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Smart Skin Disease Detection System

Mininath R. Bendre [1],Aditi R. Kharde [2], Pratima B. Kharde [3],Viraj R. Varpe [4], Ruturaj S. Kharde [5]

[1]*PREC,Loni Computer, SPPU, India*

[2]*PREC,Loni Computer, SPPU, India*

[3] *PREC,Loni Computer, SPPU, India*

[4] *PREC,Loni Computer, SPPU, India*

[5] *PREC,Loni Computer, SPPU, India*

Abstract— Nowadays information handling has become important part of our day to day life. The information that we found on internet can be used for various medical purposes. Any kind of skin disease has become a major health problem .In previous years, there was no smart use of image processing with cloud computing for medical based application .So there is too much work for medical practitioner to recognize and analyze skin diseases and various stages associated with it. Because of this the disease cannot be properly diagnosed and can be life threatening. The patient cannot detect and get information of a disease by a click of a mobile phone. So we thought of designing a Smart Skin Disease Detection system which we are developing is totally based on Image Processing, Mobile Computing and Cloud Computing as a whole.

In our proposed system we are going to download skin lesion database from ISIC where various stages of skin lesions can be found. Then the images will be smoothened and the noise will be removed using Median filter algorithm. Then the images will be segmented using SLIC algorithm. The segmented images will then be passed to SIFT algorithm which will extract features. The test image will then go through same process and return the correct skin lesion images that are matched. Thus our results will be divided in four categories melanoma, non-melanoma and benign and normal. Thus our system will help and improve the decision making and productivity of a medical practitioner.

Keywords— Image Processing ,SLIC, SIFT, ISIC.

1. INTRODUCTION

As we know today image processing and cloud computing are so hot topics. Lot of things in medical fields can be achieved with the help of image processing like identifying and providing information about different diseases that affect the human. But there was a need to develop a smart system which will identify the skin diseases and provide information about it to the user. So there is need of modernized approach. In traditional approach patient and doctor plays important role. The patient has to approach to the doctor if he thinks he has any kind of skin disease. Then doctor requires some amount of time to do diagnosis of the disease. But this process takes lot of time. Therefore in order to solve this problem awe thought of designing a smart system for detection of skin diseases. Here also the use of mobile computing is there for sending the images of skin patches and receiving the information of skin diseases. Also we are going to use SLIC and SIFT algorithm for extracting the key points or features. A global dataset called ISIC dataset is used which contains different skin disease images. Therefore objective of our project is :

i. To design and develop android based solution for skin based problems.
ii. Suggestion of preventive measures for related diseases.
iii. Develop an algorithm to classify the skin diseases using image processing
iv. To provide cloud based solution for smart skin disease detection system.

2. LITERATURE SURVEY

Skin related disease detection is seen to be time consuming process as its diagnosis required time and thereafter treatment are also long term in order to get completely cure from disease. There are some researchers who made use of image processing with some different techniques to detect the disease present on skin. In[1] image processing methods are discuss for various plant diseases, which provide efficient way to detect the disease

and similarly we can make use of same method with regards to human skin problems. Along with image processing, additionally the Mobile Cloud Computing makes the process easier.[2] integration of mobile cloud computation and there features such as storage, mobility are used to make process easy and sophisticated.

Then [3] use of scale invariant feature transform is done along with artificial neural network. SIFT is used to identify the key points and local features of images[4]. Similarly [5]uses SIFT to extract the features by calculating Eigenvalues and classifier like svm is used to classify the images. Also[6] with these the use of ISIC dataset is done which stores thousands of images of various kinds of skin diseases and one more method called SLIC is used here.

3. METHODOLOGY AND WORKING

3.1 Cloud Services

There are many cloud services available which will be helpful to provide services for end user(Patient) to upload skin images on cloud remotely. Some of them are freely available and some paid out of which we chose "Google Drive" as a cloud service provider for this project. We choose Google Drive because it is user friendly and widely use.

3.2 Image Pre-Processing

SLIC(Simple Linear Interactive Clustering)

step1:take the patient lesion image on server machine through cloud.
step2:Pass the image to SLIC algorithm
step3:SLI consist MedianFilter() methods.
MedianFilter()-It will consider necessary part of patient affected images and will increase the pixel intensity of considered part increasing pixel intensity will result in noise reduction
step4:Store the final image as a result.

3.3 Feature Matching

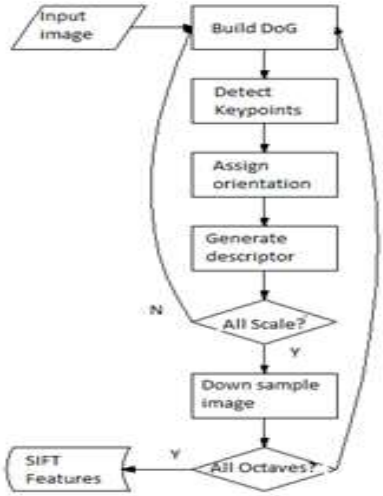
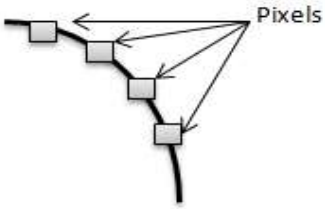


Fig.1 Flowchart of SIFT algorithm

- **SIFT-** Scale Invariant Feature Transformation use to match the features
- Step1- Identify the key points of skin images provided by data set and discard the remaining image.(images data set)
- Step2-Store the key point in vector descriptor array with different orientations.
- Step3- Identify the key points of skin images provided by user and discard the remaining image(patient images).
- Step4-Store the key point in vector descriptor array with different orientations.
- Step5-Match the key point of vector descriptor array of database skin images with vector descriptor array of patient images
- Step6-Fetch the most relevant matching result images.
- Step7-Return the corresponding result.

DESCRIPTION OF SIFT

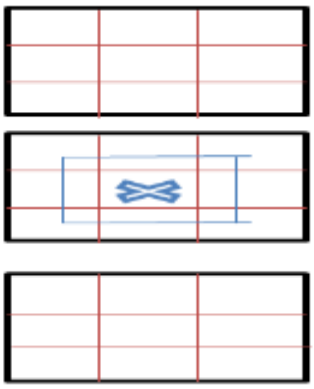
SIFT is to be used in applications involving scaling of image i.e. to detect corners, circles, blobs, etc.For example if the curve shown below is the image and the box drawn on it is pixel then there are several other pixels to be shown then SIFT is used to detect those pixels.



Following is the procedure for SIFT algorithm

1) Scale-space extrema detection
2) Keypoint localization
3) Orientation assignment
4) Keypoint descriptor and Matching

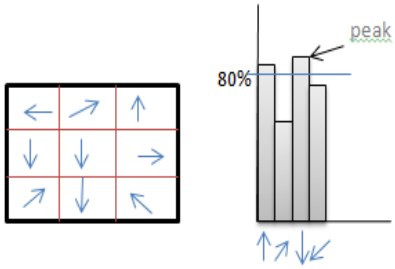
1)Scale-space extrema detection
It is the very first step and all it does is for instance we have pixels in middle or any other place then blurring of the image is done with the help of difference of Gaussian blurring, then the pixel is compared with its 8 neighbouring pixels and then the current pixel is compared with 9 pixels in next scale and previous scale. These is nothing but different octaves that are present there. If these pixels are local extrema then it is potential keypoint or best keypoint.



2)Keypoint localization
In these step if the intensity of the extrema is less than the threshold value then it is directly rejected. Also here we just required features and not the edges so using eigen value and their ratio, edges are to be removed. So basically what we get here is removal of low contrast keypoints and egde keypoints and only the strong interest points stays.

3)Orientation Assignment

Orientation is to be assigned to each keypoint so as to see where they are facing. These can be done by using orientation histogram.



Any peak more than 80% is taken into consideration. So these creates key points with same location and scale but in different direction.

4)Keypoint Descriptor and Matching
Descriptor is a vector of keypoints obtained from previous step i.e. the number of keypoints in last step multiplied by 128.
Now what is 128 ?
It creates 16X16 neighbours around the keypoint with that it is next divided into 16 sub blocks of size 4X4 and each block has 8 bin orientation.
So 4x4x8=128 bins over here.
Then next important step is keypoint matching which can be done by identifying nearest neighbours between two images. Further step involves ratio analysis between closest and second closest is to be done .

4 ISIC Dataset

ISIC data set stands for International Skin Image Collaboration. It is largest dataset present online, which is the source for our project. Here are some of the images From ISIC Data set along with there diseases.

Fig.2. Melanoma
(It is a serious form of skin cancer that begin in cells knows as melanocytes.)

Fig.3. Acne
(This disease is caused due to use of different cosmetics)

4. MATHEMATICAL MODULES

FOR OUR PROJECT SET THEORY IS AS FOLLOWS:

1. **Mobile :-**

Set(N) ={N0,N1,N2,N3,N,N5}
N0 ∈ N = Capture Skin image mobile camera.
N1 ∈ N = Establish communication with cloud.
N2 ∈ N = Send image to cloud.
N3 ∈ N = Receive acknowledgement.
N4 ∈ N = Download Image results from cloud.
N5 ∈ N = View results on phone.

2. **Feature Matching :-**

Set(V)={N1,E0,E1,E2,E3,E4,E5,E6}
N1 ∈ E = Establish communication with cloud.
E0 ∈ E = Download Skin image.
E1 ∈ E = Apply SLIC on test image.
E2 ∈ E = Apply SIFT on test image.
E3 ∈ E= Apply SIFT on database images.
E4 ∈ E = Find highest matched results.
E5 ∈ E = Retrieve highest matched result info from oracle database.
E6 ∈ E = Send info to cloud.

Venn diagram of intersection of two sets

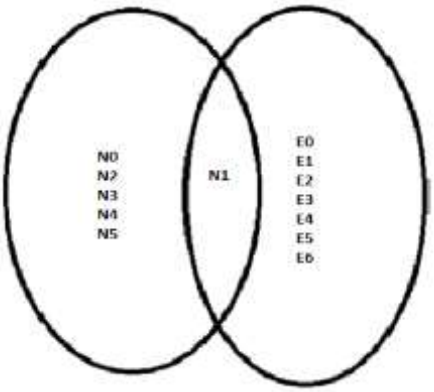


Fig.4 *Venn diagram*

Probability of our Project Modules

1.In Mobile Module:-

We have two possibilities for getting correct Result for the query image i.e. whether taken image from the mobile is good quality or not.
P (present) = ½
P (not) = ½
Hence,P(Captured-Image)=
P(present)+P(not)
=(½)+(½)
=1

2. In Feature Matching Module:-

The possibilities of getting correct results for query image i.e whether proper reference database for a disease is maintained or not.
P (present) = ½
P (not) = ½
Hence,P(Reference-Image)=P(present)+ P(not)
=(½)+(½)
= 1 .

5.DESIGN

Fig.5 System Architecture

6. RESULTS AND DISCUSSION

In these paper we have discussed different techniques because of which it is found easy to detect and classify different skin diseases on human body. Following are some screenshots that shows

how the process is carried out.Firstly the image of any skin related disease like melanoma or any other skin cancer disease is taken as input with the help of camera of mobile. It is stored on cloud. Then a image will be load for identification purpose as it is shown below.

Fig.6 Output of Loading image for identification

First the unwanted area of skin is removed using SLIC.Here the key points in images are to be extracted with of help of SIFT algorithm. There are large number of key points are to be extracted that are shows with help of blue dots.

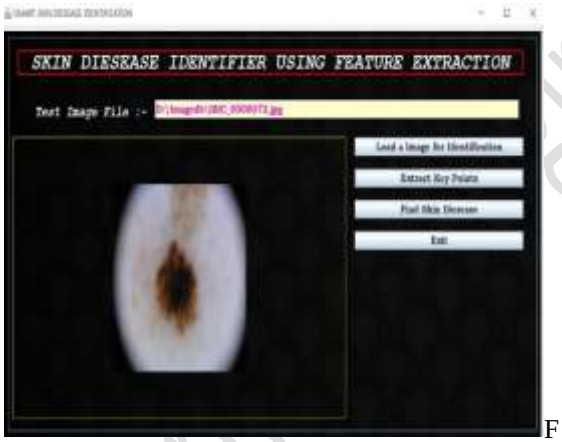


Fig.7 Output for extracting key points

And then it will see whether these key points are matching with the image in database is yes then it will show final result i.e which kind of disease they have to the patient and of what class it belongs to whether it is normal ,intermediate ,malignant. The below figure shows that image is identified with skin disease.

Fig.8 Matched Image

7.CONCLUSION

Health and fitness of a patient is very important factor. Hence there was need to detect the disease present on skin within short span of time. Our smart skin disease detection system is a combination of image processing along with cloud computing which helps the patient in detecting their skin disease. Also the use of mobile computing and desktop is done here to carry out entire process effectively. Here different techniques like SIFT, SLIC are used for accurate detection of diseases on skin of human beings. Our system also helps to reduced the time required for doing diagnosis of a particular disease. Hence it is time saving process. The use of ISIC dataset is done in our project which is downloaded from standard and verified data centres.

8. ACKNOWLEDGMENT

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AUTHORS PROFILE

Mininath R Bendre, PhD, CSE

Aditi R. Kharde
BE Computer(Student)

Pratima B. Kharde BE Computer(Student)

Viraj R. Varpe
BE Computer(Student)

Ruturaj S. Kharde BE Computer(Student)