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Particle Swarm Optimization on Image Retrieval

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ABSTRACTRelevance feedback has emerged as a powerful tool to boost the retrieval performance in content-based image retrieval (CBIR). In the past, most research efforts in this field have focused on designing effective algorithms for traditional relevance feedback. Given that a CBIR system can collect and store user relevance feedback information in a history log, an image retrieval system should be able to take advantage of the log data of user's feedback to enhance its retrieval performance. The particle swarm is an algorithm for finding optimal regions of complex search spaces through the interaction of individuals in a population of particles. Even though the algorithm, which is based on a metaphor of social interaction, has been shown to perform well, researchers have not adequately explained how it works. Further, traditional versions of the algorithm have had some undesirable dynamical properties, notably the particles' velocities needed to be limited in order to control their trajectories. The present paper analyses a particle's trajectory as it moves in discrete time (the algebraic view), then progresses to the view of it in continuous time (the analytical view). A five-dimensional depiction is developed, which describes the system completely. These analyses lead to a generalized model of the algorithm, containing a set of coefficients to control the system's convergence tendencies. Some results of the particle swarm optimizer, implementing modifications derived from the analysis, suggest methods for altering the original algorithm in ways that eliminate problems and increase the ability of the particle swarm to find optima of some well-studied test functions.

KEYWORDS: Content-based image retrieval, relevance feedback (RF), particle swarm optimizer (PSO).

I. INTRODUCTION

CBIR is an active area of research for a long due to its vast applications. A wide variety of CBIR algorithms has been proposed but most of them concentrate only on finding the similarities between the query image and the database image. So to achieve the better approximation to the information needed for the user and Particle Swarm Optimization (PSO) is used. PSO gives which images in the database that are most interest to the user. In this the fitness is determined by user's evaluation and not by predefined mathematical formula. There is highlighted a number of problems related to this (apparently simple) process. First, how good is the description provided by the adopted feature set, i.e., are the selected features able to provide a good clustering of the requested images, retrieving a sufficient number of desired images and avoiding false positives? Second, is the query significant enough to represent the conceptual image that the user has in mind, i.e., does the query capture the semantics of the user? Third, is there a reliable method to cluster relevant and irrelevant images, taking into account that, even if relevant images may luckily represent a compact cluster, irrelevant ones for sure will not? Simple minimum-distance-based algorithms are usually unable to provide a satisfactory answer to all such problems. The avoid this problem by using Relevance feedback RF and Particle Swarm Optimization (PSO).So RF has been used in different fields of information retrieval, but its current moderate success in the media domain is mainly due to the limited performance achieved by available algorithms, which require numerous iterations to achieve a significant number of relevant images. As a matter of fact, RF mechanisms currently used in some beta or demo Version of online search engines usually rely on a simple substitution of the query with one of the images found in the previous search. In this case, the history of the search is not maintained, making impossible to achieve a real adaptation of the search. It is our opinion that more sophisticated methods are likely to be adopted in the future if effective methods to exploit the history of the search will be available. And PSO algorithm, it is possible to substitute a generic query shifting by using completely different process, where the particles of the swarm can be seen as many single retrieval queries that search in parallel, locally and globally, moving

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towards relevant samples and far from irrelevant ones. Practically speaking, this can be seen as a generalized query shifting algorithm.

II. RELATED WORK

Swarm Representation the particles of the PSO are represented by the feature set, and each particle represents a feature vector. The particles fly in the search space available by the features of the image databaseTo extract the feature set homogeneous texture descriptors from the MPEG-7 descriptors are used.Homogeneous texture descriptor (HTD) illustrates the directionality,coarseness, and regularity of patterns of an image.Particle Swarm Optimization is an approach to problems whose solutions can be represented as a point in an n-dimensional solution space. Through this space a number of *particles* are randomly set into motion. At each iteration, they observe the "fitness" of themselves and their neighbours and "emulate" successful neighbours by moving towards them. Various schemes for grouping particles into competing, semi-independent *flocks* can be used. This is simple approach effective across a variety of problem domains.

III. PROPOSED ALGORITHM

The processes iteratively involved in the image search process. Fig. 1 shows the block diagram of the proposed algorithm. The system ranks the whole datasetaccording to a minimum distance criterion based on the user selects the query image. For that purpose, each image is mapped into a feature vector and the distance between query and image is calculated as a weighted Euclidean distancecomputed among feature vector pairs. Initially, the weights are all equal to 1. Then, the image which is nearest are presented to the user, and the first feedback is requested. The feedback is binary, and labels each retrieved image as *relevant* or *irrelevant.* To perform a first re-weighting of the features and a first updating of the swarm possible by the definition of relevant and irrelevant image subsets makes. After that, to collect a new feedback, a new ranking is calculated based on the weighted Euclidean distance with updated weights and the nearest images are again proposed to the user.During this process, the feature weights are iteratively specified to fit the user's mental idea of the query. In parallel, constantly updating the swarm do the optimization, which progressively converges to the image cluster that contains the best solutions found across iterations.

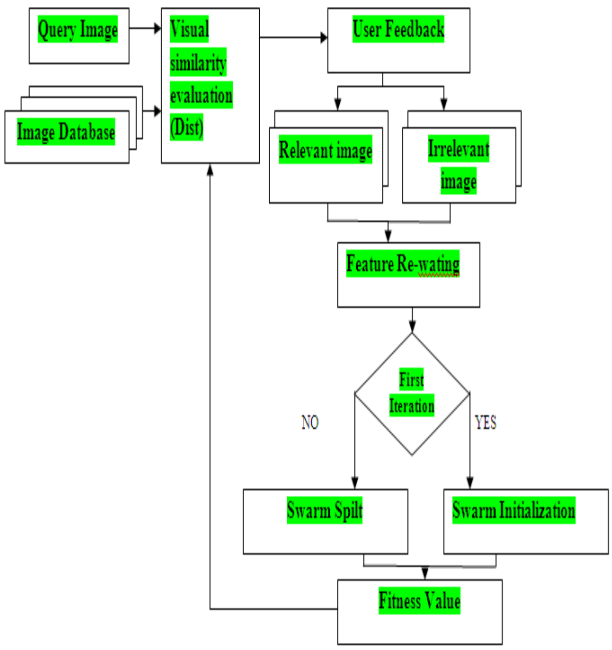

Fig. 1Flowchart of the proposed approach.

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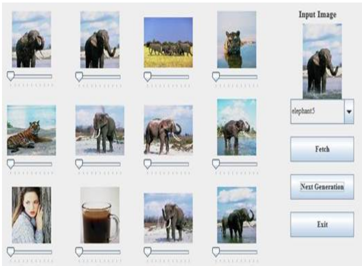
IV. EXPERIMENTATION

Here used an elephant as a samplequery image and results of successive generation were observed. The results of generation 0 are without using the PSO. This result used as an initial population to produce next generation.

Generation 0:



Total number of relevant images = 8

Generation 1:

Total number of relevant images = 10

Generation 2:

Total number of relevant images = 11

Generation 3:

Total number of relevant images = 11

From above experimentation it is observed that the retrieval accuracy gets increased in each generation of PSO.

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V. CONCLUSION

The best compared method reaches its performance at convergence after 10 iterations, while the evolutionary PSO reaches the same result after half of the iterations, then continuing its growth. The user is in the loop and his interaction with the machine is used as an iterative supervision of the classification. A feature re-weighting process and the progress of the swarm, driven by user's feedback towards the goal of minimizing a fitness function, minimizing a fitness function takes into account the characteristics of the relevant and irrelevant images, as points of attraction and repulsion. To increase the retrieval performance, further studies are being conducted about the re-weighting and fitness function.

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