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Evolutionary Program Based Approach for Manipulator Grasping Color Objects

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***Abstract*—**Image segmentation and color identification is an important process used in various emerging fields like intelligent robotics. A method is proposed for the manipulator to grasp and place the color object into correct location. The existing methods such as PSO, has problems like accelerating the convergence speed and converging to a local minimum leading to sub optimal performance. To improve the performance, we are using watershed algorithm and for color identification, we are using EPSO. EPSO method is used to reduce the probability of being stuck in the local minimum. The proposed method offers the particles a more powerful global exploration capability. EPSO methods can determine the particles stuck in the local minimum and can also enhance learning speed as the particle movement will be faster.

***Keywords*—**Color information, EPSO, hue, saturation, value (HSV), image segmentation, particle swarm optimization (PSO). Active Contour, GMM.

I. Introduction

A manipulator performing a real-time visual control strategy for eye-to-hand coordination, In order to implement an eye-to-hand cooperation system, the image processing should be processed in real-time and be accurate. Controllers have been widely mulled over the previous ten years, and alongside the change and development of engineering, the programmed controller is actualized by including tangible and visual criticism with a control system. Hence, numerous mechanical inquires about incorporated with a visual framework have been produced over a drawn out stretch of time. For case, the visual serving controls the robot by joining eye-to-hand or eye under control procedure and a controller with visual criticism is known as the eye-to-hand cooperation. A controller performing a constant visual control method for eye-to-hand coordination in this present reality was proposed in reference created an alignment calculation for an eye-to-hand framework, which can all the while achieve cam alignment, hand-eye adjustment, and coordination of the working plane identified with the robot base edge. Additionally, change proposed a picture based control system for the visual serving of an inflexible mechanical controller in eye-to-hand design, where the mechanical end-effectors were absolutely moved to a visual decided target position with a specific end goal to actualize an eye-to-hand participation framework; the picture preparing ought to be handled progressively and be precise. Along these lines, the point of this study is to discover how to portion a shade picture progressively for a dream framework, picture division is imperative in picture handling, whose aim is to partitioned the craved articles from the complex foundation. When all is said in done, it is difficult to completely consequently portion color what's more composition in a common picture]. Consequently, there are some self-loader division systems utilized by fusing client cooperation that has been proposed in, and these methodologies are getting to be more famous. In the intuitive area combining system is focused around the introductory division of mean movement, which is inputted by the client to generally show the position and fundamental gimmick of the article foundation, in the client needs to drag a rectangle inexactly around the article, and after that the article will be concentrated consequently. Proposed a straight programming approach for fragmenting a shade picture into numerous districts, where client additionally needs to drag some defined strokes to fabricate the Gaussian mixture model (GMM) for the frontal area and the foundation. XIANG et al. submitted a chart based grouping calculation for intelligent picture division, which was created with numerous straight reproductions in picture windows. Additionally, the client ought to drag a little number of defined strokes. In addition, a few studies used the color data to section the picture for example, the creators in utilized skin shade data and the confined coulomb vitality neural system to prepare the skin shade dispersion for a hand picture. To divide the hand picture in a motion distinguishment framework, and the target shades were recognized utilizing a histogram-like structure. Reference proposed a computational model for gestalt-based division, which depended on peculiarities commonly supporting or hindering one another to section activity for ROBOCUP rivalry, the creators in proposed a versatile shade adjustment focused around the BAYES hypothesis and chrominance histograms, controlled a 5 level of opportunity binocular mechanical head to track a colored question by utilizing the shade and immersion histograms and the log-polar vision. a combination skeleton focused around a smoothed 2-d histogram and a Gaussian model to identify human skin is given in. the division calculation was focused around pushing speculative questions by the robot, which gave by the drove information to distinguish the article one from the other the foundation. Not with standing, it is still troublesome also difficult to do this for completely programmed shade picture division. Albeit numerous studies can section shade pictures actually, a few methodologies take

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a lot of computational time to actualize continuously and may not be promptly accessible, we must tune six edges to cutoff the HSV shade space physically for color picture division. On the other hand, it takes a lot of time to accomplish the best eye-to-hand participation framework in the setup time. Subsequently, this paper shows a straightforward and-viable system to fragment the color picture semi automatically by the watershed calculation and the proposed EPSO strategy. AREAI portrays the most effective method to acquire a target picture and evaluate the shade data appropriation for color pictures. Segments and clarify in detail the structure of the learning of color data.

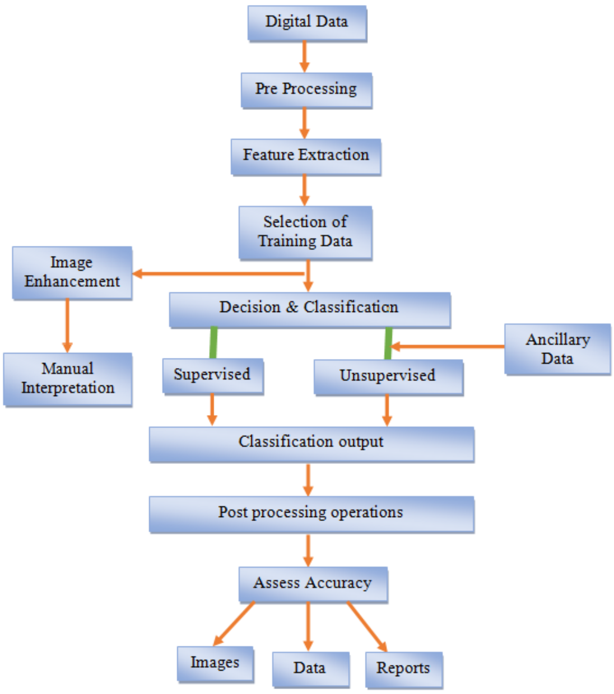

Fig. 1 Architecture of Image Processing

II. Related Work

The calibration method does not need any manual initial guess of the unknown parameters. To accomplish a higher precision, an optimization method is implemented to refine the estimation. The experiment proofs that this method is useful when the camera cannot see the hand and result with real data is consistent with the simulation and validates the proposed algorithm [1]. This technique can be used for the case when the eye does not see the hand accurately estimate the camera intrinsic parameters, the configuration between a camera and a robot, and the pose of working plane at the same time. But require high computational cost. An algorithm for interactive image segmentation is proposed in which the task is formulated as a problem of graph-based transductive classification [2]. The label reconstruction errors are estimated and minimized to obtain the final segmentation. It can still be improved. A two-step iterative segmentation and registration method to find coplanar surfaces among stereo images of a polyhedral environment is proposed and propose a user-defined initialization easing the image matching and segmentation, to incorporate color appearance and planar projection information into a Bayesian segmentation scheme, and to add consistency to the projective transformations related to the polyhedral structure of the scenes. The original segmentation of user-assisted is used to define search regions for planar homographic**,** image registering. The two reliable methods cooperate together to obtain probabilities for coplanar regions with similar colour information that are used to get a new segmentation by means of Quadratic Markov Measure Fields (QMMF) [4]. This process can be used in any environment containing planar structures. Its domain of application is wide because planar surfaces are quite common both at outdoor and indoor scenes. One can intrinsically segment a piecewise planar scene from two 2D images without performing neither camera calibration nor 3D reconstruction, to reduce computational time and to correct wrong segmentations. It may help to extend planar regions that other methods cannot detect or separate. Registering has only been conducted only from the first image to the second one, but no coherence from the registering in the opposite sense has been verified. This step should improve the performance of our method in some challenging regions such as discontinuities and occlusions. Obtaining metric information from the computed registering parameters, such as the EPIPOLE positions and the plane parameters, intend to auto-calibrate the cameras and to recover the planar piecewise structure of the scene is challenging [3]. An algorithm for interactive image segmentation is proposed in which the task is formulated as a problem of graph-based transductive classification. The computational complication is deducted, and an approach for speeding up the algorithm is presented [5]. The label reconstruction errors are estimated and minimized to obtain the final segmentation. It can still be improved in order to get a better performance. A model-based graph matching approach is proposed for interactive image segmentation [7]. A computational model for gestalt-based segmentation called Competitive Layer Model (CLM) is proposed. The CLM relies on features mutually supporting or inhibiting each other to form segments by competition. The full strengths of the competitive layer model, as shown in visual segmentation still have to be exploited. A background/reject layer might prove useful to reject the assignment to a certain segment in areas of ambiguity, where information is sparse [6]. Different layer classes with different lateral interactions might be practical to segment more complex actions, e.g. rotating a grasped object, unscrewing a bottle or similar fine manipulations. Moreover, each found segment has to be thoroughly analyzed and interpreted to facilitate further learning and a final imitation of the demonstrated movements. Effects and preconditions of actions and temporal sequences of segments can yield important cues for an imitation learning system that will be exploited in further research. To determine the suitability of the state-of-the-art vision algorithms for mobile robot domains, to identify the challenges that still need to be addressed to enable mobile robots to learn and adapt models for color, so as, to operate autonomously in response to such changes, color segmentation on mobile robots in the presence of illumination changes [8]. This is applicable to color-based mobile robot vision as well as Algorithms for color segmentation, color clarification and learning invariance on mobile robot platforms is proposed, including approaches that tackle just the underlying vision problems and the interdependencies between these modules and high-level action planning can be exploited to achieve autonomous learning and adaptation. Use of mobile robots is the ability to learn, adapt and operate autonomously. Surveying a set of representative approaches for color segmentation, color learning, clarification invariance and action-planning is done [9]. It facilitates autonomous color-based mobile robot operation: real-time operation, deployment without extensive manual training or prior information, and adaptation to previously unseen environmental conditions, identifying the feasible assumptions, limiting constraints, the information available to the robot. It requires high computational cost. A new approach for segmentation and learning of the objects or the environment is needed. Object has a (partly) smooth surface that contains some distinctive visual features and moves as an unbending body [10]. To learn the appearance of the object from multiple viewing directions, it also allows robust object recognition in cluttered scenes, helpful in complementing the grayscale-based SIFT descriptor. It cannot be allowed with more complex geometrical shapes for the initial hypothesis, like spheres, ellipsoids, super quadrics, goons etc. A multichannel signal enhancement methodology is proposed to improve the performance of commercial speech recognizers, aims to optimize speech recognition accuracy of a commercial speech recognizer in a noisy environment, which is developed by an intelligent particle swarm optimization [11].

Accuracy can still be improved, distributed manufacturing systems, especially in a manufacturing grid (MGRID) system, there are primarily two kinds of resource service requests: 1) single reserve service request task (SRSRTASK), which can be completed by invoking only one resource service, and 2) multi reserve service request task (MRSRTASK), which is completed by invoking several resource services in a certain sequence [12]. The advantages of this includes that to minimize Time, minimize cost, maximize reliability and useful in solving MO-MRSCOS problems. The main disadvantage of such a system is that the resource conflicts including classification and modeling of conflicts, and the corresponding conflict resolution based on QoS, such as trust-QoS based post-scheduling strategy. In our existing method, the convergence speed of well-known PSO algorithms is slow and may be stuck in the local minimum.

A PSO-EP based hybrid algorithm was proposed in which we use a mutation strategy and reduction to improve the variant PSO. Conventionally in order to detect the color and the position of the objects, we must tune six thresholds to limit the HSV color space manually for color image segmentation. However, it takes too much time to achieve the best eye-to-hand cooperation system in the setup time.

III. PROPOSED SYSTEM

In our proposed work, watershed algorithm is used for image segmentation and EPSO is used for color identification. The particles of the EPSO methods are more uniformly distributed over the three dimensions by the proposed Initialization procedure so the EPSO algorithms can find the closer optimum solutions at the transient iterations. The EPSO methods possess the ability to jump out the local minimum and reinitialize PSO. A PSO-EP based hybrid algorithm was proposed in which we use a mutation strategy and reduction to improve the variant PSO. The proposed EPSO methods significantly reduce the number of iterations for the color. The watershed method is applied to the interactive mark of the image with some specified strokes in some regions, in order to obtain the binary target image, the target image of different colors; the watershed method incorporates user interactions to segment the color image. The results clearly show that the proposed EPSO methods outperform the existing methods.

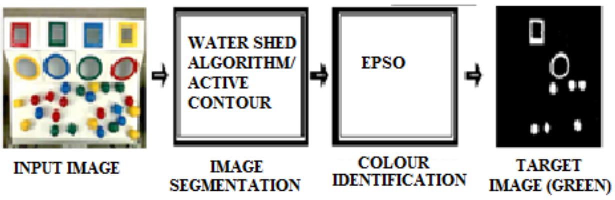

Fig. 2 Architecture of the system

The original input color image can consist of an image in which the user interactively mark some specified strokes in the desired region. Image segmentation is the process of dividing an image into multiple parts. This is typically used to identify objects or other relevant information in digital images. Active contour algorithm is used to perform image segmentation.

Steps

1) Convert the color image in to RGB image.
2) Apply the Watershed Algorithm
3) Get the segmented image
4) Compare the segmented image with original image
5) Separate each segmented image with target.
6) Find the corresponding hue, saturation and value
7) Fix a target for each color
8) Apply PSO for existing method and EPSO for proposed method
9) Compare the original image with output image
10) Fix a threshold for each value
11) Obtain the corresponding color
12) Finally analyze the result compare the target image with image obtained using PSO
13) Compare the target image with image Obtained using EPSO
14) Obtain result by comparing the obtained results
15) Plot the obtained results

IV. Module Description

The aim of this method is to find out how to segment a color image for a vision system. Image segmentation is important in image processing, whose intent is to separate the desired objects from the complex background. It is very hard to fully automatically segment color and texture in a natural image. Hence, we are using some semiautomatic segmentation for segmenting the color image.

A. Segmentation

The watershed method is applied to find the target image; the watershed algorithm incorporates user interactions to segment the color image. Then, the target image is compared with the original image to compute the distribution of the HSV color space and obtain the target image. The watershed method is applied to the interactive mark of the image with some specified strokes in some regions. In order to obtain the binary target image, the target images of different colors.

Step 1. Get the input image. Convert the input image into gray image.

Step 2. Get the gradient image for the gray image. Get the input image.

Step 3. Convert the input image into gray image.

Step 4. Get the sets of the coordinates of the points in the gradient image from n = 1,2,..R and denote it as M_1, M_2, …, M_R.

Step 5. Set $C(M_i)$ as the coordinates of the points in the catchment basin associated with regional minimum M_i in the gradient image.

Step 6. Get the minimum and maximum levels of gray image and set it as g(x,y). Denote T[n] as the set of coordinates (s,t) for which g(s,t) < n.

Step 7. Set the increments from n=*min*+1 to n=*max*+1. Denote $C_n(M_i)$ as the set of coordinates of points in the catchment basin associated with minimum M_i at flooding stage n.

$$C_n(M_i)= C(M_i) \cap T[n] \quad (1)$$

$$C_n(M_i)=\subseteq T[n] \quad (2)$$

Step 8. Denote C[n] as the union of the catchment basin portions of the watershed image at stage n:

Step 9. Formula for watershed algorithm.

$$C[n] = \cup_{i=1}^{R} Cn(Mi) and\ C[\max+1] = \cup_{i=1}^{R} C(\mathrm{Mi}) \quad (3)$$

- Initialization

$$\text{Let } C[min+1]=T[min+1] \quad (4)$$

Step 10. Get the sets of the coordinates of the points in the gradient image from n = 1,2,..R and denote it as M1, M2, …, MR

Step 11. Set $C(M_i)$ as the coordinates of the points in the catchment basin associated with regional minimum M_i in the gradient image.

Step 12. Get the minimum and maximum levels of gray image and set it as g(x,y).

Step 13. Denote $C_n(M_i)$ as the set of coordinates of points in the catchment basin associated with minimum M_i at flooding stage n.

$$C_n(M_i)= C(M_i) \cap T[n] \quad (5)$$

B. Feature Extraction

For finding the colors of each segmented part we need to find the feature of segmented images. The feature extraction is done with corresponding hue, saturation, value (HSV) color model. Hue is one of the main properties of a color, a hue refers to a pure color one without tint or shade black pigment, A hue is an element of the color wheel.

C. Optimization

For the existing method we are using particle swarm optimization (PSO). PSO algorithm is a useful tool for optimization but still has some problems including how to accelerate the convergence speed and how to avoid converging to a local minimum. For the proposed system we are using PSO-EP based hybrid algorithm, which used the mutation strategy and reproduction to improve the variant PSO. The improved PSO method can reduce the probability of being stuck in the local minimum.

The PSO algorithm is used for color identification approximately optimal ranking. CloudRank1 includes the following steps:

Step 1. Obtain the features for input image.

Step 2. Initialize positions of a group of particles, then go to Step 4.

Step 3. Evaluate the fitness. If any change in system parameters is detected, reset the best location memories and velocities of particles.

Step 4. Evaluate fitness of each particle using Step 3.

Step 5. If the new position of i-th particle is better than P best i, set P best i as the new position of the i-th particle.

Step 6. Calculate the inertia weight using Step 8.

Step 7. Update the velocity and position of each particle according to the Step 5 and Step 6.

Step 8. If the global optimum fitness is lower than a redefined threshold, output the global optimum is the proposed inertia weight and label it as particle. Else go to Step4. Apply PSO for existing method and EPSO for proposed method. Compare the original image with output image. Fix a threshold. Obtain the corresponding colour.

V. Performance Evaluation

The performance measures are obtained for both PSO and EPSO methods and the both methods. The results are getting compared with different iterations. The proposed procedure offers the particles a more powerful global exploration capability. Experimental results will demonstrate that the proposed EPSO methods not only can determine the particles stuck in the local minimum but can also enhance learning speed.

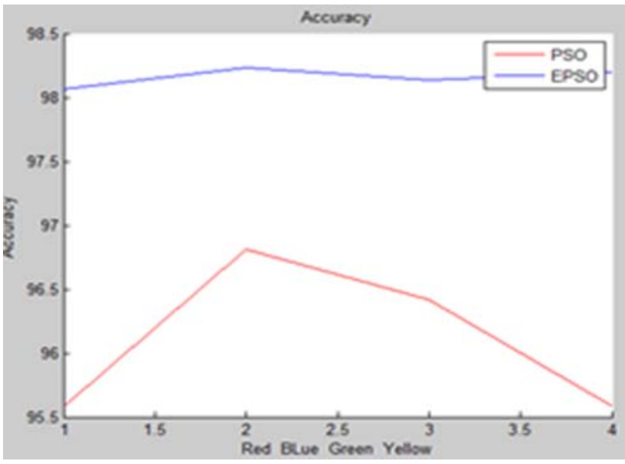

Fig. 3 Individual Accuracy

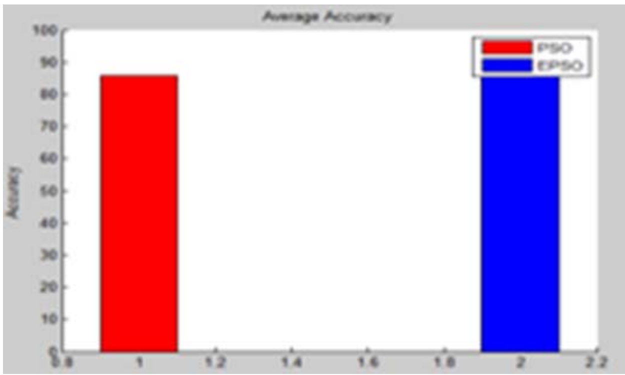

Fig. 4 Overall Accuracy

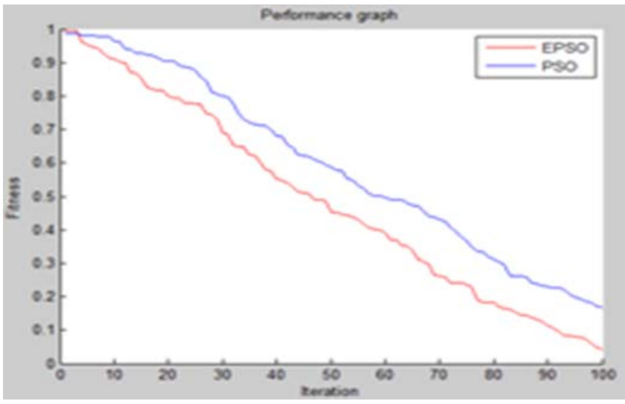

Fig. 5 Performance Graph

VI. Conclusion

The aim of this study is to find out how to segment a color image in real-time for a vision system. Image segmentation is important in image processing, whose intent is to separate the desired objects from the complex back ground. In general, it is very hard to fully automatically segment color and texture in a natural image. In this paper, EPSO method is used to reduce the probability of being stuck in the local minimum, the watershed method is applied to find the target image. We apply the watershed method to the interactive mark with some specified strokes in some regions in order to obtain the binary target image then, the target image is compared with the original image to compute the distribution of the HSV color space. As this method can determine the particles stuck in the local minimum and can also enhance learning speed as the particle movement will be faster. It is also used for colour identification for grasping of the objects by the manipulator. The plotted graph shows the better performance of the proposed method as compared to the widely used PSO method.

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