A Novel Sparse Prototype Based Differential Evolution Algorithm for Real Time Object Tracking

R.Sajitha
Assistant Professor CSE/Sivaji College of Engineering And Technology

***Abstract*—The process of locating a specific object in an image is known as object detection. Tracking one or more things overa series of frames is known as object tracking. Developing an object tracking algorithm that follows the object in blur space isthe goal. It improves object tracking's proximity. Adaptive differential evolution is the algorithm used for tracking objects in real time. The hand location is being tracked by the algorithmat changing gesturing speeds in any direction. It is possible to track gestures even when there is information blur. By using genetic operators to effectively propagate samples in the search space with a limited population size, the recommended tracker shortens processing times. The goal of the systemtransition model is to stop an object from disappearing. A collection of The blur templates can be used to identify the blur from the target. This can track items which are moving quickly or slowly, as well as track in a crowded scene.**

***Keywords*—Differential evolution algorithm, Genetic operators, Gesture recognition, Motion blurs, Real time object tracking.**

I.INTRODUCTION

In general, gestures are hand and body movements that allow one person to communicate with another. A posture is a certain arrangement of the hands that is noticed at a certain moment. A gesture is a series of temporary postures joined by movements. A gesture often consists of one or more postures that happen one after the other along the time axis. Nonverbal signals like hand gestures, facial expressions, and voice tones are also employed in interpersonal human communication in addition to spoken language to convey emotions and provide feedback. As a result, automated speech recognition systems and specially made interface devices for the disabled have replaced the traditional mouse and keyboard systems as the current trends in human computer interfaces. Facial motion and the tone of the speech play a major role in expressions.

One of the most important aspects of human evolutionary survival is the ability to detect and recognize biological motion. Humans have the ability to extract emotions from non-verbal clues such as human interactions, facial expressions and body movements. Training a machine to recognize human emotions is more challenging and is an active field of research. Currently there are two main approaches for effective computing they are audio based techniques and video based techniques. Audio based techniques determine emotions from spoken words. Techniques that analyze and categorize face expressions through videos.

The initial crucial stage of information extraction in numerous computer vision applications, including object tracking, traffic monitoring, video surveillance, and semantic annotation, is the detection of moving objects in the video stream. In these applications, a dependable and efficient moving object recognition is essential for robust object tracking in the scene.

II.SURVEY OF EXISTING TECHNIQUES

Seongkeun Park proposed a New Evolutionary Particle Filter by incorporating Genetic Algorithms with Particle Filter to prevent the loss of the object while tracking. Initially it samples the particles in search space and importance weighting can be calculated by using the Crossover and Mutation operators finally resampling can be done to remove the low importance weighting [1]. Generally, visual tracking uses optimization process for estimating the motion of object. Xiaoqin Zhang proposed a New Evolutionary Approach (Particle Swarm Optimization) for visual tracking. So that the tracking process can be done by measuring the object state and time simultaneously [2].

The particle filter with integral histogram is implemented using kinematics chain model. The particle filter generates all the models for one variable before moving to the next variable. The kinematic chain model is used to track the overlapped object. The tracker fails in cluttered background. The integral histogram increases efficiency by reducing the histogram bins [3]. Yiwu proposed an interesting method for tracking the object even in blurred target. BLUT method uses both blur templates and normal templates. Blur driven tracker is closely related with two components. To create an enriched template subspace for object representation, blend templates into the set of conventional templates. Then model a target with a sparse approximation using these templates. The tracking is robustly and severely by using this method [4]. Jonathen Alone and Athitsos proposed an interesting approach in segmentation and recognition. They proposed a common framework which can perform both spatial and temporal segmentation and gesture recognition are also be performed in this. This framework can be used to track multiple hand locations in each frame. Spatial gesture segmentation determines where the gesture occurs. Temporal gesture segmentation determines when the gestures start and ends [5]. Freeman proposed a new mechanism to control television using hand gestures. Contour tracking methods is used to track the gestures which iteratively progress a primary contour in the previous frame to its new position in the next frame. A specific percentage of the object in the current frame must overlap with the object region from the previous frame in order for the contour advancement to occur. The most significant advantage of tracking is their flexibility to handle a large variety of object shapes [6]. Vision based user interface which enables the user interactions as easy and possible by using gesture recognition techniques. These interfaces need low-latency, computationally demanding video processing. In this paper the authors demonstrated an application that uses gestures to control Television operations. Using a novel descriptor known as MOSIFT, accurate recognition is accomplished [7]. The authors' focus is very different from ours, in this they mainly focused on controlling various electronic devices by using a single remote control system. Thus the remote system contains various device icons. Each icon resembles the control panel of the particular device through a virtual menu. By interacting through the virtual menu user can control the device [8].

Gesture drawing method is implemented using a single camera dedicated hardware system. The images are captured using a single camera are streamed to the motion tracking module. The tracking module extracts the motion vector which includes the velocity and directions. While the motion is being detected its directions are used as the feature values for gesture recognition [9] Filtering technique is to detect finger tips in each image frame to predict finger tip locations in each image frames and to examine the correspondences between the predicted locations and detected fingertips [10].

III.PROPOSED ALGORITHM

Generally tracking cannot be performed in blurred target and tracking fails at variable speed of gesturing. This paper proposes Adaptive Differential Evolution algorithm for real time object tracking. Thus the Adaptive Differential Evolution algorithm starts by initially feeding the particles to the system transition model. The particles are can be feeded to the transition model to prevent the loss of the target while tracking.

$$\{y_i^{t+1} = y_i^t + u_i^{t+1}\} \quad u_i^{t+1} \in v[-u_{max}, u_{max}] \quad (1)$$

Where, u_{max} is the maximum velocity and v is the uniform random distribution. Apply genetic operators to generate set of candidate solutions. Thus two types of genetic operators are used for generating candidate solutions. They are Mutation and Crossover operators. In Mutation an alternate solution can be produced it may change entirely from previous solution. During evolution mutations happen based on a user-definable mutation probability. This probability should be low if it is too high the search will turn into a random search.

$$y_{mutate,i}^{G} = y_i^{G-1} + m, \quad (2)$$

Where m is a mutation vector, G denotes generation, and i denotes I^{th} individual. The crossover operator on the other hand combines two or more individuals to generate new candidate solutions. It also exploits new areas of the search space. The Crossover operator that, pairs two individuals and mates them by performing a convex linear combination. Best crossover operator which pairs all individuals with the best solution.

$$y_{xover,i}^{G} = s.y_i^{G-1} + (1-s).y_j^{G-1},$$
$$y_{xover,j}^{G} = (1-s).y_i^{G-1} + s.y_j^{G-1}, \quad (3)(4)$$

Where, s is a parameter that lies between zero and one, $s \in [0,1]$. Evaluate fitness function to determine how closely the given solution matches the target. The convergence criteria can be checked to find the transformation between normal and blur template. Thus stop the criteria

$$\{ f(y_i^o) \}_{i=1}^{N} \approx \rho(l, r_{yi}) \quad (5)$$

Where, r denotes reference object and l denotes candidate object and f denotes fitness function. The proposed tracker is much more effective than other trackers. Generally this algorithm which starts with an initial population of candidate solution and at each step the individuals evolve with the set of predefined solutions.

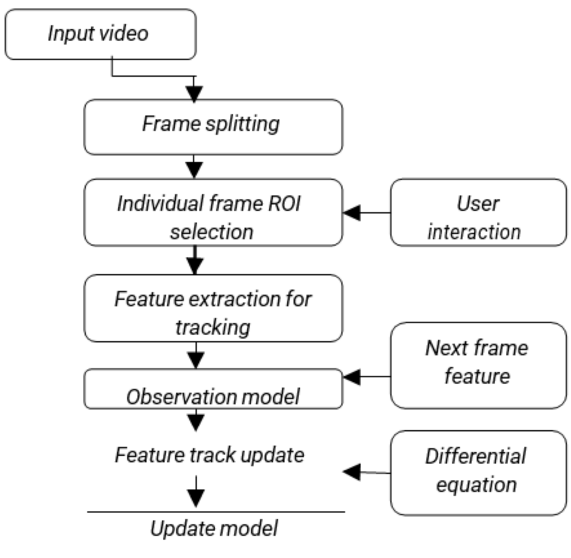

Fig1: Proposed System Architecture

Fig1 shows the processing of the proposed system. Initially an input video is selected and each frames of the video are spited. Select an object from the first frame of the video the object are selected based on user's Region Of Interest. Thus this selected object is extracted for tracking. The observation model which predicts where will be the object in the next frame.

A. Input image reader

Input images are obtained for processing. This module is used to obtain the physical information about the image that includes the size, resolution image type, blurrness (if any missing information in the image). Usually video is processed with frame set information that can be passed to obtain the collection of image frames.

B. Object selection

Once the video is processed, then in the first frame the object that is required to be processed/trackedis framed by user interaction. A square view is created onthe ROI and the ROI is separated for processing. ROI's feature information is calculated and the features are tracked on the further frame sets. Thus the selected object is tracked throughout the whole video. The selected object is tracked in individual frames throughoutthe video.

C. PCA feature selection

Two general approaches for dimensionality reduction. The process of feature extraction converts the current features into a space with fewer dimensions. Feature selection is selecting a subset of the existing features without a transformation feature extraction.

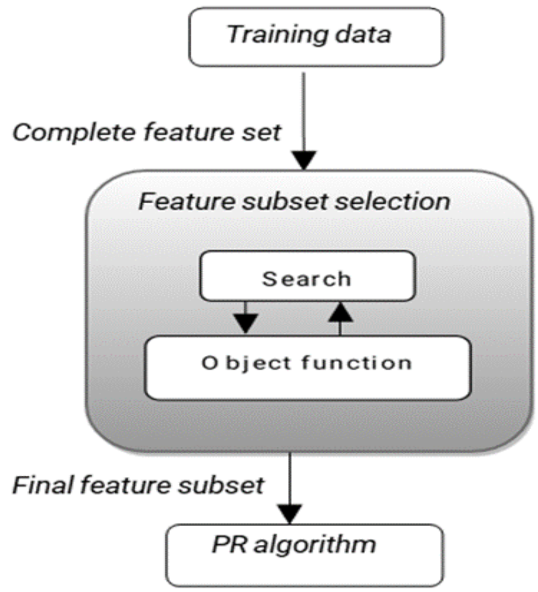

Fig2: PCA Feature Selection

Fig2 shows the processing of PCA feature selection in which initially the features are selected from the predefined training data. In which the features are searched by using the object function. Finally apply PR algorithm for these searched feature sets.

D. Feature subset selection

Given a feature set x= {xi| i=1…N} find a subset x M= {xi1, xi2,…,xiM},with M<N, that optimizes an objectivefunction J(Y). The objective function evaluates candidate subsets and returns a measure of their "goodness". This feedback is used by the search strategy to select new candidates.

E. Differential evolution

DE algorithms start with an initial population of candidate solutions, and the quality of each solution is evaluated using some predefined fitness function. The initial population is then allowed to a selection process that generates a new set of solutions. At each step of the evolutionary process the individuals within the *candidatesolution evolve through a set of predefined operators. Mutation operator randomly alters a selected individual. Random crossover operator pairs two individuals and mates them. Best crossover operator pairs all individualswith the best solution.*

EXPERIMENTAL RESULTS

The proposed Adaptive Differential Equation is implemented together with two other algorithms, SPSO and PF+DE. The SPSO is implemented using the system transition model. To reduce the effect of the background, colour segmentation to the tracking process. The first frame is scanned and the fitness function is evaluated. SPSO confuses the face with the hand due to motion blur.

Fig3: Object Tracking In Ambiguous Environment

Fig3 shows a coffee mug in a table. In the second frame a hand is holding the mug. In the third frame the hand started moving the mug at a rapid motionspeed. Thus the proposed tracker can able to track the object without failure and thus the can be tracked even inthe presence of blurness.

The proposed tracker can be able to track the object even if it is occluded. The proposed tracker has better position estimation. This is due to the use of crossover operator. The dynamic threshold is updated it enables the proposed tracker to perform better than the other two trackers, in the presence of motion variation

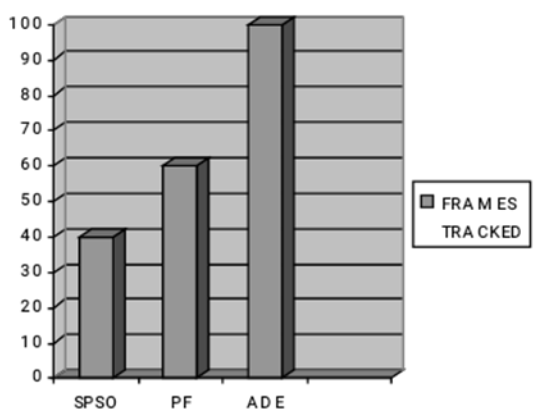

Fig4: Comparison Of ADE Vs SPSO, PF

Fig4 shows the comparison of the Adaptive Differential Evolution Tracker with Sequential Particle Swarm Optimization and Particle Filter. In the above chart the x axis denotes the trackers and y axis denotes the number of frames. Thus comparing with the other two trackers the ADE tracker can track the object throughout the entire number of frames. The SPSO tracker uses a predefined threshold so that it loses the target in some frames. The sequence is characterized bytemporal motion blurs of the object. The most challenging issue in SPSO tracker is when the object is occluded by some other objects. The particle filtering generates all the models for one variable before moving to the next variable. It also allows for new operation of resampling.

IV.CONCLUSION

The adaptive differential evolution algorithm for real-time object tracking tracks motion blur information accuracy and efficiency of the proposed method, compared with other trackers that assume tracking in blur free space. A trustworthy and efficient moving objectdetection system is necessary for robust object tracking in the scene. Accuracy in shape detection and reactivity to changes in time in different scenarios (indoor, outdoor)and different light conditions and efficiency in detection are provided. The same object can be identified more reliably from frame to frame if its shape and position are accurately detected and faster.

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