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"A novel content-based facial image retrieval approach using different similarity measurements"

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ABSTRACT

Today's world is advanced which comprises of information within the arrange of content, pictures, recordings, and many more. Wide utilization of the Web leads to the development of computerized information. The browsing of the Web also allows clients to look for pertinent pictures or recordings from inaccessible destinations. Image-retrieval is the dynamic investigate regions where clients can get pertinent advanced pictures when they browse through the search engine. Content based image retrieval (CBIR) introduced in 1990s, this is the projecting area in image-processing because of its miscellaneous application in inter-multimedia, companies' image-archives. CBIR framework is utilized in numerous applications, for example, Automatic Face Recognition Systems, Biodiversity Information Systems, Crime Prevention, Architectural, and Engineering Design Fingerprint Identification, Cultural Heritage, Digital Libraries, etc. In the proposed methodology will suggest enhancement in some major area such as time and accuracy over the existing algorithm to retrieve the relevant images from the database.

1. INTRODUCTION

Current CBIR systems generally execute image-retrieval with three fundamental parts specifically, similarity-measure, semantic-gap-reduction as well as low-level features (Inbaraj, R. and G. Ravi,2019). The Content based image retrieval (CBIR) approach normally rely on feature-extraction as well as similarity measurement techniques. Feature-extraction algorithms are also known to abstract low-level visual information, such as colour ,intensity, shape, texture from the images to

create an index feature-vector (Muhammad Kashif, Gulistan Raja, and Furqan Shaukat,2020) and extract high level features, such as cooccurrence matrix gray-level (Meenakshi Garg, and Gaurav Dhiman,2020) , speeded-up-robust-Features (SURF) (Vikas Wasson,2017; Najeeb Ur Rehman Malike et al.,2019) , bag of visual words(BVW) (Arun, K. S., Govindan V. K, and Madhu Kumar S D,2019), scale invariant feature change (Aasia Ali and Sanjay Sharma,2017;Tao He et at.,,2018;Payal Chhabra, Naresh Kumar Garg, and Munish Kumar,2019;) and variations of local-binary pattern (Oana Astrid Vatamanu et al., 2013;Raju et al., 2020). Also, many researchers have presented various algorithms for content-based image retrieval (CBIR). For enhancing performance of the CBIR, this research methodology uses new methods for the facial image-retrieval system.

2. RELATED WORK

Proposed texture descriptor, and it was the combination of matrix of gray-level cooccurrence as well as local ternary pattern. First local-ternary-pattern of pixels was obtained and then used gray-level cooccurrence matrix in four directions of grey-level, correlations between pixels pairs as features it sets calculated. 2D texture data as well as database of facial-images were consider to test the suggested dictionary, and the results were compared with other descriptions of the feature. (Vahid Naghashi , 2018).

Introduced color retrieval and texture images based on the binary pattern of the local directional region. (Srishti Gupta et al.,2020).

Proposed squared euclidian distance (SED) as well as adaptive-particle-swarm-optimization (APSO) is consider to support to build facial image-retrieval approach. Three steps involve in the program: image-retrieval, feature removal, optimization. Primarily, from the saved images the feature-extraction are completed. Low-level features like texture shape, colour, and high-quality features such as right eye, left eye, face, mouth, nose, where two factors consider in method of removing feature. In the second phase, such elements were narrowed between semantic gap by a well-known process of dynamic particle density. After that, a standard euclidian distance measurement will be used to obtain low-resolution facial images and question. The system with squared euclidian distance (SED) as well as adaptive-particle-swarm-optimization (APSO) as would then developed in active platform of matlab, and then analyzed. (Manikandan Kalimuthu, and Ilango Krishnamurthi,2015).

Recommended combination of convolutional neural networks (CNN) along with sparse-representation in CBIR approach, in such deep features were extracted based on convolutional neural network as well as sparse-representation to improve retrieval accurate and even a speed. The result of experiment revealed that the method had reach to the higher speed as well as accurate results compared to state-of-the-art methods. (Amir Sezavar, Hassan Farsi, and Sajad Mohamadzadeh,2019).

The content-based image retrieval (CBIR) dependent on local patterns and supervise ML technique is recommended. The approach used three kinds of databases it means colour, texture, shape to enhance the effective approach of the system. Analysis performance showed that local number portability gave enhanced the average recall than local-binary pattern, as well as local-ternary pattern .To increase accurate outcome as well as system used the local number portability

method with ML method, and Analysis performance showed that local-pattern with ML method improved average of accurate outcome from 36.23 - 85.60 percent while the system used Local Number Portability along with cubic SVM on DB1 (Corel1K), and from 82.51 - 99.50 percent while used Local Number Portability including satisfactory KNN on DB2 (Vistex DB), and in the range of 56.63 - 95 precent while used Local Number Portability including group of sub-space discriminant on DB3 (face DB). (Supreethi K.P and Maher Alrahhal ,2020).

3. ISSUES IN EXISTING METHODOLOGY

The existing research methodologies consist of some problems, which are enlisted as follows,

- Facial images are used in several security applications. But facial images have various poses, directions, etc. it is bit difficult for retrieve useful images from database this is the challenging area of research.
- Some methodologies consider the image annotation along with content-based retrieval, which leads to time complexity
- Throughout the image achievement method the facial-images possible to get deuterate by noise. In the facial image obscures noise is present and the useful data or information is available in the image and so it creates the analysis work more crucial.
- In the existing feature descriptor has a weakness in terms of reliability and robustness.
- The existing research methodologies have a problem with accurate retrieval.
- Some of current methodologies use a traditional segmentation algorithm, which has a disadvantage of over-segmentation. This over-segmentation significantly reduces accuracy.
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4. OBJECTIVES OF PROPOSED METHODOLOGY

The proposed approach methodology is will be able to successfully retrieve the important facial images from the facial database based on a content-based image retrieval system. The proposed system consists of some objectives, which are described as follows,

- To retrieve useful and relevant images from the facial images dataset.
- To enhance the image contrast as well as at the similar time, remove the noise with the help of a new Enhanced Anisotropic nonlinear diffusion and Adaptive Quadri histogram equalization (EAAQ) algorithm.
- To present the reliable and robust features for accurate facial image retrieval.
- To present the Similarity Estimation based Partition Around Mediods (SEPAM)clustering algorithm for effectively clustering the gender (i.e., male and females).
- To present the Modified-You-Only-Look-Once (MYOLO) segmentation algorithm for segmenting the important parts, like skin, nose, hair, etc. effectively and accurately.
- To reduce and select the important and useful features using the new Entropy-based Red Deer Optimization ERDO optimization algorithm.
- To effectively calculate equality of the query image and the input image with some distance metrics, namely, square Euclidean distance, Minkowski distance,

Jaccard distance, Hamming distance, Relative standard distance, and Manhattan distance.

- To show the efficiency of proposed system by comparing the proposed system with the existing methods.
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5. PROPOSED METHODOLOGY

Content based facial image-retrieval approach is challenging issue. To succeed the above-mentioned problem, this paper proposed the novel content based facial image-retrieval system with use of different similarity measurements. In this proposed methodology consists of seven steps, namely, preprocessing, feature extraction, clustering, segmentation, extraction of feature, selection of feature, and similarity measurements.

Firstly, the facial-images taken will take from FG-NET dataset. Then, preprocessing steps will carry out by the use of Enhanced Anisotropic nonlinear diffusion and Adaptive Quadri histogram equalization (EAAQ) algorithm. Here, the noise will reduced first using the Enhanced Anisotropic Nonlinear Diffusion (EAND) algorithm. Anisotropic Nonlinear Diffusion algorithm will be an effective algorithm to decrease noise in flat-regions and at similar time, it preserves edges to a higher extend. But the existing AND algorithm degrades the proper structure and reduces the resolution of the image. So, the wavelet transform will applied to fit the resolution for effectively reducing the noise. And, the contrast will enhance by using the Adaptive Quadri Histogram Equalization (AQHE) algorithm. The contrast of the image will enhance to clearly see the features of the object, which will also enhances the retrieval. Here, the AQHE will be consider because the normal histogram equalization has the problem of over enhancement because of the intensity variation of the image. So, to avoid the over-enhancement problem, this research methodology will be uses the AQHE algorithm. After that, some common feature extraction will be done from image such as histogram of oriented-gradients, local-binary pattern, and bag of visual words (Arun, K. S., Govindan V. K, and Madhu Kumar S D,2019) .Next, clustering operation will perform by using Similarity Estimation based Partition Around Mediods (SEPAM) clustering algorithm, which accurately clustered the male and female groups. The goal of the PAM algorithm is to optimize the average inequality of objects to their nearest selected object. But the PAM algorithm takes an initial set of points randomly and it didn't provide accurate results. So the proposed system initially takes the pair of data-points and calculates the similarity between them, so the term is called the SEPAM clustering algorithm.

After that, the segmentation will perform using the Modified-You-Only-Look-Once (MYOLO) algorithm. The normal YOLO algorithm has a problem of less accuracy and it didn't calculate the small objects in facial image effectively. So, the proposed system uses the MYOLO algorithm. After that, the GLCM and from the segmented image some semantic features are extract. After feature extraction, only the important features will choose with the help of Entropy-based Red Deer Optimization (ERDO) algorithm.

Next, thus the pre-processing, feature extraction, clustering, segmentation, extraction of feature, and selection of feature process will carried out for the query image. After that, equality will calculate among the feature which are selected

from the query image and the selected feature of input image using some distance metrics, namely, Square Euclidean distance, Minkowski distance, Jacarrd distance, Hamming distance, relative standard deviation, and Manhattan distance. Then all the distances will be summed and the average value will determine. The image which has the less average value will retrieved. The diagram of the proposed approach methodology is shown below:

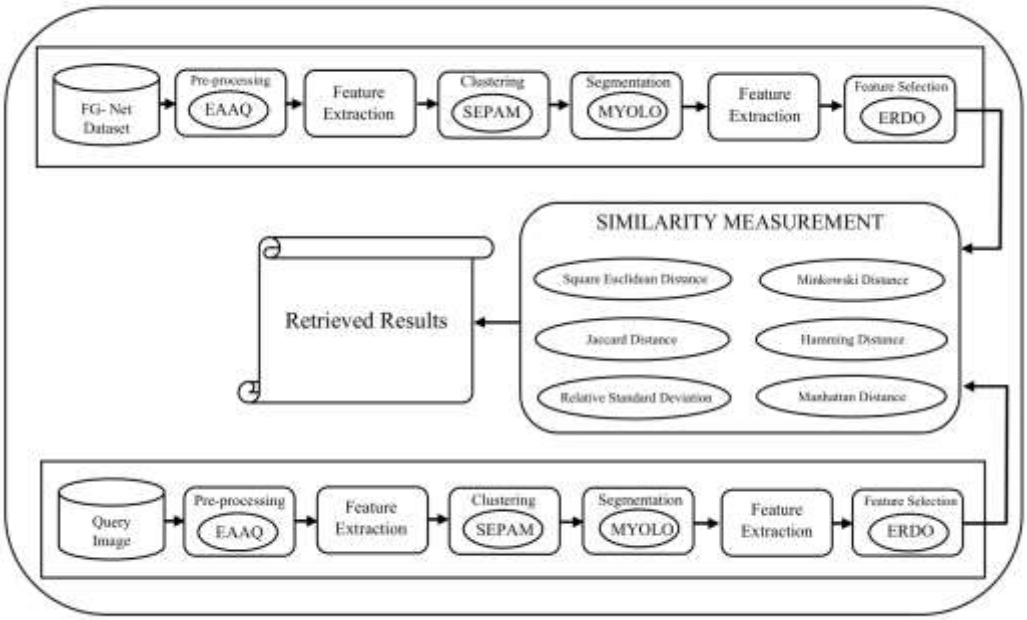

Figure 1: Flow diagram of proposed methodology

6. CONCLUSION

In this research, a novel approach proposed for content based facial image retrieval using different similarity measurements. In addition, this system will overcome the maximum drawbacks like throughput, accuracy, reliability and over segmentation problem of traditional methods are also suggested. The seven-step process namely pre-processing, feature extraction, clustering, segmentation, extraction of feature, selection of feature, and similarity measurements are used to achieve the best performance among the other models.

The performance of the system will enhance various algorithms at different steps of process such as, noise in image reduced using EAAQ, categorisation of gender using SEPAM, whereas MYOLO algorithm use for segmentation of various facial feature like skin, nose, hair, etc., also for selecting these important feature ERDO will used.

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