SPOTTING SKIN DISORDER USING TEMPLATE MATCHING

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ABSTRACT: There are a number of skin diseases like Acne, Eczema, Hives, impetigo, Melanoma, Moles etc. Acne is a disease that affects the skin's oil glands. The small holes in the skin (pores) connect to oil glands under the skin. These glands make a substance called sebum. Eczema, also known as atopic dermatitis, is a long-term skin disease. The most common symptoms are dry and itchy skin, rashes on the face. Hives causes red and sometimes itchy bumps on the skin. Likewise, different skin diseases have different symptoms. Sometimes, it is difficult for the dermatologist to diagnose the skin disease by looking at the disease. This paper aims at spotting the skin disorder by using the template matching algorithm.
KEYWORDS: skin disorder, disease, itchy, dry, analysis, diagnose, image processing and disease type.

1. INTRODUCTION

The prominent sense organ of our body is skin. Skin is the sense organ which senses the temperature of the outside environment, touch and pressure caused by other objects and living things. So many people in the world are suffering from skin disorders because of the changes that are taking place in today's environment. As mentioned in the abstract part there are different skin diseases and diagnose of the disease may be difficult to the dermatologist at the initial stage. But Skin disorders that are diagnosed at the initial stage can be given treatment and made curable within less time. Our paper proposes a new technique to diagnose the skin disease perfectly and the dermatologists can use this application for a better treatment.

Some strategies for identification of skin diseases are proposed in the literature. Er. Shrinidhi Gindhi et al [S+17] proposed an innovative approach for skin disease detection using image processing and data mining. They said that the exact location of the disease affected skin can be determined and it can point out the correct type of disease at a low cost. But this technique can identify less number of skin diseases. Pravin S. Ambad et al [AS16] proposed a technique image analysis system to detect skin diseases using statistical parameters. They claimed that their system can detect disease at an early stage but it is not sensitive to noise. Nisha Yadav et al [INS16] developed a system Skin diseases detection models using image processing and in this paper they made a comprehensive study of a number of skin disease diagnosis systems with different methodologies and their performances. They investigated that all the techniques they have studies are of low accuracy. Shervan Fekri-Ershad et al [FST13] developed an innovative approach using color based image retrieval technique that detects skin diseases. They concluded that their technique is less computational complexity and can identify many skin diseases. But this technique is not sensitive to noise, changing body position and illumination. The rest of the paper is organized as follows.

The related work is described in section 2. Section 3 presents the spotting of skin disorder system activity and modules. In Section 4 we describe the design of spotting skin disorder system. We describe the algorithm in section 5 and we conclude the paper in section 6.

2. RELATED WORK

From the literature survey we found that most of the existing systems are having some disadvantages like only few skin diseases are detected [S+17] , not sensitive to noise [AS16][AGR14], not accurate in detecting all kinds of skin diseases [FST12]. Spotting skin disorder system provides a better solution as it uses the template matching method.

All the disadvantages that are discussed in section 1 can be overwhelmed by using spotting skin disorder system which we have developed by using template matching technique. This system aims at identifying skin diseases and is developed by using Python along with its layout toolkit PyQt & PyUIC. The proposed system processes the image and identifies the type of skin disease then it generates the report which contains suggestions for patients**.**

Determination of skin disease using image processing has three modules.

1) The DTD (Disease types database) is used to store the details of different types of diseases in the Database

2) The DA (Disease Analysis) module is used to analyze the given disease, using its image, and
3) The Frontend module is used to create the needed GUI screens for the system.
This system is very useful to the poor patients who can't go for regular medical checkups, because of high medical expenses. This system is also useful to the doctors, as they need not remember the details about each and every skin disease. It also leads to the enhancement of quality of human life.

3 SPOTTING SKIN DISORDER SYSTEM

3.1. Activity involved in spotting skin disorder

The following figure (Fig. 3.1) describes the activities involved in spotting skin disorder system. We enter the patient details and store them into the database. Later we provide the symptoms and the skin disease images as the input. We process the given symptoms. The skin disease detection is done using the template matching algorithm and finally the output is displayed as particular skin disorder is detected and report is generated.

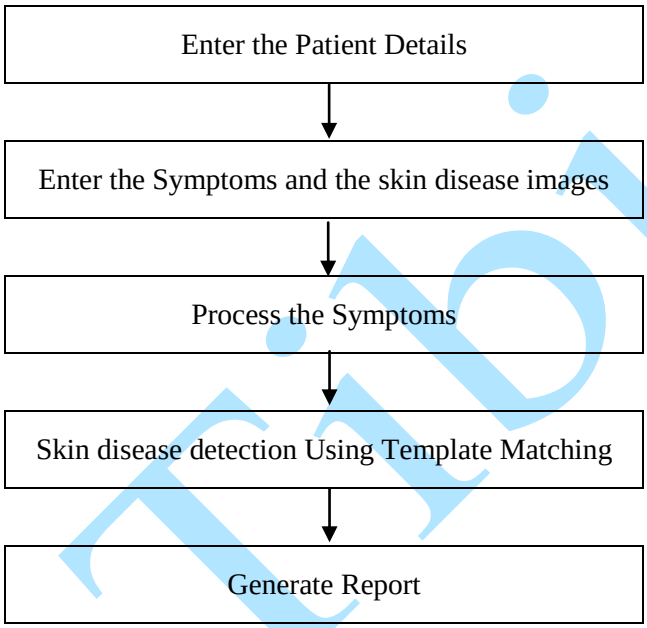

Fig. 3.1. Sequence of steps involved in spotting skin disorder system

3.2. Modules involved in spotting skin disorder

Spotting skin disorder system has three modules.
The DTM (Disease types module): This Disease type module is used to store the details of different types of diseases in the Database. To the system we load patient details like patient id, name, age, disease symptoms like Dry skin, Sensitive Skin, Red Skin, Inflamed skin, Intense Itching, Scaly Rough skin, Recurring Rash, Oozing and crusting, Unable to sleep with intense itching, Dark colored patches of skin observations and image files as input.
The DA (Disease Analysis) module: The Disease analysis module is used to analyze the given disease, using the images which are stored in the database. The details which are entered are analyzed and processed by python tools like pyqt and pyuic.
The Frontend module: The Frontend module is used to create the needed GUI screens for the project.

4. DESIGN OF SPOTTING SKIN DISORDER SYSTEM

The following figure (Fig. 3.2) is a sequence diagram that shows object interactions arranged in time sequence.
The activity can be described as an operation of the system. So, the control flow is drawn from one operation to another. In an activity diagram we can see that first we have to open the disease identification tool and then we will check whether all the needed details are there or not. If Yes, go to next step otherwise enter the needed details. After successfully entering the Symptom details the customer needs to provide the test results & Images as input, and then click on the corresponding button which will lead to the analysis of symptoms and spotting of the skin disorder.

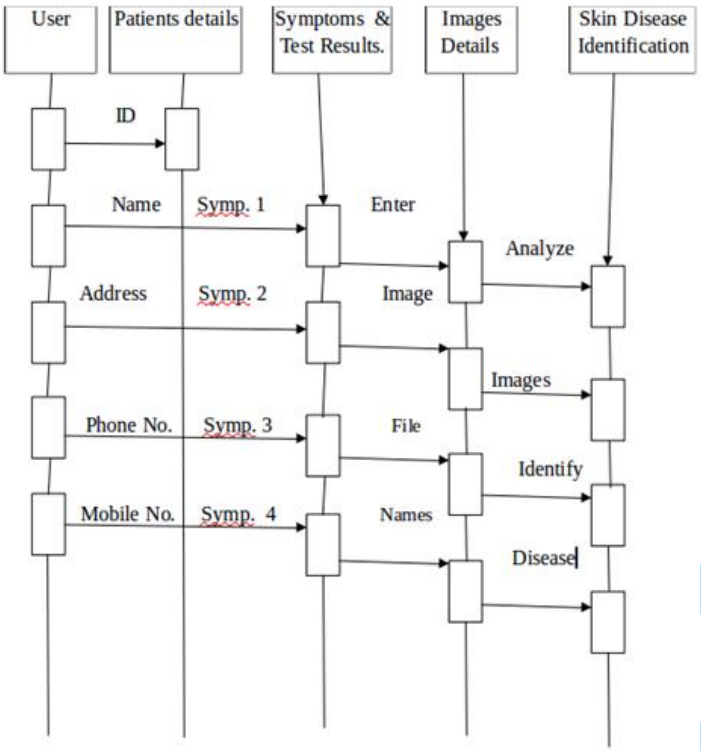

Fig. 3.2. Sequence diagram of spotting skin disorder system

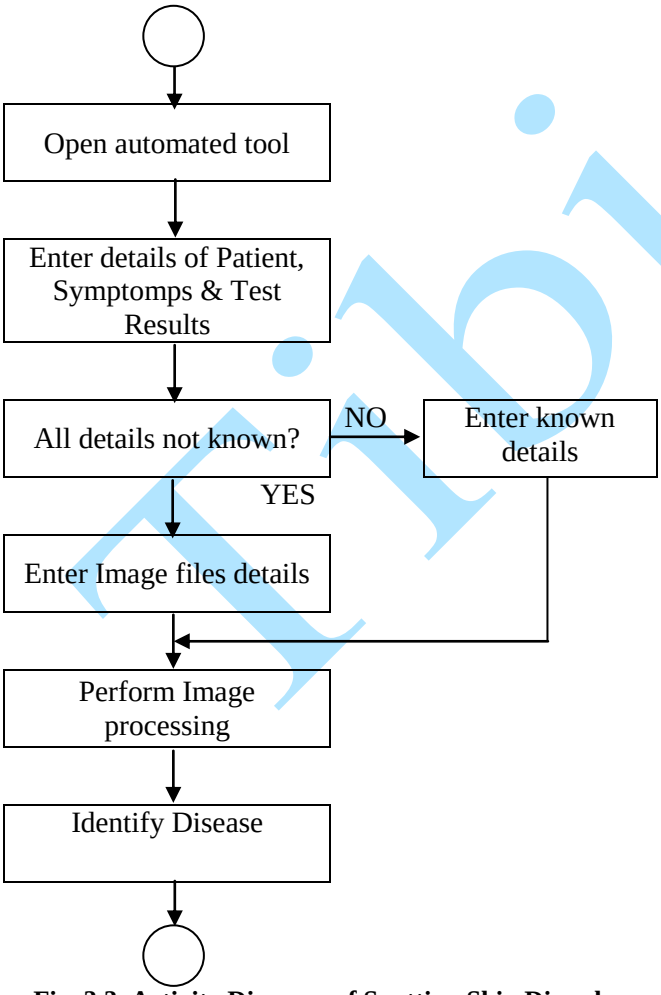

Fig. 3.3. Activity Diagram of Spotting Skin Disorder System

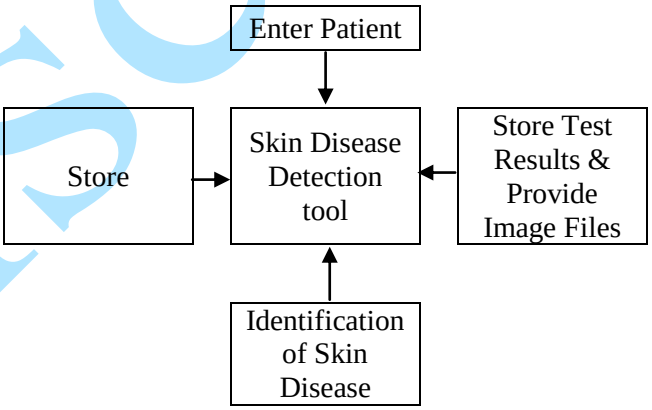

Fig. 3.4. Architecture of spotting skin disorder system

Figure 3.4 shows an architecture diagram of the spotting skin disorder system. When we load test results and image files as input. The details which are entered are analyzed and processed by python tools like PyQt and PyUIC.
All the above observations are stored in skin disease detection tool and generate the result as identification of skin disorder accordingly.

5. TEMPLATE MATCHING ALGORITHM

Template Matching is a method for searching and finding the location of a template image in a larger image. OpenCV [***19] comes with a function cv2.match Template() for this purpose. It simply slides the template image over the input image (as in 2D convolution) and compares the template and patch of input image under the template image. Several comparison methods are implemented in OpenCV.

```
 import cv2
 import numpy as np
from matplotlib import pyplot as plt
img=cv2.imread('me ssi5.jpg',0)
img2 = img.copy ()
template = cv2.imread ('template.jpg',0) w, h = template. shape[::-1]
# All the 6 methods for comparison in a list
methods = ['cv2.TM_CCOEFF', 'cv2.TM_CCOEFF_NORMED', 'cv2.TM_CCORR',
      'cv2.TM_CCORR_NORMED', 'cv2.TM_SQDIFF', 'cv2.TM_SQDIFF_NORMED']
for meth in methods: img = img2.copy () method = eval(meth)
         # Apply template Matching
  res = cv2.matchTemplate(img,template,method)
  min_val, max_val, min_loc, max_loc = cv2.minMaxLoc(res)
  # If the method is TM_SQDIFF or TM_SQDIFF_NORMED, take minimum if method in
  [cv2.TM_SQDIFF, cv2.TM_SQDIFF_NORMED]:
    top_left = min_loc
    else:
    top_left = max_loc
  bottom_right = (top_left[0] + w, top_left[1] + h)
  cv2.rectangle(img,top_left, bottom_right, 255, 2)
  plt.subplot(121),plt.imshow(res,cmap = 'gray')
   plt.title('Matching Result'),
   plt.xticks([]),
  plt.yticks([])
  plt.subplot(122),
  plt.imshow(img,cmap = 'gray')
  plt.title('Detected Point'),
   plt.xticks([]),
  plt.yticks([])
  plt.suptitle(meth)
  plt.show()
```

Methods used in template matching:
`cv2.matchTemplate(image, templ, method[, result]) → result`
Parameters:

- **Image** – Image where the search is running. It must be 8-bit or 32-bit floating- point.
- **templ** – Searched template. It must be not greater than the source image and have the same data type.
- **Result** – Map of comparison results. It must be single-channel 32-bit floating-point. If image is $W \times H$ and templ is $w \times h$, then result is $(W - w + 1) \times (H - h + 1)$.
- **Method** – Parameter specifying the comparison method (see below).

The function slides through image, compares the overlapped patches of size $w \times h$ against templ using the specified method and stores the comparison results in result. Here are the formulae for the available comparison methods (I denotes image, T template, R result). The summation is done over template and/or the image patch: $x' = 0 \dots w - 1, y' = 0 \dots h - 1$

- method=CV_TM_SQDIFF

$$R(x,y) = \sum_{x',y'} (T(x',y') - I(x+x',y+y'))^2$$

- method=CV_TM_SQDIFF_NORMED

$$R(x,y) = \frac{\sum_{x',y'} (T(x',y') - I(x+x',y+y'))^2}{\sqrt{\sum_{x',y'} T(x',y')^2 \times \sum_{x',y'} I(x+x',y+y')^2}}$$

- method=CV_TM_CCORR

$$R(x.y) = \sum_{x',y'} (T(x',y') \times I(x+x',y+y'))$$

- method=CV_TM_CCORR_NORMED

$$R(x,y) = \frac{\sum_{x',y'} (T(x',y') \times I(x+x',y+y'))}{\sqrt{\sum_{x',y'} T(x',y')^2 \times \sum_{x',y'} I(x+x',y+y')^2}}$$

- method=CV_TM_CCOEFF

$$R(x.y) = \sum_{x',y'} (T'(x',y') \times I'(x+x',y+y'))$$

Where

$$T'(x',y') = T(x',y') - 1/(w \times h) \times \sum_{x",y"} T(x",y")$$

$$I'(x+x',y+y') = I(x+x',y+y') - 1/(w \times h) \times \sum_{x",y"} I(x+x",y+y")$$

- method=CV_TM_CCOEFF_NORMED

$$R(x,y) = \frac{\sum_{x',y'}(T'(x',y') \times I'(x+x',y+y'))}{\sqrt{\sum_{x',y'}T'(x',y')^2 \times \sum_{x',y'}I'(x+x',y+y')^2}}$$

After the function finishes the comparison, the best matches can be found as global minimums (when CV_TM_SQDIFF was used) or maximums (when CV_TM_CCORR or CV_TM_CCOEFF was used) using the minMaxLoc () function. In case of a color image, template summation in the numerator and each sum in the denominator is done over all of the channels and separate mean values are used for each channel. That is, the function can take a color template and a color image. The result will still be a single-channel image, which is easier to analyze.

CONCLUSION

This work entitled **"Spotting skin disorder using template matching"** is useful to identify the diseases based on patient symptoms, test results & Images. The project is very useful to the poor patients who can't go for regular medical checkup, because of high medical expenses. The project is also useful to the doctors, as they need not remember the details about each and every skin disease. This project finally leads to the enhancement of quality of human life.
Determination of skin disease using image processing has three modules. The DTM (Disease types module) is used to store all the required data. The DA (Disease Analysis) module analyses the skin disorder and generates a report, where as The Frontend module is used to create the needed GUI screens for the project.

FUTURE SCOPE

As of now the system is considering only 10 symptoms and two test results for analyzing each disease. This project can be improved further by considering more symptoms & Test Results. The Symptoms Considered are: Dry skin, Sensitive Skin, Red Skin, Inflamed skin, Intense Itching, Scaly Rough skin, Recurring Rash, Oozing and crusting, unable to sleep with intense itching, Dark-colored patches of skin and test results considered are Eczema identification and Hives identification.

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