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# Color, Texture and Shape Hybrid Features Based Image Retrieval System

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*Abstract*— **In field of picture preparing and investigation Content based picture recovery is an essential issue as there is fast development in putting away and catching sight and sound information with advanced gadgets. Albeit broad studies, led and picture finding is coveted from interactive media databases and it is extremely testing and open issue. This paper clarifies for the most part about the determination of the picture highlights like shading, surface, and edge for the substance based picture recovery framework which utilizes the intelligent hereditary calculation. The shading highlight is extricated by utilizing mean and standard deviation, the surface element is separated by utilizing BDIP and BVLC highlight and the edge elements of a picture are removed by utilizing the watchful edge indicator. Extra to these, enhanced weights is ascertained by applying hereditary calculation on two dimensional entropy of picture. Since, Two-dimensional entropy utilizes both the dark estimation of a pixel and the nearby normal dim estimation of it, and along these lines gives better results. Here the term intuitive hereditary calculation (IGA) achieves all the more near the client's need and fulfillment of picture recovery**.

***Index Terms*—BDIP, BVLC, Canny Edge Detector, CBIR, IGA.**

## I. INTRODUCTION

Expansive picture databases are hard to peruse with conventional content quests in light of the fact that the errand of client based comment turn out to be exceptionally tedious, as the content frequently neglects to pass on the rich structure of pictures. A substance based recovery framework takes care of this issue where recovery depends on the mechanizing coordinating of highlight of inquiry picture with that of picture database through some picture closeness assessment [1]. Content-based picture recovery is a strategy where important pictures from huge scale picture databases are looked by interests' .it has turned into a dynamic and quick propelling examination zone since most recent two decade. Amid the previous decade, striking advancement has been made in both hypothetical exploration and framework improvement. Be that as it may, there stay numerous testing research issues that keep on attracting scientists from various controls [2].

Early strategies to picture recovery were not fundamentally taking into account visual components but rather in light of the literary explanation of pictures. It implies that pictures were initially commented on with content and afterward sought utilizing a content based methodology from conventional database administration frameworks [2]. Notwithstanding, the execution of customary way to deal with picture recovery is extremely delicate to the watchwords utilized by the client and the framework. In this manner, content-based picture recovery (CBIR) has gotten much consideration in mixed media recovery group. It manages the picture content itself, for example, shading, composition, and shape and picture structure rather than explained content [3].

Principle thoughts behinds CBIR is to examine picture data by low level components of a picture, for example, shading, composition, shape and shading design and so on., and to make highlight vectors of a picture as its file. The components are put away in a picture highlight database for future use [3]. At the point when an inquiry picture is given, the elements of the question picture are separated to coordinate the components in the element database by a pre-built up calculation, so that a gathering of comparative pictures to the question picture can be returned as the recovery pictures [4-6]. There are three principal bases for substance based picture recovery, i.e. visual element extraction, multidimensional indexing, and recovery framework plan.

a. Highlight extraction and indexing of picture database as indicated by the picked visual components, which from the perceptual element space, for instance shading, shape, surface or any mix of above.
b. Highlight extraction of question picture.
c. Coordinating the question picture to the most comparable pictures in the database as indicated by some picture similitude measure. This structures the hunt some portion of CBIR frameworks.
d. Client interface and criticism which oversees the presentation of the results, their positioning, the kind of client cooperation with plausibility of refining the pursuit through some programmed or manual inclinations plan like Genetic calculation.

Hereditary calculation (GA) is a computerized reasoning method in view of the hypothesis of common choice and advancement [7]. It is a productively worldwide looking calculation in light of the standard of "survival of the fittest" and utilized for enhancement and seeking issues. As specified some time recently, usage of substance based picture indexing and recovery (CBIR) utilizing one substance highlight does not give adequate recovery exactness. To conquer this issue, any novel model for the substance based picture recovery framework must consolidate numerous components for the picture like shading, composition, and shape. Tragically, relegating

approach weights for every element can't accomplish great result. These weights must be streamlined utilizing any inquiry advancement method like hereditary calculation (GA) for expanding normal exactness and normal review of picture recovery.

General flowchart for hereditary calculation show in figure.1. Terminals are typically program inputs, in spite of the fact that they may likewise be constants. Capacities take inputs and deliver yields. A capacity information can be either a terminal or the yield of another capacity. The wellness of an individual is dictated by its viability in creating the right yields for all cases in a preparation set. The preparation set is a set containing inputs and their reporter beforehand known yields. To develop the populace, and improve the sought destinations, it is important to pick the right people to be liable to hereditary administrators. Along these lines, choice administrators are utilized to choose the people, typically, taking into account their wellness. Case of determination technique are roulette wheel, competition and rank-based choices. Hereditary administrators present variability in the people and make development conceivable, which may create better people in back eras. The hybrid administrator trades sub-trees from a couple of people, producing two others. Transformation administrator replaces a haphazardly picked sub-tree from a person by a sub-tree arbitrarily created. The proliferation administrator basically duplicates people and embeds them in the people to come.

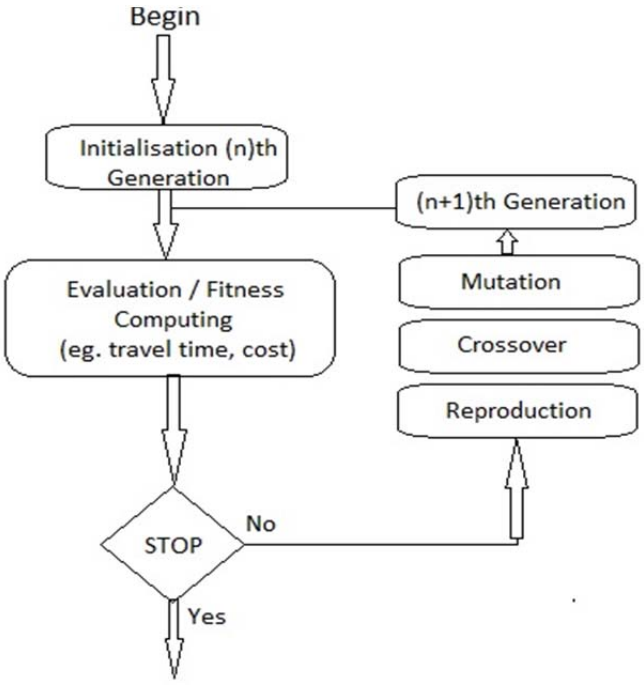



Fig. 1. Genetic Algorithm Flow Diagram

IGA [8-10] is a branch of transformative calculation. The principle contrast amongst IGA and GA is the development of the wellness capacity, i.e., the wellness is controlled by the client's assessment and not by the predefined numerical equation. A client can intelligently figure out which individuals from the populace will imitate, and IGA naturally creates the up and coming era of substance in view of the client's information. Through rehashed rounds of substance era and wellness task, IGA empowers exceptional substance to advance that suits the client's inclinations. Taking into account this reason, IGA can be utilized to take care of issues that are troublesome or difficult to define a computational wellness capacity, for instance, advancing pictures, music, different masterful plans, and structures to fit a client's tasteful inclinations.

Whatever is left of the paper is composed as takes after: Section 2 outlines the extraction of shading in RGB space. Area 3 displays the BDIP and BVLC surface representation. Segment 4 gives the shrewd Edge Detection for shape highlight extraction. Segment 4 characterizes the technique utilizing hereditary calculation to ascertain the improve weight of picture. Area 5 manages the out proposed picture recovery framework. Segment 6 portrays the similitude measure and test results for proposed picture recovery. Conclusions are appeared in Section 7.

## II. COLOR FEATURE EXTRACTION

From the likelihood hypothesis, a likelihood circulation can be exceptionally described by its minutes. In this manner, on the off chance that we translate the shading circulation of a picture as a likelihood dispersion, minutes can be utilized to portray the shading appropriation. In our paper, the snippets of the shading dispersion are the shading highlights that used to portray the picture.

The main request (mean), the second (standard deviation) and the third request (skewness) shading minutes have been ended up being productive and compelling in speaking to shading disseminations of pictures. Since we are working with RGB picture (H x W x 3), we need to ascertain mean, standard deviation and skewness independently for every channel. For this situation, each of them will be 3-values vector. In absolute we have 3 x 3 = 9 values for every picture.

In the event that the estimation of the ith shading channel at the jth picture pixel is pij, then the shading minutes are as the accompanying:

Moment 1 : Mean

$$E_i = \frac{1}{N}\sum_{j=1}^{N} \rho_{ij}$$

Moment 2: Standard Deviation

$$\sigma_i = \sqrt{\left(\frac{1}{N}\sum_{j=1}^{N}\left(\rho_{ij} - E_i\right)^2\right)}$$

Moment 3: Skewness

$$S_i = \sqrt[3]{\left(\frac{1}{N}\sum_{j=1}^{N}(\rho_{ij} - E_i)^3\right)}$$

For color image, color moments are very compact representation features compared with other color features since only 9 numerical values are used to represent the color content of each image channel.

## III. TEXTURE FEATURE EXTRACTION

### A. Block Difference Of Inverse Probabilities( BDIP)

BDIP is a composition highlight that adequately extricates edges and valleys from pictures. Edges speak to the zones which include unexpected change in power, and valleys speak to the territories which contain neighborhood force minima. These are the essential components in human vision and, particularly, valleys are essential central in the visual view of article shape [11]. Piece contrast of reverse probabilities, which is one of the proposed surface components, is characterized as the distinction between the quantities of pixels in a square [11-12].

$$BDIP = M^2 - \frac{\sum_{(i,j)\in B} I(i,j)}{Max_{(i,j)\in B} I(i,j)}$$

Where B signifies a square of size M x M . The bigger the variety of intensities there is in a piece, the higher the estimation of BDIP. Where I(i, j ) means the quality at a pixel (i, j)in the picture I [12].

### B. Block-Based Local Correlation (BVLC)

BVLC [12] is one of the surface components that is utilized to gauge composition smoothness. Furthermore, it speaks to the variety of piece based neighborhood connection coefficients as indicated by four introductions. Every nearby relationship coefficient is characterized as neighborhood covariance standardized by neighborhood difference

$$\rho(k,l) = \frac{1/M^2 \sum_{(k,l)\in O4} I(i,j)I(i+k,j+l) - \mu_{0,0}\mu_{k,l}}{\sigma_{0,0}\sigma_{k,l}}$$

Where μ0,0and σ 0,0 speak to the neighborhood mean quality and standard deviation of the square with size MxM. The (k,l)term signifies four introductions (90º, 0º, 45º, - 45º). Subsequently, μk,l and 0k,l repressent the mean worth and standard deviation of the moved square, individually. The bigger BVLC esteem demonstrated that the fixings in the square are unpleasant.

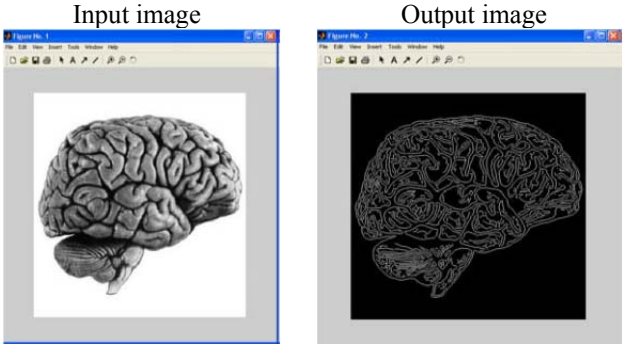
## IV. SHAPE FEATURE EXTRACTION

Shape is a critical and most intense element utilized for picture characterization, indexing and recoveries. Shape highlight can be spoken to by either edge based or district based. It gives numerical data of a picture and its quality does not change notwithstanding when the position, size and course of the items are changed. By utilizing watchful edge administrator [13], edge histograms of pictures are produced, which are given as shape highlight for further handling in recovery framework.

The accompanying demonstrates the vigilant edge location calculation steps. The calculation keeps running in 5 separate strides.

1. **Smoothing**: Blurring of the image to remove noise.
2. **Finding gradients**: The edges should be marked where the gradients of the image have large magnitudes.
3. **Non-maximum suppression**: Only local maxima should be marked as edges.
4. **Double thresholding**: Potential edges are determined by thresholding.
5. **Edge tracking by hysteresis**: Final edges are determined by suppressing all edges that are not connected to a very certain (strong) edge [13].

The following Figure 2 (a) and 1(b) shows the results of before and after feature extraction of the work for a brain image.




(a) Brain Image (b) Edge detected Brain Image

Fig. 2. Sample Edge Detected Brain Image

## V. TWO-DIMENSIONAL ENTROPY EXTRACTION BASED ON GENETIC ALGORITHM

There are two noteworthy contemplations in functional utilization of GA: one is the manner by which to delineate enhancement issue into GA's hunt space, i.e., how to encode the people to tackle the advancement issue. The other one is the manner by which to pick appropriate wellness capacity [14].

The picture two dimensional entropy highlight manages pixels of various dim level.. The two-dimensional histogram entropies are gotten from the two-dimensional histogram that is dictated by utilizing the dark estimation of the pixel and the nearby normal dim estimation of the pixel. Since the functional picture utilized as a part of this paper is 256-level, every dim level in the populace is spoken to by 8 bits. Since 2-dimensional histogram contain both the pixel dim level and the normal dark level of the area, the chromosomes are encoded as 18 bit strings, with the initial 8 bits speaking to the pixel dim level and the second 8 bits speaking to the normal dim level of the area [14].

The wellness capacity is gotten from two-dimensional entropic technique, which is characterized as

$$\varphi(s,t) = H(O) + H(B) = \log(P_{st}(1-P_{st}) + \frac{H_{st}}{P_{st}} + \frac{(H_{L-1L-1} - H_{st})}{(1-P_{st})}$$

In this approach, the populace size is 20, the hybrid likelihood is 0.8, the transformation likelihood is 0.01, and foreordained number of eras is 40.

A theoretical system of the Improved Adaptive Genetic Algorithms is given underneath, where is a populace of applicant answers for a given issue at era:

(1) k = 0 ， generate an initial population N(k) .

(2) Compute the population N(k) .

(3) Perform the GA's reproduction, crossover, and mutation.
(4) Finish the GA and get the final optimal threshold if the predetermined number of generations is reached or the optimal threshold of each generation remains same for 20 generations, else return to (2).

## VI. Structure Of The Proposed Method

**Phase 1: (Learning)The proposed CBIR Algorithms**

Purpose: Construct the features database and the index files.
Input: RGB image.
Output: Image's features database and its index files.
Procedure:
{
Step1: The input images are color images in RGB color space.
Step2: Calculate the color features (moments) using equations 1, 2, and 3.
Step3: Calculate the texture features using equation 4 and 5.
Step4: Calculate the shape features (Canny edge detection) as described in section IV.
Step5: Using genetic algorithm Calculate the image weight by two dimensional entropy extraction using equation 6.
Step6: Construct multi dimension features vectors that will represent the images where each dimension containing numerical values of the feature vector.
Step7: Save weighted features vectors in the features database.
}

**Phase 2: (Querying) The Proposed CBIR Algorithms**

Purpose: Retrieving N images similar to the input image.
Input: RGB image, number of retrieved images N.
Output: N image similar to the input image.
Procedure:
{
Step1: The input image is a color image in RGB color space.
Step2: Extract the features vector for the input image by using same techniques as given in phase 1.
Step3: Calculate the weighted features vector for the input by multiplying its features vectors by the optimal weight vector that generated by G.A.
Step4: Calculate the distance between the input image and images in the database that has the smallest distance with the input using Euclidian distance.
Step5: Retrieve the first N image that are more similar to the input image.
Step6: If user is not satisfied with retrieved image than marks those image which are not similar to query image and than apply refinement algorithm to fetch most similar image. This process is repeated until user is not satisfied.
}

Figure3 show a block diagram for the proposed CBIR system. The architecture details of this proposed system are describe in the following section.

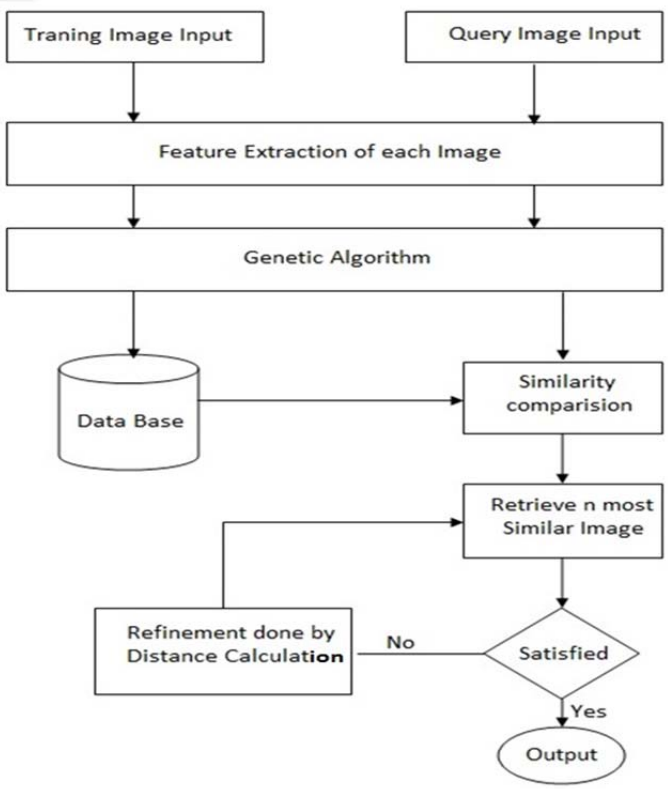



Fig. 3. Block Diagram for the Proposed CBIR System

## VII. Experimental Result And Analysis

To check the adequacy of the proposed recovery framework this segment manages the subtle elements of execution assessment that incorporates the picture database, the assessment measurements, and the consequence of our strategy and execution examination with existing strategies.

### *A. Image Database*

The picture dataset is chosen from the Wang database. This picture database comprises of 1000 pictures with 10 object classes. Furthermore, every item classifications contain 100 pictures.

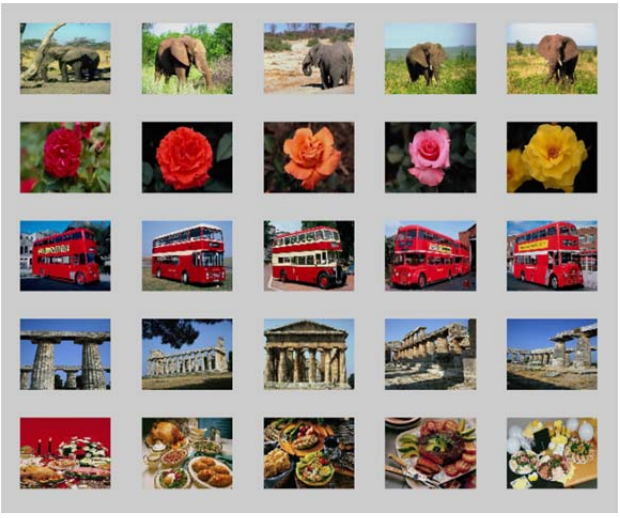


Fig. 4. some example of Wang image dataset

*B. Evaluation Matrices*

For recovery effectiveness we have consider two parameters to be specific review and exactness. We ascertained review and accuracy esteem in both case yield in the wake of applying the RGB shading based mean and standard deviation for shading highlight extraction, BDIP and BVLC surface component for the composition highlight extraction and vigilant edge location for the shape highlight extraction. For the likeness estimation we have utilized the Euclidian separation Metrics. In our trial, the exactness and review are computed as [15]:

$$precision = \frac{\text{No. of relevant images retrieved}}{\text{Total no. of images retrieved}}$$

$$recall = \frac{\text{no.of relevant images retrieved}}{\text{Total no. of relevant images in the database}}$$

*C. Retrieval Results:*

We execute the proposed technique on the picture database. The test results as far as normal accuracy and utilized proposed technique and the other three strategies are appeared in Table 1 and Table 2 separately and the relating chart is appeared in figure 5 and 6 individually

**Table 1 Average precision calculation of proposed method against other method**

| Semantic name | The method [7] | The method[8] | The method[3] | The proposed method |
|---|---|---|---|---|
| Africa People | 0.5348 | 0.5875 | 0.6907 | 0.7284 |
| Beach | 0.4568 | 0.4119 | 0.5532 | 0.7646 |
| Building | 0.4689 | 0.4235 | 0.5645 | 0.6442 |
| Buses | 0.8451 | 0.7169 | 0.8936 | 0.8965 |
| Dinosaur | 0.9089 | 0.7453 | 0.9327 | 0.9628 |
| Elephant | 0.7267 | 0.6508 | 0.7084 | 0.6928 |
| Flowers | 0.7456 | 0.8324 | 0.8847 | 0.9081 |
| Horse | 0.7241 | 0.6930 | 0.8137 | 0.8284 |
| Mountain | 0.5349 | 0.4486 | 0.6458 | 0.7496 |
| Food | 0.4672 | 0.4454 | 0.6983 | 0.6894 |

**Table 2 Average recall calculation of proposed method against other method**

| Semantic name | The method [7] | The method [8] | The method[2] | The proposed method |
|---|---|---|---|---|
| Africa People | 0.1198 | 0.1221 | 0.1471 | 0.1550 |
| Beach | 0.1574 | 0.1765 | 0.1807 | 0.1450 |
| Building | 0.1436 | 0.1738 | 0.1801 | 0.1735 |
| Buses | 0.1132 | 0.1190 | 0.1385 | 0.1518 |
| Dinosaur | 0.0998 | 0.1231 | 0.112 | 0.1945 |
| Elephant | 0.1298 | 0.1451 | 0.1635 | 0.1250 |
| Flowers | 0.1096 | 0.1159 | 0.1276 | 0.1720 |
| Horse | 0.1210 | 0.1398 | 0.1216 | 0.1572 |
| Mountain | 0.1436 | 0.1836 | 0.1909 | 0.1935 |
| Food | 0.1351 | 0.1379 | 0.1573 | 0.1625 |

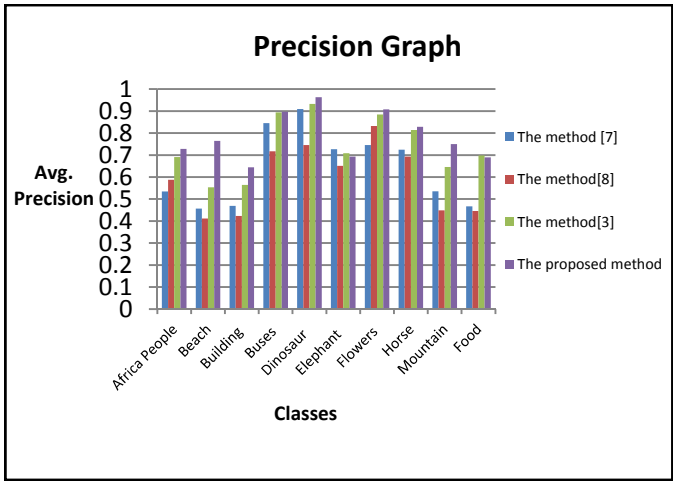



Fig. 5. precision comparison graph of proposed method against other method.

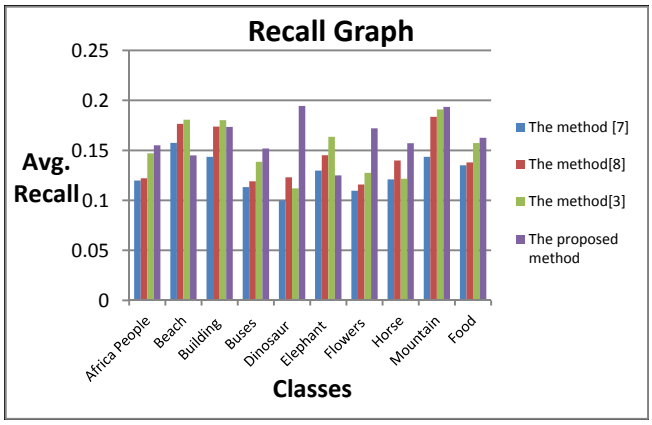



Fig. 6. Recall comparison graph of proposed method against other method.

## CONCLUSION:

In this paper, we proposed a system for the picture recovery utilizing joined components, i.e, Color minute as a shading highlight, BDIP and BVLC surface element and watchful edge discovery for the shape highlight . We additionally ascertained two dimensional entropy of picture utilizing hereditary calculation to upgrade the picture weight. Since Two-dimensional entropy utilizes both the dim estimation of a pixel and the neighborhood normal dark estimation of it, and along these lines gives better results. Trial results on the test picture dataset demonstrated that our proposed strategy beats other two techniques as far as accuracy and review. Later on, bigger benchmark picture dataset will be utilized to encourage assess the adequacy and productivity of our proposed strategy.

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