td>visual images, 2D &amp; 3D gives better performance at shorter distances, as distance increases performance of 3D decreases</td>
</tr>
<tr>
<td>Chen et al, 2009</td>
<td>Not specified</td>
<td>6 samples from 250 subjects</td>
<td>Not specified</td>
<td>LBP, Multi-resolution LBP, LBP Histogram</td>
<td>manifold learning</td>
<td>Intra spectral, recognition performance increases from 2% to 94.2% at rank 1 (homogenous illumination condition) and from 3% to 97.3% at rank 1(heterogenous)</td>
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</table>
environments but with uncontrolled conditions not much work has been focused. In this report, a list of various image acquisition setups, databases, pre-processing techniques, feature descriptors and classifiers are provided. Among them most of the work has been done using still images and only frontal view. Similarly, less work has been focused on long distance face recognition.

Briefing generally the methods discussed in this chapter, each has its own pros and cons and each one is effective in its own field of usage. Though some schemes become intricate and their computational cost in terms of time and space might go up high, the trade-off is made on the functionality. Fundamentally main emphasis of conducting this survey is to group together all the work related to Long distance and night time face images into one document.