Big Data and Computing Visions

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Big. Data. Comp. Vis. Vol. 2, No. 4 (2022) 143–148.

Paper Type: Original Article

Object Detection by Neural Network for Smart Home

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Citation:

Mekawy, I. (2022). Object detection by neural network for smart home. *Big data and computing visions,* 2(4), 143-148.

Received: 12/03/2022 Reviewed: 15/04/2022 Revised: 02/05/2022 Accept: 07/06/2022

Abstract

Household object detection is a brand-new computer technique that combines image processing and computer vision to recognize objects in the home. All objects stored in the kitchen, room, and other areas will be detected by the camera. Low-end device techniques for detecting people in video or images are known as object detection. With picture and video analysis, we've lost our way.

Keywords: Object detection model, Neural network, Deep learning, Python.

1 | Introduction

The topic of household object detection has been finding with in history many times, but each approach deals with a different method. The implementation of machine learning in this area uses a lot of mathematical calculations [1]. Each image in the video feed needs to be further divided into pixels and analyzed in details. This project is equipped with image detection algorithms in order to make lives of elderly people easier. In place of manual calculation, different frameworks are used like Regression Based Framework, Region Proposal Based frame [2]. The model needs to be given the input. Further processing is done using deep neural networks. In this, there are more than one layer in the network helps increase the accuracy of the output [3]. People at their old age face difficulty in visually recognizing object and they need a 24*7 human assistance. So, this system aims to give the remote in their hands. The remote will identifies the object and speaks out the name of object and old age people and eyeless people can easily get find the object [4]. As the aerial of technology has made advancement, object detection is playing a very important role. The power of machine to recognize object just like a human does, can be used in a variety of domains [5]. This project deals with one such domain, object detection using video and image for home assistance and also eye tracking system [6]. The Dalal-Triggs detector which won the 2006 PASCAL object detection problem, used a standard gradient histogram filter (SOG) function to describe a group of objects [7]. This sensor uses a moving window technique, where a filter is added to any image or video location. We may think of the sensor as just a compiler that accepts an object, a position within the same image

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http://doi.org/10.22105/bdcv.2022.333756.1072

and a scale as feedback. The classifier decides whether at the specified location and scale and instance of the target group occurs or not [8].

1.1 | Household Object Detection Methods

Household object detection is a part of old age person which is detecting all object in house. *Fig. 1* represents the different methods for the same. Detection of moving object from a series of frames taken from a static camera is commonly achieved by means of frame gap [9]. The frame differential approach is the common movement detection approach. This approach adopts variations dependent on pixels to locate the moving object.

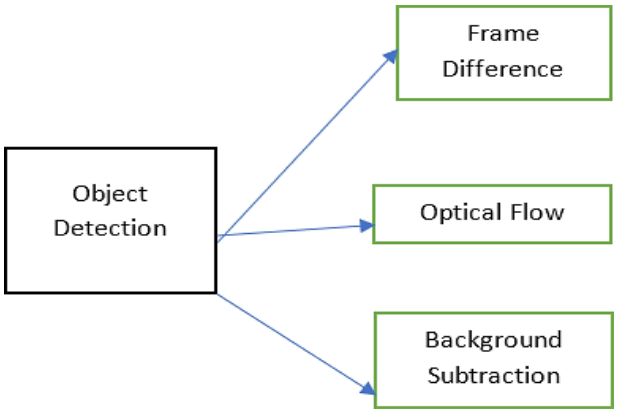

Fig. 1. Object detection methods.

2 | Literature Review

A literature review or narrative review is a type of review article. A literature reviews is a scholarly paper, which includes the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic [10]. In such an un-supervised training area, this group suggested model, neural network would outperform human performance in tasks such as speech recognition, image recognition, predicting [11]. We can render any standard model capable of solving multiple tasks in various application domains. Illustratively, the paper describes gradient descent, back-propagation, and Stochastic Gradient Descent principles for transmitting data to specific neural models [12]. Methods of optimization include SGD, Ad grad, Ad Delta, RM Sprop, and Adam which help to evaluate the learning rate. Intuitions from this paper help to realize that a broad dataset makes for more accurate tests [13]. Larger weights are not stored, and the parameter shifting results. These boundaries often limit proper back- propagation which eventually leads to reduced accuracy [14]. This paper came up with substantially better reliable ConvNet architectures later on, which not only achieve region-of -the-art precision on ILSVRC identification and optimization tasks, but are also relevant to other object recognition datasets, where outstanding efficiency is achieved even if used as part of a fairly simple pipeline [15]. The teaching scale is dynamically calculated by either single-or multi-teaching. The model itself will change the scale for the latter by controlling the jittering out of data [16]. Fully linked network is implemented at the end, which improves the parameter by having a more robust output. As the fully connected layer has expanded parameters, the operation of the fully connected layer in certain situations allows output to be affected by the device threshold [17].

Early work on object recognition was based on strategies for the matching of templates and basic partly based models. Methods were later adopted, based on statistics. This original popular family of object detectors, all focused on mathematical classifiers, laid the foundations for most study in terms of preparation, measurement and classification techniques [18]. Object recognition is a vital function for any device that communicates with humans; it is the most popular computer vision feature [19]. Many external identification problems were studied, however. Most instances refer to objects, in which

humans often communicate, such as other person and body arts, such as ears, hands, and arms, as well as vehicles, such as cars, aircraft, and animals [20]. Most object recognition systems consider the same simple technique, generally known as sliding window: an exhaustive search is performed in order to identify the objects that appear in the image at various sizes and locations [21]. This quest requires use of a classifier, the detector's central component, indicating whether or not a given image patch corresponds to the target [22]. Since the classifier essentially operates at a specified scale and patch size, many iterations of the input image are created at various sizes, and the classifier is used to identify all potential patches of the same size, with each version of the image downscaled. They cannot accommodate well the case of two cases of the object being next to each other, and may not be sufficient to find the object [23].

Proposed System

Objects such as glass, table, human, books, dog, chair etc. are identified and the user is alerted by speech created that tells about the name of the recognized object. The algorithm is a well-defined method that helps a computer to solve a problem. A series of unambiguous instructions is another way of defining the algorithm. Use the word 'unambiguous' is symbolic of no room for contextual interpretation. When you ask your machine to run the same algorithm, with the exact same outcome, it will do so precisely the same way.

Softmax Function

We use convex analysis and monotone operator theory results to obtain additional softmax function properties that are not yet addressed in the current literature. In particular we show that the softmax function is the log-sum-exp function's monotonous gradient map. By making use of this relation, we show that the inverse temperature parameter defines the Lipschitz and Softmax function co-obligation property. SoftMax feature measures the distribution of the event's probability over various occurrences 'n.' In general terms, this equation would determine the probability of increasing target class for all other target groups. The estimated probabilities for deciding the target class for the specified inputs will be helpful later. The principal benefit of utilizing Softmax is the spectrum of potential probabilities. The spectrum would be from 0 to 1, and the sum of all odds equals one. If the softmax method used for the model of multi-classification returns the probabilities of each class and the high likelihood of the goal class. The formula computes the exponential (e-power) of the given input value and the of all the values in the inputs. Then the ratio of the exponential of the input value and the sum of exponential values is the output of the softmax function. The above graph in (*Fig. 3*) is a graph which is used to show relation between input value and softmax score.

CNN Classifier

The Co-evolutionary Neural Network (CNN) proposed the most common type of deep neuralnetwork in use for machine vision issues. One of the major initial attempts to use CNN for action recognition was by Baccouche et al. in a 3D coevolutionary neural network is trained in this work to allocate a vector of functions to a small number of consecutive frames. A recurrent neural network makes use of the spatio-temporal evolution of these characteristics for classification. We must create a CNN in this post, capable of classifying pictures. A 3D coevolutionary neural network is trained in this work to allocate a vector of functions to a small number of consecutive frames. A recurrent neural network makes use of the spatio-temporal evolution of these characteristics for classification.

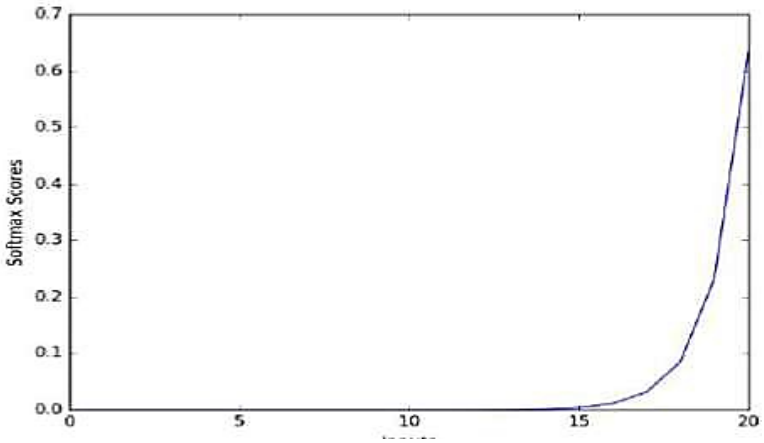

Fig. 2. Graph of Softmax function input and output.

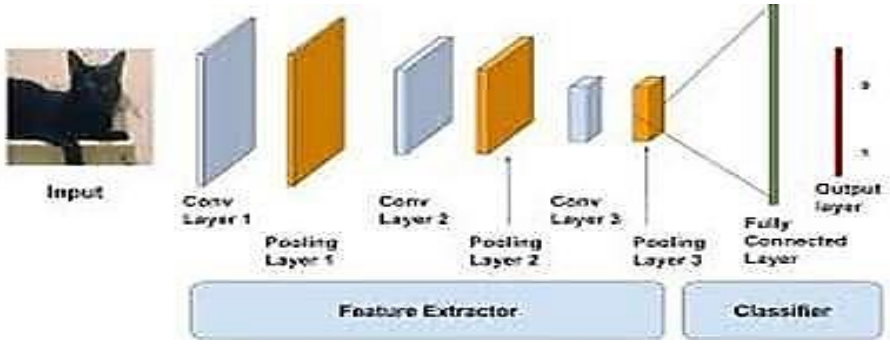

Fig. 3. Classification using CNN.

3 | Result and Discussion

Colour is an integral attribute that defines the image quality and, as seen in *Fig. 4*, colours that appear in the photographs can be described successfully in image classification. The collection of the amount of the quantization rates in the colour classification is an essential matter. At the other hand, the more precise multilevel colour classification can be accomplished when colour representations are merged using various quantization rates. The classification is obtained by merging separate base classifiers, using image histograms as their inputs at various stages of quantization.

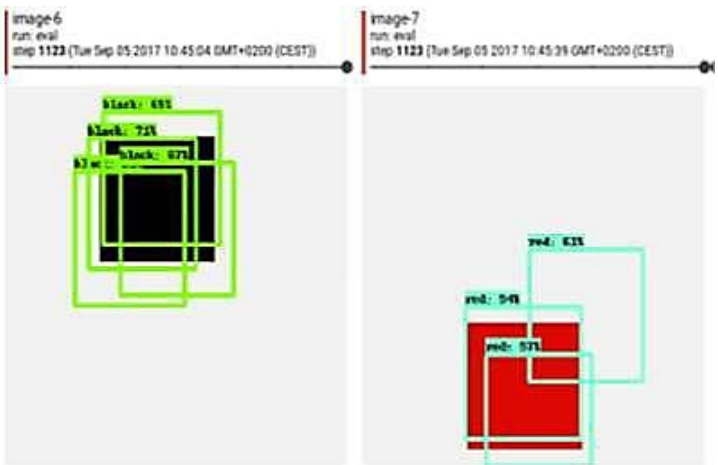

Fig. 4. Base classification for colour identification.

Although with many interacting artefacts' the algorithm can quickly distinguish the dominant groups with ease for these situations the most important aspect concentrated here is the distance between

bounding box. The algorithm will differentiate between the class "chair" for the example seen above in *Fig. 5*.

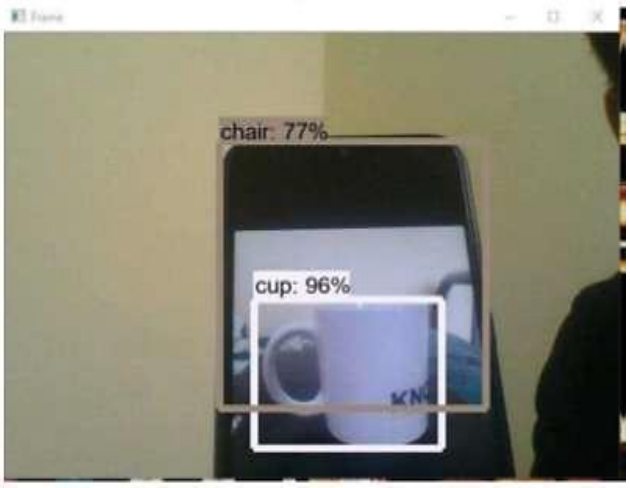

Fig. 5. Cup object detection (box within box).

4 | Conclusion

Analysing various approaches, it is deduced that it is much more practical and reliable to use deep learning rather than traditional machine learning strategies for target recognition. Implementation of machine learning involves a lot of mathematical equations which are boring to a computer program. Implementing profound evolutionary neural networks cuts computations by a significant amount. Successfully the generated system recognizes basic objects such as container, table, human, bottle, device etc. Humans use all kinds of artefacts' in their everyday lives. This initiative also reduces the expense of processing by using CNN as well as precision.

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