

Image Based Object Recognition from a Database

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Abstract: *In this paper, I showed the role of object recognition in search engines based on the image of an object as our primary data. Most of search engines use words as a primary search detail. In this paper we used image of an object to recognize the object on our image and find more detail about it. We detected and extracted the features from the source image and find the match with a group of images of known objects from a database. The process was accurate and fast because it provided the accurate and correct results.*

Keywords: Image, Object recognition, database, search engine, features extraction

1. Introduction

Assume you have or you capture a photo of an object, you don't know what it is or you need more information about it, first you will need to recognize the object on your image then find some more information about it. Object recognition based on matlab can provide us with a solution.

2. Object Recognition

It has been an essential application in search engine like Google. Google has been using the technology for quite some time now, in Google Instead of typing words, you can use a picture as your search to find related images from around the web. For example, if you search using a picture of your favorite band, you can find similar images, websites about the band, and even sites that include the same picture.

Search by image works best when the image is likely to show up in other places on the web. So you'll get more results for famous landmarks than you will for personal images like your latest family photo. In computer vision is the task of finding and identifying objects in an image or video sequence. Humans recognize a multitude of objects in images with little effort, despite the fact that the image of the objects may vary somewhat in different viewpoints, in many different sizes / scale or even when they are translated or rotated. Objects can even be recognized when they are partially obstructed from view. Object recognition has a great impact on most of our sophisticated systems. It has great influence in industrial field (production lines), security field (facial and finger print recognition), banking (recognition of water marks on money), space technologies, robotics and automation and so on. Object recognition has high accuracy; it avoids human error which might be due to eye problems, color blindness, tiredness, lack of concentrations or normal human errors. The application of object recognition in search and identifying the image of different objects has brought a major impact in recognition field by increasing the efficiency, accuracy and speed in recognizing object.

In my research, I develop the same search engine, based on image as your pre source of information but the results will be details of the object found on that image, not just the similar images or the website as in Google. This application can further be used in industrial production lines to identify

different products and their quality, can be used in robotics too, where the robot will be able to identify and recognize different objects for further actions.

There are many research and publications about object recognition but many of them focuses in just features detection, some in matching just the two objects. Google has an application of searching for details of an object by using an image as your primary source of information, but I haven't seen how they manage to do it, In my research I use feature detection and extraction from the image of object which we need to identify and find more details about it then finding the match from a data base of images and bring up the resulted object of high number of matching features with the pre defined image of an object and more details about it.

The same work was done by Ragatha, D.V. and Yadav, D. and published in Computer Modeling and Simulation (UKSim), they focused more on using the knowledge in search engines only where the image will be used as query to find more information, in my research I tried to further use the knowledge in the field of robotics and automation.

3. Problem Formulation

It have been a serious problem in identifying object from their image from medical to engineering field. Try to assume a pharmacist who wants to give medication to a patient but he forgets some other details of the medication, he can just take the picture of the medicine he has and upload to the application and finds all the details about the medicine like the contents of the medicine, how to use it and all allergies, in engineering field try to assume an electronic engineering assembling a certain circuit and he have on hand unknown electronic component, he can just take the picture of the component and upload to the application and he can have immediate result such as name of the unknown component, its schematic, functions and terminal identification.

In my research The task was to identify a body spray and provide some more details about it. I took a picture of the body spray in my room; I took another picture of the same body spray mixed up with objects. I saved the photos in the same folder with other unrelated photos of different things just to create confusion. All of the images were saved in the same folder which I took it as my data base, I used a sample

of only 25 photos but there is a possibility of accessing the photos from a database of many photos of different objects.

I used matlab 2013a to read the image paths of all the object and load the images into matlab using imread code and path reading codes .I first loaded the image of my unidentified object which I didn't have enough information about it(the image of the body spray).I detected the features on the that image, I used the SURF FEATURES detection to detect the SURF FEATURES on the image. There are several features to use when you are doing object recognition base on features detection. In my research I preferred to use **SURF (Speeded Up Robust Features)**,this is because it was more convenient for me to count the number of detected features from the images of my objects and to count the number of matched when there is a match between two images of two distinct objects. By counting the features it provided me with the data to calculate the percentage of matching and to chose the best match. The other reason of using SURF descriptor is faster.

SURF (Speeded Up Robust Features) is a robust local feature detector, first presented by Herbert Bay et al. in 2006, that can be used in computer vision tasks like object recognition or 3D reconstruction. It is partly inspired by the SIFT descriptor. The standard version of SURF is several times faster than SIFT and claimed by its authors to be more robust against different image transformations than SIFT. SURF is based on sums of 2D Haar wavelet responses and makes an efficient use of integral images.

After I detected and extract the SURF features from the image I then code matlab to read one image after another from my data base using for loop to maintain the loop until I read all the images in my data base, detect their features, extract their features and find match with the image I was searching for. Then I counted the number of SURF detected features on the image I was searching for its information, then I counted the number of SURF features detected on the rest of the images, finally I counted the number of features matched between the features of the image of the object to be searched for with the rest of the images, I did all the counting's using matlab codes ,I finally displayed the image from the data base with the highest number of matching as my resulted image and informations about it.

I calculated the percentage of matching by using my own formula;

Let X be the image searched for, Y be the image in the data base, A be the number of features detected and counted on X,B be the number of features detected and counted on Y and C be the number of features matched between X and Y
 Percentage of matching= $(c/(A+B))*100\%$

The results were quite impressive because I was able to count the number of features on the image of an object which I was supposed to find its details and the features on every image in my database and find the best match by counting the number of features matched and I was able to calculate the percentage of matching, which gave me the best and correct result. I actually tried to confuse my search by putting the image of the same body spray mixed up with other things, but apart from putting almost similar object

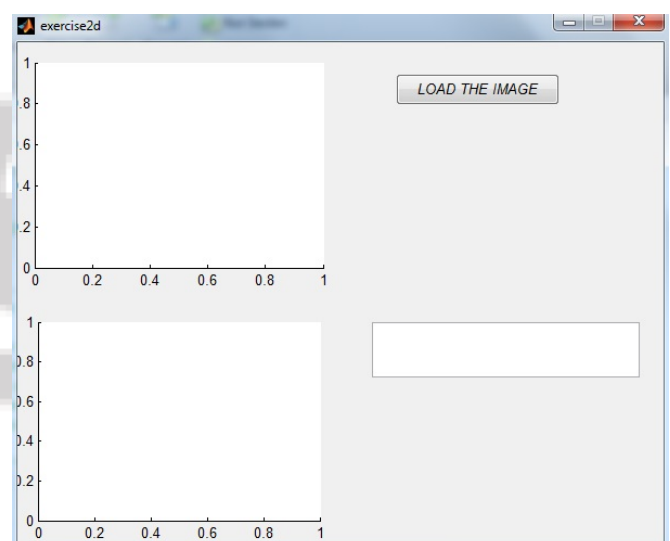
images, my search gave me result of exactly the same object I tried to search.

I loaded the images by loading their paths into matlab using the command imgpaths, then I read the image of interest object(the one which I was supposed to identify) using imread(image path),then detecting the SURF features from the image using detectSURFfeatures().then extracting and counting the features detected. I counted the number of features because I used the numbers to calculate the percentage of matching. Second, I detected and extracted the SURF features in the rest of the images and find the match between the features of detected and extracted from the image of the interested object and the features detected and extracted from the rest of the image by using the function matchedG1Points = G1Points (boxPairs (:, 1), :); and matchedG2Points = G2Points (boxPairs (:, 2), :) were G1points and G2points are the features detected on the image of object of interest and image from the database respectively(I save the images into just a folder for demonstration instead of a large database). Then the image with high matching were detected and displayed. I was able to calculated the percentage of matching by taking the number of matched features diving by the total number of features detected on both matched image and multiply by 100.

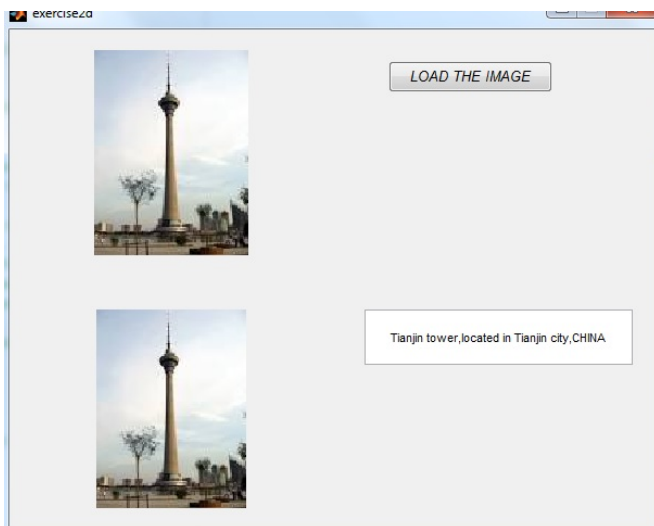
4. Results

The results I found were quite impressive, I was able to load the image of an object into my application and display the resulted match with more information's about it. There were still some matches with other images from the folder image (which I took as my data base) but I was able to code and display the image with high number of matching features. I was able to display the matched image and the message of information about the detected/identified image.

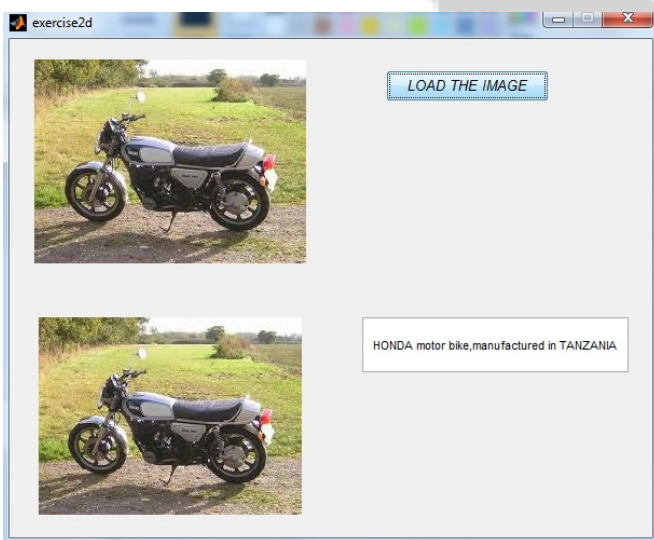
Application before loading the image



Results 1



Result 2



5. Conclusion

I can now say my research was productive with more positive results, I was able to detect, extract and match SURF features and identify the object of interest. The advantages of the application are

- The application is easy to use
- You only need a picture as your query
- The upload of the image is too fast
- It can give you other similar objects

The disadvantages of the application are,

- the image of the object to be recognized has to be pre saved and its detail must be pre provided first in the data base, if you search for an image which has not yet being saved and no details about in the data base you won't find any result.
- The speed of the search
- The process of identification was fast when I use few image and a bit slower when I increased the number of images in the folder
- Quality of the image to be uploaded has to be considered for better.

6. Recommendation

I would like to recommend to the one who will do more research about my work to try to use more than one image features extractor from the query image and the database of image for more perfection of matching and also I would like to recommend more research on how to increase the speed of searching.

References

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Author Profiles



Deogratias mzurikwao received B.E in Electronics and communication Engineering(ECE) from St. Joseph university of Tanzania in 2011. From 2011-2012 he worked as Instrument engineer at Mtibwa Sugar Estate Factory in Tanzania, From September 2012 he is doing masters in signal and information processing at Tianjin University of Technology and Education in Tianjin, China.

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