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Review on Various Object Detection Methods in Camouflage Images

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Abstract
There are wide research going in the field of object detection. This paper reviews some of the existing Camouflage Object Detection(COD). COD aims to identify objects that are likely to be same as their surroundings. The similarities between the target object and the background make COD far more challenging than the traditional object detection task. Nowadays machine learning is being used in the health care because of its ability to process huge datasets beyond the scope of human capability. The camouflage mainly hide the texture of a foreground object into the background image frame texture. The camouflage detection method or decamouflaging method is mainly used to detect foreground objects which are hidden in the background image. In this paper a survey of camouflage detection methods for different applications and areas is presented.
Keywords: *Camouflage Object Detection, Deep learning, Computer Vision, Decamoufalging.*

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I. INTRODUCTION

Camouflage Object Detection or COD for short is a machine learning frameworks for distinguishing objects that are same as their background. It can be called as background matching camouflage. The environmentalist call it when an animal adapts their body's coloring to match with their surroundings in order to avoid recognition. It mainly works by deluding the visual perceptual system of the observer. The identification of such objects using traditional salient object detection (SOD) is a challenge because it works by identifying the most attention-seeking objects in an image. The Camouflaged objects have large number of similarities with the background, making it difficult to detect. It mainly requires a lot of information about visual perception in order to do Camouflaged Object Detection (COD). A possible solution for COD is a simple framework created by a group of international researchers, called the Search Identification Network[1] (SINet). The word camouflage has come from the traditional days of Animalia in those days animals wont to hide themselves from predators by changing their body pattern, texture, coloration as per environments texture. In war, camouflage may be a technique for military to hide them within the background texture in order that enemies couldn't identify them and Decamouflage may be a technique to reveal the opponent those are camouflaged in the image texture. The Camouflage associated work are divided into camouflage assessment and design and camouflage detection. The Camouflage Identification System or Decamouflaging is mainly use to reveal the target object from its background that is discriminating foreground object from camouflaged image. Some of the applications of Camouflage Identification System like discriminating enemies in war field, detecting the defects in products during manufacturing, Identifying duplicate products during logistics etc. The concept of Decamouflaging is the way to detect specific texture to spot from the provided background. Some models have been proposed in literature to identify camouflaged region, however most of them consider either recognizing motion camouflage , that detect an object which mainly tries to get camouflaged during movement or in the static image contrast to a motion camouflaged problem.

The leftover piece of this paper is coordinated as follows. Area 2 talk about some essential ideas of COD, just as certain variations and preparing issues. Then, at that point Section 3 present general methodologies for object recognition. In Section 4 the ends are given.

II. CAMOUFLAGE OBJECT DETECTION

In this section, they review some core concepts of Camouflage Object Detection(COD). At present COD is not a well studied subject because of the lack of a large dataset. Therefore, the researchers created the COD10K[1] dataset. It mainly contains about 10.000 images which are divided into 78 different categories. It is mainly a mixture of images containing camouflaged and non-camouflaged objects or simply backgrounds. The dataset is builted in a hierarchical structure. First each picture is appointed a super-class and a subcategory. Then each bounding box is explained for each image. After that the image gets assigned with a set of attributes,

for example occlusion or indefinable boundaries. At last the explanations are extended by likewise clarifying each article occurrence. It contains 10K images covering 78 camouflaged object categories, such as aquatic, flying, amphibians, and terrestrial, etc[1]. All the camouflaged images are hierarchically annotated with category, bounding-box, object-level, and instance-level labels, facilitating many vision tasks, such as localization, object proposal, semantic edge detection [2], task transfer learning [3], etc. Each camouflaged image is assigned with challenging attributes found in the real-world and matting level [4] labeling.

These high-quality explanations help with providing deeper insight into the performance of algorithms. In Camouflage, hiding and insignificance are applied to the natural coloration of animals and artificial camouflaged image. Natural and artificial camouflaged images are used for research in a wide variety of applications as follows:

- Natural camouflage are founded in animal or insects to hide from their predator.
- In Motion camouflage it is the hiding of object in the visual background. It is occurred when texture and color of moving object is same as the background.
- In Artificial Camouflage texture patterns are used in the battle fields to hide soldiers and weapons. Here first camouflage textures are evaluated from the environment and then camouflaged textures are used to design coloration of cloth, weapons etc.
- In logistics mixing up of duplicate product into original in such a way that duplicate product will get camouflaged into original. For example in a set of medicine one of medicine is duplicate but it is difficult to identify which one is duplicate. This is also example of artificial camouflage.

III. GENERAL APPROACHES FOR OBJECT DETECTION

This section discuss the main approaches used in detecting objects in camouflage images.

1.1 Visual Camouflage Breaking[6]

A couple of animals are capable to change their body configuration to hinder their revelation by trackers. Here Darg administrator is principally utilized for disguise breaking viably in picture areas like sunken or smooth arched 3D items. This technique don't remove the article totally ,however some edge is resolved which can change the outcomes. Here they contrast and clarify Darg administrator and edge based identification administrator and established that convexity based cover recognition is far superior to edge based location administrator. Present natural confirmations which shows that discovery of the convexity of the graylevel capacity might be utilized to break disguise. This depends on Thayer's standard of countershading [5], which sees that a few creatures utilize detached hue to forestall their picture (under daylight) from showing up as curved graylevels to a watcher. This infers that different creatures may break disguise dependent on the convexity of the graylevels they see (or, more than likely there was no need in a particularly latent hue). The objective is of this item identification task is to distinguish 3D curved or inward articles under solid disguise.

1.2 Colour Intensity Based Camouflage Detection[7]

Here the cover identification system dependent on shading and power highlights of a picture. One of the fundamental test in this identification interaction is that the frontal area object pixel has a similar power as the foundation object and furthermore two kinds of disguise to be specific dull and light are talked about. A dim disguise seems when the pixel has less power and unnoticed in to a shadow. Light Camouflage seems when the closer view pixel force is more splendid than the foundation pixel power. With the help of normalized chromaticity checks and normalized powers from concealing - power model, front line recognizable proof is refined . By applying the pixel order method we can remove the cover divide. It don't work as expected in serious shadow and light. It tends to be upgraded by thinking about sign, corner and edges of the picture.

1.3 Co-occurrence Matrix and Invariant Central Moments[8]

For the disguise object discovery they are utilizing co event network based surface extraction inside locale of little square of a picture. Here first they partition the full picture outline into little equivalent disjoint squares and compute invariant focal minutes up to Kth request (tenth request is adequate) for each square. Finally camouflaged bits of an image are spotted by pack examination system and saw through watershed division technique. This system gives extraordinary result, at whatever point masked part is accessible in a close by neighborhood of the squares of picture and outright degree of cover should not be more than 4%.This procedure may not be practical when huge measure of disguised picture present in input picture outline or when the typical surface itself is sporadic. In addition it is likewise not ready to segregate deficient part if more than one kind of deformity is available in one picture outline.

1.4 Bayes Classification and Gaussian mixtures model for background observation[9]

Proposed a strategy to separate forefront from Background in visual reconnaissances application by utilizing Bayes grouping and Gaussian combination model for foundation perception yet since it is of disguise it is difficult to pick an edge to segment front facing region from establishment. Regularly in visual observation applications issue of disguise seems when the shading properties of frontal area object are like foundation picture outline. By this strategy they can decrease fluctuations in foundation picture outline by averaging video outlines in arrangement. By this they can lessen likelihood of disguise however improvement in this work is required.

1.5 Detection of motion camouflage by Optical Flow model[10]

Cover location is the place where the moving article is hided behind the scenes picture since the moving forefront object has the very shading as that of foundation . Normal objective movement recognition calculations like edge distinction technique, Gaussian Mixed Models, CodeBook Models performs better however these calculations doesn't work as expected when the moving objective article picture is of a similar shading as foundation. So optical stream model dependent on speed field attributes can be utilized for adequately portioning the moving item for this situation. The principle restriction of technique is that it can undoubtedly controlled by commotion sway.

1.6 Object detection using top down information based on EM (Expectation Maximization) Framework[11]

Here new forefront object identification strategy is utilized which sum up the Expectation augmentation structure by incorporating spatial, hierarchical, ghastly highlights of a picture for the frontal area object recognition dependent on foundation. In this technique ,in view of condition of each focus on, a top down data is remembered for the item model to make an assumption amplification system to develop frontal area model. This closer view model can be utilized to improve the identification of disguise parcel. This strategy is essentially for the visual reconnaissance application yet they likewise portray how to deal with cover issue. The principle limitation of this strategy is that assuming segment of the article shape is dark, location of cover may not be exact.

1.7 HSV colour and GLCM texture to identify camouflaged object[12]

This cover object location is utilizing a nearby HSV (Hue, Saturation, Value) shading model and dark level co - event network surface highlights to identify the disguised article in a picture. First and foremost , input picture is being splitted into equivalent size of sub squares and afterward their surface highlights and shading highlights of sub squares are determined. To address the shading highlight of picture, aggregate histogram is utilized by measuring HSV Color space from each sub square .Gray level co-event grid is utilized to ascertain the surface component of each sub square. With the assistance of the coordinated coordinating with plan of sub squares of inquiry and target picture, contiguousness grid of a bipartite chart is shaped. This contiguousness framework is utilized for coordinating with the question sub square picture and target sub square picture dependent on standard of Most Similar Highest Priority on pictures. This blend of shading and surface are primarily utilized in the investigation of distinguishing cover.

1.8 Weight structural similarity (WSSIM) to find the camouflage texture[13]

Here disguise object discovery is communicated as weight underlying closeness strategy by which we can assess the encompassing and afterward plan the cover surface according to the assesment. Here they examine about making a disguise picture with the assistance of weight underlying comparability and nature picture includes, this equivalent strategy can be utilized to segregate the cover surface. Primary highlights like normal luminance, standard deviation, relationship, entropy of given characteristic picture edge can be make used to recognize the cover surface.

IV. CONCLUSION

The word camouflage is being utilized from the old long periods of collective of animals when hunters shroud themselves in encompassing by changing their body surface. Then, at that point after thusly this idea has been got well known in military and in numerous spaces and applications. There are principally two unique sorts of disguise, regular and counterfeit cover. Characteristic disguise is something which is produced consequently like picture of a tiger covered up behind the scenes where we can't separate tiger from foundation . Cover issue additionally happens when the shading components of a pixel of new item are excessively near the foundation shading components. Counterfeit disguise is principally planned by basic surface appraisal . There are numerous strategies by which we can remove surface highlights from picture insights like co event lattice or spatial recurrence space however they work in impediment. Invariant focal minutes up to kth request is one of the

techniques through which we can dissect surface highlights yet it doesn't work if more than one sort cover is open or fragment of camouflage is more. Identification of a moving item which is being covered in foundation and shadow is likewise presented dependent on shading measurements and edge data, this strategies conquer the issue of shadow impact . By this way we have various strategies to distinguish disguised part in covered picture, every one of them are having some imperative to discover disguised bit. Surface assessment is useful in various employments of picture planning for portrayal, division, revelation of pictures. So the majority of the thoughts camed up for disguise identification depend on surface examination , which principally uncover the covered bit of a picture by utilizing wavelet change. Advantage of wavelet change is that they offer a simultaneous impediment on time and repeat space. In Summary, cover identification can be improved with the assistance of picture upgrade and great surface investigation procedure. In this way we have found in the writing that methods used to identify covered part in picture is changes dependent on the application areas[14]. The recognition of imperfect Camouflaged Image is a drawn-out work. So wavelet change is acceptable methodology towards surface investigation and in recognizing disguised picture.

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