**Assignment No: 1**

**Problem Statement:** Algorithmic Strategies used in the Project.

**Introduction:**

Photos with people are the major interest of users. Thus, with the exponentially growing photos, large-scale content-based face image retrieval is an enabling technology for many emerging applications.

The need to find a desired face from a collection is shared by many professional groups, including journalists, design engineers and art historians. While the requirements of image users can vary considerably, it can be useful to characterize image queries into three levels of abstraction: *primitive*features such as shape, *logical*features such as the identity of objects shown and *abstract* attributes such as the significance of the scenes depicted. While systems currently operate effectively only at the lowest of these levels, most users demand higher levels of retrieval.

Users needing to retrieve faces from a collection come from a specific domains of users.

**Algorithms used:**

1. HAAR
2. Covariance Texture Colour Co-occurrence
3. Geometric Moment
4. Euclidean metric

**HAAR Algorithm:**

A hierarchical system for face recognition with HAAR algo knowledge sources which solve both the context sensitivity problem and the face instantiation problem is presented. The system achieves 97-99% accuracy using a two-level architecture and has been implemented using a systolic array, thus permitting real-time (1 ms per face) multifont and multisize printed face recognition.

**Covariance Texture Colour Co-occurrence:**

In appearance-based image processing, high-dimensional statistical models are estimated from low numbers of training samples. Sample scatter matrices areunreliable estimators of class covariances, yet many methods rely on them for dimensionality reduction and often for classification too. This paper argues for regularized covariance estimation and introduces a new method suitable for appearance-based image processing. The method is demonstrated for face detection, where a maximum likelihood classifier trained with regularized covariances achieves discrimination and detection results comparable to those of complicated multimodal and non-linear classifiers

**Geometric Movement:**

Triangular meshes are widely used to represent object shapes and many techniques have been developed for processing triangular meshes. Feature detection is important in mesh pro-Cessing because features can be used to specify the target Region of a mesh to be processed and/orthepeculiar parts to Be preserved in processing. In mesh editing, the edited parts Are usually the features of a mesh. In mesh morphing ,features and their correspondence should be speciﬁed between Two meshes. In mesh simpliﬁcation and mesh compression, An important goal is to represent the feature so famesh with A small amount of data.

**HMM (Hidden Markov Model):**

A new Hidden Markov Model (HMM)-based face recognition system is proposed. As a novel point despite of five-state HMM used in pervious researches, we used 7-state HMM to cover more details. Indeed we add two new face regions, eyebrows and chin, to the model. As another novel point, we used a small number of quantized Singular Values Decomposition (SVD) coefficients as features describing blocks of face images. This makes the system very fast. The system has been evaluated on the Olivetti Research Laboratory (ORL) face database. In order to additional reduction in computational complexity and memory consumption the images are resized to 64×64 jpeg format. Before anything, an order-statistic filter is used as a preprocessing operation. Then a top-down sequence of overlapping sub-image blocks is considered. Using quantized SVD coefficients of these blocks, each face is considered as a numerical sequence that can be easily modeled by HMM. The system has been examined on 400 face images of the Olivetti Research Laboratory (ORL) face database. The experiments showed a recognition rate of 99%, using half of the images for training. The system has been evaluated on 64×64 jpeg resized YALE database too. This database contains 165 face images with 231×195 pgm format. Using five training image, we obtained 97.78% recognition rate where for six training images the recognition rate was 100%, a record in the literature. The proposed method is compared with the best researches in the literature. The results show that the proposed method is the fastest one, having approximately 100% recognition rate.