ROBUST METHOD FOR SALIENT OBJECT DETECTION FROM VIDEO STREAMS

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ABSTRACT

This paper introduces a robust method called "Water Flow Controlled using Minimum Barrier Distance and Machine Learning in enhance phase" to formulate the problem in the salient object detection (SOD) from video stream. By using this approach, the two goals that are rectified in our research are being specified. The major part is focused on finding the bigger territory in the frame that is used for false positives to predict fixation on the picture. When the salient object is located close to the boundary region, there is a lack of accuracy, to enhance the accuracy of our work, performance in the expected work to improve. And the second objective here is the RGB resolution that the foreground and background have the same hue, and then it is difficult to detect the salient objects from datasets. The experimental analysis and the output metrics state that when comparing the current work, the Mean Absolute, F-measure and Precision-Recall are improved. The result validating the proposed work is getting the PASCALS dataset for extraction of the image feature and the resolution is very robust. Other parameters that are to be estimated are Structure similarity index map (SSIM), Correlation parameter (CP), Peak signal-to-noise ratio in future work.

Keywords: Salient Object Detection (SOD), Post Processing, Foreground, Background Salient Object Detection, False Positive

I. INTRODUCTION

From Images or videos, the Salient Object Detection (SOD) is generally performed on the frame, where the striking areas were seen on the human's first location, which relies on the image's foreground object. The identification of Salient objects is one of the enhanced visual analysis works on photographs and videos. As a result, it is used in various fields, such as medical field, education field, etc., where the visual distinctive feature is required to be outstanding. This provides better understanding for locating the dynamic area in the scene in the computer vision. When it is said to be a successful identification, the three process steps must be acquired:

1. The successful detection is said to be when there is a lack of real region as salient and having a wrong mark that context region as salient must be small.
2. High resolution should be required to obtain and obtain the exact location of the salient object and to maintain the original image information.
3. They are easy to detect as it is in the front end process and it has to be better in the computation efficiently.

The Salient Object Detection and Salient Object Segmentation are typically performed on the two processes where the salient object is initially identified and then the segmentation is done

accordingly. Visual saliencies are available that include the ability to pick visual information that is used for further processing. These are essentially some of the variance between both the saliency detection and the saliency models that determine the presence of the scene where the human monitors are capable of consuming. SOD 's main task is to identify an essential part of the image from the context priors that occurs during the pre - processing stage of the image, such as feature extraction, illustration direction, etc., SOD has two groups, namely Top-Down and Bottom-Up approaches. The Top-Down is closely linked to classification problems, while the Bottom-Up focuses on colors, features, and spatial distance to construct the salient map [1]. The SOD model is focused on the latest applications such as image recognition, automation and graphic fields where Salient area recognition is said to be the process of recognizing the attentive area in any type of video or image [2]. It will produce the smooth linked areas generally. To test this region, the first is to locate the broad salient area within the frame that results in the fixation prediction being false positive. The other one of this is that the sparse salient region will be missing in detecting salient areas of objects when popping-out is done. Visual saliency is extended to multiple applications including such classy modeling, image recognition and segmentation of images [3].

The main objective is to analyze the precision in situating salient object near the boundary region. To solve problem, the proposed module, "Water Flow Controlled using Minimum Barrier Distance," is used. The parts of the paper are arranged like this. Section II, reviews Survey of Literature. Section III, showing the prototype solution, Section IV, presenting simulation findings and then Section V, being the qualitative technique preceded by Section VI, is the overview of our Conclusion strategy.

II. SURVEY OF LITERATURE

Utilizing unsupervised video segmentation, the Salient object is identified by monitoring the ground-figure segments. The integrated graph is built here in such a way that the novel function combines static and motion signals. The function is Mean Histogram of Optical Flows which obtains the statistical movement of data in the effective way in which each super pixel lies. The video processing is achieved by using the manifold rating approach which is one of the benefits of the proposed approach. The generated graph is done on seven video in this form of process, it is seen that they are mapping the temporal spatial activity. It is developed to ensure the salient output in the stable manner to also make the necessary output and boost the performance metrics there. There is also some case of image processing that is more stable in the approximation by having the

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example over this type of process. It relies entirely on the identification of the salient area in the video to get the best result [4].

Currently, identification based on the bottom-up approaches which are used to design the context map is becoming more and more salient. In doing so, it takes into account the two techniques used for automata, including global color and the spatial distance matrix. The method is used by using the neighboring object to establish the intrinsic relation with the salient that has been bound to the adjacent object. Besides that here has been some of the system that is used for their own superiorities for the salient detection. One method is being used to combine the global distance by implementing the restrained resemblance to enhance the cellular automata with the pre-map. Modulating the global color in the difference and the distance in the spatial effective and focused on the grouped state line of a seeds is planned to begin the system in depth [5].

The unsupervised approach used during the geodesic distance makes a part of the saliency autonomy for segmentation of video objects. It is measured at the position of an object residing on the background that receives the standard maps of salience. The approach suggested here is the wavelet-Temporal which is revealed to map to point the foreground and the position of the background. The built work is used to combine the spatio-temporal segmented image and the geodesic distance used to locate the exact spatio-temporal and resulting in the first processing of the feature extraction. The Spatio-temporal is used to measure the geodesic distance for each pair of adjustment frames to measure the inter-frame map of the background images. The preceding step is the segmentation of the combination of saliency, recognition of the overall appearance and representation of position in the reduction of the graph-cut power. It is used in this in the precision of the Spatio-Temporal saliency, which performs well enough in the image segmentation. The drawback is, however, with regard to image resolution and the accuracy of the pixel is lower in probability [6].

The identification of salient objects is achieved in a series of the video framework that is one of the complex tasks. This is used for the application of computer vision the main reason is to explore the spatial and temporal indications. Symmetric spreading is being used to identify the saliency on the main frame to increase accuracy. Besides this there are several key frame extraction videos, which can be used for uniform sampling efficiency. Sampling the main frame of each video would allow you to explore the Saptio-Temporal that has the difference in the coherence of the object's color difference and identify the salient object in the image set. Significant object detection can be achieved by normalizing the relevant diagram, having a trade-off in the video by doing so of the efficiency and effectiveness used to evaluate main frame in the collection of such intervals. The performance of the wide interval is also increased, but the saliency maps are in poor condition. In video frames, they will increase the good quality of salient charts, if the image is in broad intervals [7].

By using the Boolean hierarchical map techniques the identification is carried out on the image's salient surface. The real-time proposal is required to create a video using boundary median filter to stop the flicker. Using this, they have the performance improvement in the contrast function and the approach depending on the frequency. In post-processing methods our system is used to deal with the salient entity that crosses the image boundary. By contrasting this to the other image segmentation process the results are now in an effective way of identifying the background with the same speed and high quality of the identification of the salient object. In order to make this more effective in the real - time applications, the BMS in runtime output is used to make it implementable in the GPU in the hierarchical one. It's faster than some of the other solutions and achieves decent picture and video quality. The integration of temporal information and the preservation of temporal coherence are lacking [8].

Studying the identification of salient objects is one of the key sections in the development of computer vision. There will be hundreds of models designed to detect the image with the salient being used in the large amount of data set images to be using the deep learning models from below up. All of these issues can be seen in the video-based SOD are not even in the satisfactory way of exploring the vast set of video datasets. One of the daunting tasks is to build the datasets to obtain the reasonable spatiotemporal perspective description. Dataset use has 200 videos for the VOS. If this present architecture is being used for individual fixation or manually formatted through the object in the video compared to the current process. So, when the annotation meaning in the relevant object is in the less vague. Nonetheless, the salient stack is driven and compares with the huge VOS model and also shows the discrepancies and the relationship between the images based on SOD. The VOD is the daunting job with the many videos in the real-time scenario and the subset is also VOS-E is a very strong reference from the current spatiotemporal modeling process. In addition, the subset covers many types of real world situation in the VOS-N which make the suggested methodology grow better. This form of dataset is very useful in the video-based SOD, and the unmonitored saliency used by the auto - encoders for the directed salience of the good baseline model for measuring performance new video-based models. The downside is that the MAE is small it can be changed, as well as the data set range is lower [9].The robust deep model creation is used to detect the eye fixation within the picture. Through studying human visual learning and concentration, the process of watching the human being's video stream is replicated and it involves memory and gesture details used to model adjacent focal points in the images. All the previous method of motion information detection is taken into consideration here in order to achieve the highest likelihood of eye fixation. The current system states are used with comparison of eleven delegates to verify the proposed model is in the stage of supremacy. The final stage is demonstrated in the following approaches of participation that are:

i. Saliency detection is a profound model of the lack of film, a need for some data pre - processing procedures.

ii. The sequential memory has been broken to improve an over-simplification of the prototype by allowing changes between two consecutive pixels within an image to be confined to a certain range, as well as the related eye obsessions should therefore

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remain associated.

iii. Wide-ranging experiments were conducted and then comparative results were reported, not only supporting the improved quality of our projected model compared to previous methods but also validating the robustness of our planned approaches. The downside is that concentrating more on human brain functions and researching in depth can be established, and memory could be more precise and reliable detections of eye fixation points and also their saliencies [10].

III. PROPOSED SYSTEM

To detect improvement in the precision rate for the identification of salient objects in an image, we need a complete localized standardized color module of RGB resolution, which means it is difficult to implement when the foreground and background attain the same color. The relevant entity isn't adequately identified in this situation. The research predominates that there are many problems in the Video Stream concerning the identification of salient objects. The basic study is to develop a stable, salient object detection system to resolve these concerns, such as precision and accuracy, with image from the background priors being better generated. In this analysis, we will make an effort to model a Water Flow Driven (WFD) system using Minimum Barrier Distance (MBD) for detection of Salient artifacts. The MBD is higher in value dependent on pixels and absorbs the low cost of computation. Through this the Water flows with the flow expense from source to destination pixel. The expense of flow was only evident by this MBD. Through this approach the required image quality is achieved with better precision performance and MAE. The pattern of water flow is one of the natural phenomena, which is performed at the picture boundary on the seed pixels. It is shown to be a water flow from the origin pixel to the target pixel which varies the cost of the flow. Here, the MBD is the measured cost of flow. The MBD is stable at the distortion and blur seen in the location of the seed point. In our research the MBD is performed after pixel segmentation, the image boundary is extracted to find the salient point. In water flow process, the key concept for the MBD would be that the pixel wise computation is completed. The flow of water from the origin to destination is calculated by the MBD; in this case if the water flows to the pixels have the specific flow costs, then the MBD must be determined. When the water flow to the pixel is in the gray color indicates that there are flooded pixels, if the RGB color indicates that the flow shown in Fig.1:

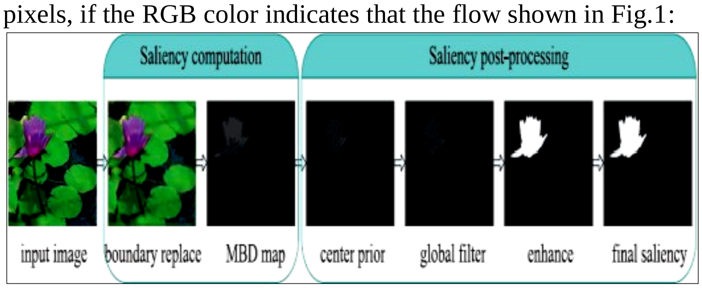

Fig1. Work in WFD method [13]

There are two phases which are extracted from Salient Computation and Salient post processing in our research study. The prevalent computation is getting the replacement of the boundary; from this the mapping on the pixel-based MBD is finished. Therefore the salient post processing is taken in such a way that center prior is detected in the image and the softening and improvement is performed on the image as well as the final outcome of the RGB image is collected afterwards. The final image is determined by using this two stage of the salient processing. The photos input are in the natural settings, the dataset held in our presented design is the 150 photos that contain both the foreground and the background. The boundary size is between 7x7 and 10x10 here the boundaries are split into 64 patches for higher accuracy and performance. The initial step for finding the MBD is to find the Mean Absolute Distance Approximation Image Error. Which are represented below equation 1:

$$MADAE_{appro} = \frac{1}{|I|}\sum_{i\in I}|Dapp(i) - Dexact(i)| \quad (1)$$

MADAE is used here for the measurements of the boundary map which have the distance between the foreground and the background. Where is the pixel number in the image in our function, the pixel is assigned to be 640x480. Dapp and Dexact is the estimated and exact distance map based on the pixel size described above.

The distance between the images is determined by using this formula, and all then MBDs have the fuzzy subset to map the salient object in the image. The boundary map tends to be f: D R, G={(x, fA(x)): x D} is the graph for this. Where, f: D [0, 1] is the graph's starting value in the initial stage. A is the dubious set of D, f is the attribute of membership. Essentially the picture distances for the foreground and background are estimated, in order to measure them the equation is developed as follows in equation 2. The minimum barrier distance is determined using this formula, along with the direction of p and q which is the foreground and the background.

$$\mu(p, q) = \min_{\pi \in \Pi} \Phi(\pi) \quad (2)$$

The procedure of the suggested method will be seen in Fig.2, here the input picture will be broken into the frames and the reference frame will be transformed into the gray image, it will be a binary image of 0 and 1 and then the image segmentation will be replaced by the segmentation process and the pixel-based image will be performed by the MBD and the middle will be followed and the boundary will be collected.

The input picture is the actual scenarios in our research, where there are 150 picture datasets. The photos here are split into the 64 patches to make the work more accurate and effective. To gain image segmentation, attention is given to measuring MBD. Therefore, for the identification of salient objects in the image, two steps are being used to proceed which are of salient computation and salient post processing. Where those two are performed as the final stage of extraction for the further phase of the RGB file.

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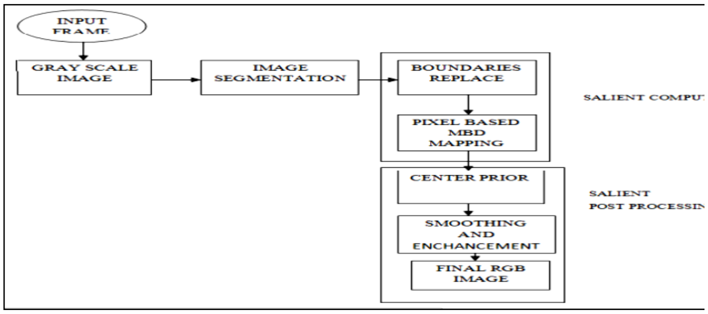

Fig.2. Proposed Workflow [13]

The system proposed operates in the following process step which is as shown in:

A) The grey scale information is transformed from the RGB value 0-255 to the binary grey scale value of 0 and 1 from the input image which is the nature set of the scenario.

B) The grey level image is partitioned into pixels of 64 patches in the extraction process, the pixel size being 640x480.

(C) The boundary is then extracted from the pixel value, and then the measurement of the MBD for the representation of the salient part of the image on the foreground and background separation is performed. Here we measure the foreground and background using the MBD.

D) Using the water flow method the water flow begins from initial pixel and the entire image pixel is filled three times before all pixels are completely covered with the missing distance.

E) Here, the foreground and background are identified and the foreground is cantered on further phase, as centre priors and therefore colour repetition is avoided. Because, the MADAE is used to calculate approximation of the images.

F) Then, the accuracy and the MAE are determined by smoothing and enhancing the image to obtain the appropriate foreground result this is a strong one.

(G) Finally, the resulting high-resolution outcome which includes robustness with performance speed shall be achieved. Because, the MBD is quite useful in device speed to increase the processing of the detection of salient objects on the image.

The MBD is used to calculate the approximation method where distance to be extracted is located and the Distance approximation is taken for evaluation. The $|I|$ is used to find the pixel number in the image. If the pixel is in the T^{th} frame then the boundary box function definition is similar in the following formula 3:

$$\psi(Zt, r) = [\, f_1^T, f_2^T \ldots f_{64}^T]^T \qquad (3)$$

R is the picture bounding box that is in Zt's, T^{th} frame. The function vector of every patch is Correct. The function descriptor for r is plain. So, between each patch and boundary patch, the measurement of MBD is in. The maximum patch is initially marked as 0. Therefore, the distance with respect to the weight of each pixel in the processed image is taken. There is a good understanding of the segregation on both the foreground and the background processing in our proposed work by formulating these equations So, the similar colour has not been overlapped in nature, only complex images are taken into account in the processing of the inputs to find the salient object. This is one of the daunting activities involved in detection process.

. The datasets used during our proposed program is the PASCAL-S, where 850 realistic images are presented. And it's been separated into the 8 free viewing subjects to examine the function of the pictures. This series of data entries looks at the multiple variety of complex images with background. The basic task is to get rid of the representation of the dataset such as the middle bias and colour differential bias. The dilemma we face is that when the foreground and the background have the same colour means it's hard to have the relevant item in it so that the intensity improves on both the foreground and the background images. For the improvement of the salient diagram, the equation 4 is as follows.

$$f(c) = \frac{1}{1+\frac{1-t}{t}\exp(-\alpha(c-t))} \qquad (4)$$

where,

F is the equation function which is being represented.

The contrast in the foreground and in background picture is c.

T is the maximum value for the image data.

If the range is equal to the foreground and background, α is the enhancement to be regulated.

IV. PERFORMANCE METRICS

1. Precision

The input image is said to be precise in precision. When the image is claimed to be salient, for instance, it must be completely captured as a salient image in this situation, the accuracy is 100%. Taking into account with detail the two types of cases is perhaps the true positive and the false positive. For the accuracy, the formula is taken as follows in equation 5.

$$\text{Precision} = \frac{SF}{SF+FP} \qquad (5)$$

Where,

SF is the Salient foreground, in other words True Positive pixels that are partitioned correctly as foreground FP are the False Positive pixels that are incorrectly partitioned as foregrounds..

Recall

The Recall does not capture the proper salient image in full. So, throughout the given picture, it can be a minimum of region to be salient. Unless the minimum value means that it is the false positive, so the retrieval must be 100%. Here the general detection cases are performed on the true positive and the false negative. The recall formula is interpreted as follows in Equation 6.

$$\text{Recall} = \frac{SB}{SB+FN} \qquad (6)$$

Where,

SB is the Salient Context i.e. in the salient picture which is based on the identification of the foreground, the absolute true positive.

FN is the false negative where the pixels are perceived incorrectly as history, where percentage of salient pixels is perceived.

2. Mean Absolute Error (MAE)

This is generally used in the specified image for the difference of two variables. It is indicated, like the foreground and the image

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background. There are essentially imitations from the 0-1 range. Here the focal object and the image's ground truth value mimic each other. This is represented by the expression in equation 7 which is as follows.

$$MAE = \frac{1}{k}\sum_{i \in 1} S(k) - G(k)$$

Where,
K is Coordinate Pixel 's initial level.
I is the number of imitated frames in the Pixel to pixel.
S is the most excellent component of the coordinate.
G is the image's Ground Reality.

3. F-Measure

The F-measure is the exactness test in the picture. Both involve the harmonic meaning of the precision and the retrieval together. In our work the measure f is used for the detection of salient objects shown in equation 8 at both the advanced and the fixed limit. The following example illustrates the value measurement for the precision and also the recall.

$$F(\alpha) = \frac{(1+\alpha^2)PrecisionXRecall}{\alpha^2(Precision+Recall)}$$

Where,
α is the image accuracy factor in the detection of the salient object and α is set to 0.4.
The performance measures are aggregated in the following table 1.The comparison is made in the natural multiple patterns on three metrics in the PASCAL-S dataset. The value comparisons are computed in the percentage terms.

METRICS	EXISTING	PROPOSED
PRECISION RECALL	0.82	0.9
F-MEASURE	0.65	0.98
MAE	0.19	0.1

Table1. Performance Metrics

The accuracy and recall for the suggested is determined manually, the current method has the accuracy and recall in the 0.82 while the proposed measure in the 0.9 range showing the appropriate graph representation type in fig.3.

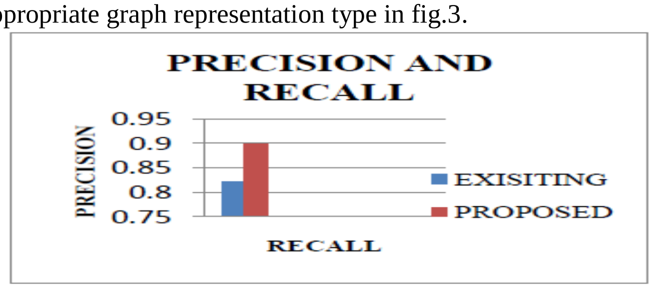

Fig.3 P&R Metrics Values

The graphic is shown to be 100% recall implies then the entire image is chosen. The graph's precision means that the salient regions are extracted in the picture in the same manner that has the salient map with the 0-255 limit. The PR for the current work falls between both the 0.8 and 0.85 in the chart. The PR is mapped onto the 0.9 throughout the proposed work. That indicates the precision of identification of salient objects on the proposed system is achieved better.

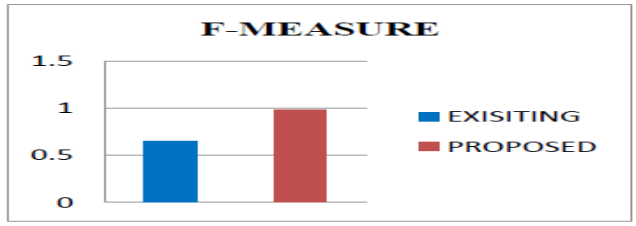

Fig.4 F-Measure Metrics Values

From of the graph the F-Measure is seen on fig.4 where the F-measure is the cumulative value of both the accuracy and the recall of the weighted harmonic. Here for specific machine analysis the α2 is set to 0.4. The contrast of the current and the F-measure proposed has the adaptive criterion for the identification of salient objects. And the image output is measured for both recall and precision by way of the pixel values for the exact performance test.

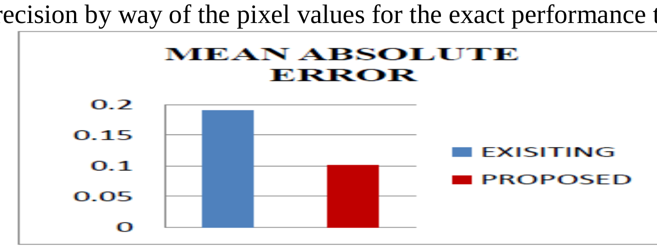

Fig.5 MAE Metrics Values

The proposed scheme shows, in the terms of the MAE, an enriched state of art technique. The MAE identifies the pixel - to - pixel error in the image shown at fig.5.The suggested technique MAE is 0.1 when compared to the existing technique they are based in the range of 0.1 to 0.2 the actual form of MAE in the prior knowledge is 0.19. The proposed work has been shown to have the minimum range of MAE for improving the performance. Thus the error in the picture is found in the range compared using our method of water flow.

CONCLUSION

In the research, proposed a novel approach namely "Water Flow Driven using Minimum Barrier Distance and machine learning in an enhance phase" for improved image detection of salient objects. Developing these methods takes into account the video stream or running images of normal scenarios. The video has been split into the number of frames / image the pixel-based representation of the specific picture. The image is taken as input and is identified for post processing to remove the foreground and background detection, as well as the salient object. In the proposed research technique, it detects the salient object very effectively, and the output is analyzed for the precision retrieval, MAE and F-measure. The outcomes suggest that the existing work having limitations in the accuracy metrics and needs to be improved, also if Machine learning is applied in an enhance phase then the results will be improved robustness will be achieved more effectively. The two

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objective measures which are illustrated in the work and are concluded that the proposed concepts are more robust and effective in the detection of the salient object as compared it with existing techniques.

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