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# GENETIC ALGORITHM FOR MOTION ESTIMATION

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**Abstract:** Genetic Algorithms are a form of evolutionary computing algorithm which are inspired by Darwin's theory of evolution and simulate mathematically the evolution of living organisms. Genetic algorithm have a powerful global searching ability, they are quite suitable for dealing with multi-modal optimization problems such as the motion estimation. Motion estimation is the key step for image registration. It is the process of quantifying movements in successive images. One of the key elements of video compression schemes is motion estimation. For a video, sequence consists of a series of frames, to achieve compression; the temporal redundancy between adjacent frames can be exploited. That is, a frame is selected as a reference, and subsequent frames are predicted from the reference using a technique known as motion estimation. Genetic algorithm is applied to solve rather difficult problems by using simple coding technique and genetic system.

**Keywords:** Genetic algorithm, motion estimation, genetic algorithm based on motion estimation, application of genetic algorithm

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## INTRODUCTION

Genetic algorithms are the most powerful unbiased optimization techniques for sampling a large solution space. Because of unbiased stochastic sampling, they were quickly adapted in image processing. They were applied for the image enhancement, segmentation, feature extraction and classification as well as the image generation. The genetic algorithm is a family of computational models inspired by evolution and is used to find true or approximate solutions to optimization problem. Genetic algorithms are a class of optimization procedures which are good at exploring a large and complex space in an intelligent way to find values close to the global optimum. Compared with General optimization algorithm, genetic algorithms have the following AdvantagesDoesn'trequire derivative information,Optimizes variables with extremely complex cost surfaces.May encode the variables so that the optimization is done with the encode variables.Provides a list of optimum variables, not just a single solution.Application of genetic algorithm using motion estimation which show that how GA is used to track, capture and select the image. The extraction and selection of good features for tracking is critical to the robustness of Global Motion Estimation, with application in several areas including video stabilization. A robust method based on genetic algorithm for the estimation of the motion between two successive overlapping images. The 3D structure of multi-link from motion, and investigate the relationship among the number of the frames.

## II. GENETIC ALGORITHM

Genetic algorithms constitute a widely used artificial intelligence-based optimization method. GAs have been inspired by the process of natural selection and evolution, and mimic this process, to perform a heuristic search among a number of possible solutions to an optimization problem.

The algorithm is based on a solution encoded population of strings, each of which represents a possible solution to the problem, and is called an 'individual'. A group of these individuals coexisting in a span of time is referred to as the population. The function to be optimized is referred to as the 'fitness function'. The initial population consists of randomly generated individuals. In each generation, the fitness of every individual in the population is evaluated, on the basis of which multiple individuals are stochastic call selected from the current population. Individuals undergo further modification, through recombination and mutation, to form a new population. It is well-known that such GAs constitutes heuristics capable of finding solutions to complex optimization problems.

## III. MOTION ESTIMATION (ME)

One of the key elements of video compression schemes is motion estimation. For a video, sequence consists of a series of frames, to achieve compression; the temporal redundancy between adjacent frames can be exploited. That is, a frame is selected as a reference, and subsequent frames are predicted from the reference using a technique known as motion estimation. The process of video compression using motion estimation is also known as interframe coding. When using motion estimation, an assumption is made that the objects in the scene have only translational motion. This assumption holds as long as there is no camera pan, zoom, changes in luminance, or rotational motion. However, for scene changes, interframe coding does not work well, because the temporal correlation between frames from different scenes is low. The current frame is divided into macroblocks, typically 16×16 pixels in size.This choice of size is a good trade-off between accuracy and computational cost. However, different motion estimation techniques may choose different block sizes, and may vary the size of the blocks within a given frame. Each macroblock is compared to a macroblock in the reference frame using some error measure, and the best matching macroblock is selected. The search is conducted over a predetermined search area. A vector denoting the displacement of the macroblock in the reference frame with respect to the macroblock in the current frame is determined. This vector is known as a motion vector. When a previous frame is used as a reference, the prediction is referred to as forward prediction. If the reference frame is a future frame, then the prediction is referred to as backwards prediction. Backwards prediction is typically used with forward prediction, and this is referred to as bidirectional prediction. In video compression schemes that rely on interframe coding, motion estimation is typically one of the most computationally intensive tasks, taking up to 60% of the processing time. During reconstruction, the reference frame is used to predict the current frame using the motion vectors. This technique is known as motion compensation. During motion compensation, the macroblock in the reference frame that is referenced to by the motion vector is copied into the reconstructed frame. In motion estimation, the search process can be modified to suit the needs of a particular algorithm. The search area is typically restricted to lower the computational cost associated with block matching. Also, in many cases, the objects in the scene do not have large translational movements between a frame and the next. That is, the fact that frames in a video sequence are taken at small intervals of time is exploited.Fig.1 show that the moving object i.e person is capture at a particular point by genetic algorithm.

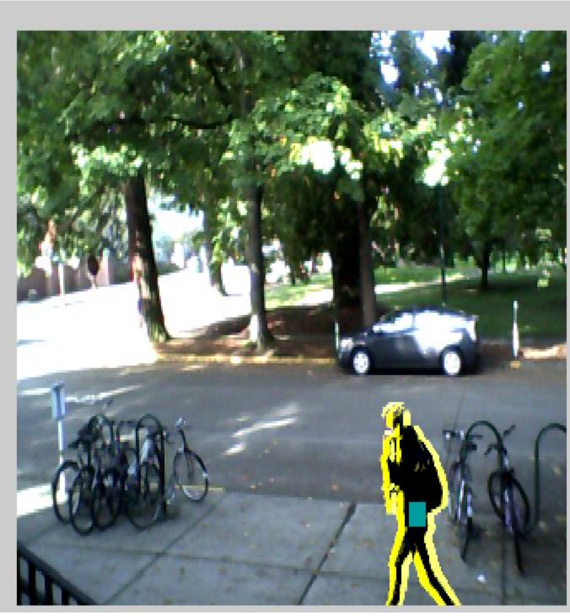

Fig.1. Motion of person Capture by GA

## IV. GENETIC ALGORITHM BASED MOTION ESTIMATION

Application of genetic algorithm using motion estimation which show that how GA is used to track, capture and select the image.

### A. Genetic Algorithm-Assisted Feature Extraction and Selection for Global Motion Estimation

The extraction and selection of good features for tracking is critical to the robustness of Global Motion Estimation, with application in several areas including video stabilization. The classical approach to this problem involves first extracting real-world points, based on structural criteria such as edges and corners, and subsequently selecting the more reliable features for tracking. Potential information in the movements of non-structural elements could thus be lost during feature extraction, while the selection criteria may not correlate well with camera movements. A genetic algorithm-assisted approach, in which the feature extraction-selection process is directly coupled to the robustness of global motion estimates. This adaptive approach effectively learns the feature set whose movements, most closely correspond to global motion, thus ensuring robustness.

Fig.2. Tracking of Features by GA

Motion estimation is the process of quantifying movements in successive images, and the term ‘global motion’ generally refers to the motion associated with the camera. The occurrence of global motion in an image sequence is characterized as either intentional, as in the case of panning, zoom etc., or unintentional, as in the case of shaky hands or an unstable camera mount. The latter type of global motion gives rise to an adverse effect on the quality of the video, in the form of jitter. From a compression perspective, this jittery movement requires unnecessarily high bit rates, thereby requiring suppression. Video stabilization methods thus aim to reduce the amount of this jitter in video sequences using global motion estimation (GME). GME approaches that rely solely upon information within the frame sequence are based upon some form of tracking. There are two approaches to such inter frame tracking, one being the ‘direct’ approach, which employs information obtained from all pixels in the frame, as potential indicators of the movement. The other is a feature-based approach, which employs a strategy of concentrating computation on specific areas of the image where it is possible to get good correspondence with global motion. Feature-based methods find application in compression and video stabilization systems, particularly those requiring camera motion estimation alone and not motion from the scene. Feature-based methods require the dual processes of extraction and selection of congenial features for the global motion estimates to be robust. The process of extraction involves identifying potential interest points, based on texture related structural criteria such as corners and edges, with emphasis on distinguishing physical real-world objects. Good features are then selected based on their ‘trackability’.The trackability of a feature depends upon its resilience to deformation, occlusion etc. in subsequent frames, and also correspondence of its movements with that of the camera. Since feature tracking itself is relatively well established, the robustness of global motion estimate depends critically upon this dual-process of feature extraction and selection. It is pointed out that information present in the movement of pixel groups that do not correspond to distinct real-world structures, such as those straddling depth discontinuities, may also correspond well to the movement of the camera. The above classical approach thus may involve potential loss of this information. Also, selection procedures for trackability and outlier removal may not correlate well with the ego-motion of the camera.This application, contain novel genetic algorithm (GA)-based approach, which combines the processes of feature extraction and selection. Our approach effectively learns the 'best' feature, i.e. the group of pixels which when tracked, results in maximally robust global motion estimation. our approach departs from the classical definition of features as distinct real-world objects (edges, corners, etc). In fact, our approach is blind to the structural content of the feature, and instead evaluates arbitrary subgroups of pixels based on their correspondence to global motion. This effectively couples the process of feature selection to the robustness of global motion estimation. Our approach is especially applicable to the process of video stabilization. It is experimentally evaluate that the performance of this approach and compare it to a recent, popular stabilization software that is also based upon feature tracking, and demonstrate enhanced performance. A novel approach to feature extraction and selection for global motion estimation, based on genetic algorithms. By using a fitness function that directly correlates with robustness of estimate, our method ensures enhanced performance, especially with respect to video stabilization. Our approach represents a departure from the classical structure-based approach to feature identification. Like other feature-based methods, our approach critically depends upon the presence of relatively stable, trackable features in the scene, whose movements provide good correspondence with the camera jitter. Thus, videos where such features are lacking can pose a challenge for motion estimation; nevertheless, we expect our approach to be more successful than others, in locating such ideal features.

**B. *3D* Motion Estimation of Human By Genetic Algorithm**

By Genetic Algorithm it achieve the unique robust numerical solution to motion estimation of the coplanar links. Then it apply the techniques to human motion analysis, und obtain the 3D motion data of joints, reanimate successfully the data. The experiments with simulated data and real images are included to demonstrate the validity of the theoretic results.Motion and structure determination of articulated objects from multiple frames is important in a large number of applications such as human gait analysis and the monitoring of robot motion. The application based on assumptions of the articulated model and coplanar constraint, it estimate 3D motion of the human walking by Genetic Algorithm.The relationship between the normal angle(left), 3D coordinates of the endpoint with the noise(middle), total error(right) and the noise. Although the coplanar equations and rigid equations can not be satisfied exactly due to the noise in 2D images, there does exist “a virtual plane” which makes the recovered 3D motion of the link satisfy the final error criterion.Fig.2 show the 3 dimentional view of object obtain by 3D motion estimation technique. Here to obtain the unique 3D human motion we assume that over a small number of image frames some parts such as leg and arm move in a unknown fixed plane. In many real human motions the constraint appears reasonable. If we can determine motion of the coplanar parts of the articulated human, it is possible to estimate 3D structure of all human. Thus motion and structure determination of some coplanar rigid links from many frames play important role in the motion estimation of the articulated objects. The 3D structure of multi-link from motion, and investigate the relationship among the number of the frames and links and the number of the equations and unknowns. By Genetic Algorithm, the robust numerical solutions can be achieved.

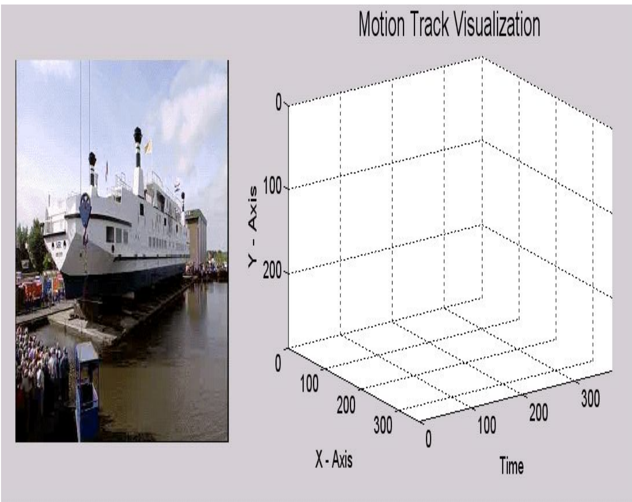


Fig.3.. 3D Motion Estimation of Human By Genetic Algorithm

**C. Robust Motion Estimation for Overlapping Images Via Genetic Algorithm.**

A robust method based on genetic algorithm for the estimation of the motion between two successive overlapping images, a classic problem in computer vision.Genetic Algorithms are growing rapidly as an attractive technique in the area of artificial intelligence, yet currently there is no general theory which would allow the specification of the appropriate parameters of a GA for any given real-world problem. Motion estimation is the key step for image registration, one of the most important research topics in the field of computer vision. In most cases, it is assumed that the motion between two overlapping images is a projective transformation. A robust algorithm for estimating projective transformations using one specific GA. For this application, compared with the local optimization algorithms, the GA has proved to be able to converge on the global optimum and to produce a set of more accurate motion parameters.

Fig.3. Overlapping of Images via Genetic Algorithm

Fig.4. Robust Motion Estimation for Overlapping Images via Genetic Algorithm

The proposed method to estimate the motions[8]

for a collection of overlapping images. Once we mapped all the images into the same coordinate system using the estimated motion parameters, The gain compensation and multi-band blending for multi-image fusion to create a seamless mosaic. Finally, it produced a panorama as shown in Fig. 4. It demonstrates the effectiveness and the robustness of the Genetic Algorithm-based motion estimation method.

**D. A Noval Fast Estimation method based on genetic algorithm**

A noval fast motion estimation method based on an improved genetic algorithm is presented[1], in this application both objective search and random search derived from genetic mutation. Motion Estimation is an essential component of many video encoding algorithms. The most popular method adopted to estimate the motion between frames is block matching algorithm(BMA),in which a block of size M*N(usually 16*16) is compared with a corresponding block within a search area in the previous frame.

## V. CONCLUSION

This paper discussed that how a genetic algorithm is used for motion estimation. Application shows that how Genetic Algorithm is used in various technique i.e to track, capture and select the image. The extraction and selection of good features for tracking is obtain by Global Motion Estimation, A robust method based on genetic algorithm for the estimation of the motion between two successive overlapping images. The 3D motion estimation of human in which 3 dimensional view is obtain by genetic algorithm. a noval fast estimation method for block matching algorithm..

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