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Whitepaper

Automatic Object Removal and Background Replacement

with Deep Convolution Neural Networks and Feature Data Analysis

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1. Introduction

Automatic object removal replacement in image environments is a challenge for many applications, such as scene restoration, environmental impact assessment, and image mapping. Thanks to the rise of Deep Convolution Neural Networks (DCNNs) and semantic segmentation datasets, we can now detect unwanted objects from images with state-of-the-art accuracy.

By creating target object masks, we can be more creative with our image editing than ever before; this could mean removing or replacing objects in an image, or even replacing the entire background of images. With the help of machine learning, our image editing capabilities have been taken to a whole new level.

2. Feature Data Collection Methods

Along with the deep learning and image processing technologies, the collecting of object feature data methods needs to be researched and developed in order to satisfy the different users needs. Feature-data is data/information which is stored within an object, is extracted and recognized in order to identify in an image, relates to each of data and is an important data source in training and learning processes. Feature-data is usually organized into image pixels, each pixel is represented in location and data such as meaning data, color or position. The object's features also are grouped into categories, such as shape, texture, brightness, contrast, and color. By recognizing these categories, the object feature data can be used to draw conclusions about the objects in the image. This enables deep learning algorithms to accurately identify and classify objects based on their features.

Feature-data organized into image pixels

In order to support users in collecting feature-data, some tools and methods have been proposed. However, these tools and methods are not really to satisfy the user's requirements. The user's requirements focus on the content of the object, while the image contains too many redundant elements. Users desireto access information according to the specific object, while feature data are organized. In summary, users want to access information scientifically and systematically, which meansthat they want to collect the feature data of any object within image or by user's selection.

2.1: Proposed Solution

Therefore, the posed problem here is to build a method for in-depth accessing and filtering feature data, classifying data to help users easily to capture or follow the information flow. In this paper, we propose a solution for this problem, that combines the method of in-depth accessing and pre-processing object feature analyzing and extracting method.

The goal of this method is to build a process of automatically and selectively collecting the feature-data, and sorting the collected data according to all objects in image. This method can reduce the number of errors in computation, improve efficiency and increase the quality of implementation of the final result.

2.2: Methodology

In the proposed method, the object content is extracted from image data using the DSE (Data Segmentation and Extraction) algorithm and the object relationship is extracted using the OITS (Object Indexing Tracked System) algorithm, while an in-deep accessing method is used for extending the scope of information. The input of this proposed method is a set of images. First, the image's layout is pre-processed from the input image by using the DSE algorithm.This algorithm identifies the distinct features of the image such as lines, curves, shapes, and objects. The extracted main content is then continuously analyzed for finding related data. All related data are continuously accessed and pre-processed in-depth to extract the main data objects. This process involves utilizing data mining techniques to locate and identify any associated content that is pertinent to the image. The result of this iterative process is a set of images with their main content (these

images have content relationships with the input image).
Next, these main contents are analyzed to extract the object's elements. To understand the relationship between the objects, the image relationship graph is constructed. The graph is then analyzed by using the OITS algorithm to extract article relationships. This algorithm can identify any object relationships that exist in the graph, such as homology, similarity, or containment. Finally, the set of extracted objects is sorted following the relationship level, generated from the OITS algorithm, which is the final result of the proposed method.

3. The Iterator Process of Analyzing Objects

The process of analyzing objects requires two steps: pre-processing of images and deep analysis of the main content area to find related objects. The main aim of this module is to collect the maximum amount about a specific object. To this end, the DSE algorithm is employed to extract the main content area in images.

The process

- Pre processing of imagne
- Analyzing the main content area

3.1: Pre-processing of Image

The first step of the process is to pre-process the image. This step focuses on the main content area of the image and is essential to ensure accurate analysis and uncovering of the details in the image. The pre-processing step includes operations such as noise reduction, image enhancement, and image segmentation. These operations help to remove unwanted elements in the image and highlight the main content area.

3.2: Analyzing the Main Content Area

The second step is all about digging deeper into the main content area. Once the image is pre-processed, the DSE algorithm is used to identify related objects – allowing you to gain even more insight into the image. This step involves analyzing the structure of the image's maincontent, generated from the module analyzing image layout (following DOM algorithm), to identify the data contained within the objects. The desired output of this step is a collection of all objects' features that can be labeled and categorized.

4. Extracting Object Features and Its Mapping

The primary target of this module is to extract set feature data of all objects in images. This data extraction is achieved through two distinct processes.

4.1. Analyzing Data structure

The first process involves analyzing the data structure of the overall pixels in the image to identify the data contained within the objects. This step includes operations such as edge detection, feature extraction, and object segmentation. These operations help to identify the individual features of each object, such as the umbrella's spokes, the sunbather's legs, and the beach ball's circles.

4.2: Removing Unwanted Elements

The second process focuses on removing any unwanted elements surrounding the objects' features. This step includes operations such as background subtraction, foreground detection, and object tracking. These operations help to remove any unnecessary elements, such as sand or seaweed, that may be present around the objects' features. The desired output of this module is a collection of the individual features of each object, labeled and categorized for further analysis.

4.3. Mapping Data

Finally, the extracted object features are mapped and categorized based on their properties such as shape, size, texture, and color. This mapping process enables the user to access the feature data of an object or part of an object quickly and easily. The extracted feature data can then be used in various applications such as image classification, object recognition, removing object and reconstruct a background, or replacing with new objects.

5. Experimental Results

Currently, we have implemented the tool and have executed experiments on our image dataset containing objects, humans and faces to assess the performance of the method. The results of the experiment showcase that the amount of data is higher in fineness, does not contain redundant elements and the output objects are related to specific requirements. Furthermore, the proposed method can be applied to any image regardless of its structure or size. In the future, we are looking to continue improving the tool, allowing users to have more options during data collection.

6: Conclusion

Our proposed method for analyzing and extracting object features is dynamic and innovative, allowing you to access the feature data of an object or part of an object quickly and easily. By scanning through the image pixel by pixel and extracting the feature data of the specific object or part of the object, our method enables you to gain a comprehensive overview of the image, unlocking its data-rich potential. We believe that our method has a wide range of potential applications and can help in various fields, from healthcare to entertainment and beyond.