

COMPREHENSIVE REVIEW OF TECHNIQUES USED TO DETECT SKIN LESION

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Abstract: Diseases are distinct and are spreading at the rate of knots. Lack of time and ignorance serve the great cause of diseases within human and all other living beings. Skin diseases are by far most dangerous as it spread like a fungus. Technology is growing with heap and bounds. It provides on the go information to the user about diseases. So problem of lack of time is resolved. Many distinct techniques exist that are utilized in order to analyze and provides optimal cure rate to skin related diseases. Level of severity is also indicated through advanced techniques present for diagnosis. Techniques used for this purpose utilizes image processing. The image is analyzed in phases. The initial phase is image pre processing. This phase partition image into segments. The overall process is known as segmentation. The comprehensive comparison and analysis of techniques is presented through this paper.

Index Terms— image processing, Skin diseases, Segmentation, image pre-processing, filtering.

I. INTRODUCTION

The human body have largest organ called skin. It separates the inner parts of body and also form outer environment. The skin is major organ which protect body from the allergy, viruses, infection, bacteria and it also controls the temperature of body. There are many symptoms like swelling, burning, redness and itching which can change or damage the texture of skin. They may be caused by allergies, irritants, genetic problems and immune system problems. All these symptoms can result in different diseases like acne, alopecia, eczema, ringworms causing distortion in look and feel of person concerned. Diseases such as cancer related to Skin can be caused by many distinct reasons [1] The various techniques of image processing like filtering, feature extraction, segmentation are utilized to detect these skin diseases. The image processing techniques are applied only on digital image so we need to convert image into digital form. This digital image is used to get meaningful information or to get improved image by performing functions onto image. So we can say that it is the signal processing in which input an image and the output also another image is having same properties of input. Image processing is widely used technology that take input samples as 2-D signals and after that they apply fixed signal processing methods to them.[2]

For dermatologists, there are numerous difficulties to distinguish the infected area in order analyze the skin sickness.

The eczema is a fundamental footstep of analysis along the size of lesion's covering is highly valuable in curing record. [3].

The various techniques of image processing like filtering, feature extraction, segmentation are utilized to detect these skin diseases. The image processing techniques are applied only on digital image so we need to convert image into digital form.

This digital image is used to get meaningful information or to get improved image by performing functions onto image. We can say that it is the signal processing in which input an image along with the output of distinct image should have similar properties of input. Image processing is widely used technology that takes input samples as 2D signals and apply fixed signal processing methods to them .[4]

The skin diseases have very wide range. It is necessary to identify these diseases on early stages and prevent them from spreading. The parameters that are considered for disease detection must be identified in early stages. The process continues by firstly taking an image, for noise reduction filters are applied on it and after that the various segment of image is utilized to extract the information. This extraction can be done by feature extraction on the basis of input parameter. When extraction is to be done then classify them using appropriate classifier to identify diseases.

Image segmentation is an important footstep in medical image processing. It is generally linked with medicines and diagnosis of breast cancer cells [5], brain tumor [6][7] , and it is useful in the detection of skin cancer and infected skin [8][9], size of pieces of skin ulcers [10]and burnt scars [11] consumed as a part of segmentation of skin disease based on its strategies. Expects to minimize the assumed time to enhance the patient's condition and it also enhance the exactness of the skin doctors involvement, an automated technique is researched to measure the skin disease [3].

Data Mining

To automatically sort medicinal images, data mining methods must be utilized, association rule mining and neural networks. In both cases, the issue comprises of building a classification model utilizing traits extracted from and connected to Melanoma, then evaluating the adequacy of the model using new images. The way toward building the classification model (classifier) incorporates pre-handling and extraction of visual elements from already labeled pictures (i.e. training set).

Machine learning

The medical images can be analyzed by the use of machine learning algorithms. Machine learning algorithms provides automation approach in which user interpretation is minimal, conventional image processing techniques cannot be used in order to analyze complex medical images like ultrasound and Medical resonance imaging. The reason is that conversional techniques are based on assumptions. Geometric constraints are also present in the conventional mechanism. In order to optimize the work new techniques to analyze the ultrasound and MRI images can be utilized.

The group's research ranges from the plan and assessment of state-of-art machine learning key structure location, division and evaluation strategies which insert information and requirements on ultrasound acquisition and features, to the design of new tools to enable biologists to answer biological inquiries that they haven't possessed the capacity to consider before because of an utmost of nature of microscopy pictures, or non-versatility of manual analysis techniques.

Although there exists legion of skin diseases which are dangerous but Melanoma is one of the extremely dangerous type of it that even causes death. The Melanoma is rare but overall death rate of 75% is due to this skin disease. The analyzed process may detect this disease at early stage then it is curable but at later stages it will be difficult to cure and handle and may lead to death also. Early stage detection is critical in case of this disease[1].

Today is the era of technology. It is enhancing and providing effective mechanism in area of health care. Computer system can be used for analyzes of disease like Melanoma. The image related to this disease can be processed using techniques like segmentation, feature extraction and classification, [1]. There exists phases associated with cancer detection through computer system. Preprocessing is one of the critical phase in the armory of computer aided cancer detection strategy. [13].

Technology is the heart and soul of new era which can be used to check skin cancer. Image processing is divided into sections such as enhancement, restoration and noise removal strategies. Filtering mechanisms are used to enhance existing [13].

Distortion in image is caused by wide variety of reasons. Some of the reasons are resolvable and some are incurable in nature. The causes could be temperature, medium of transfer, whether conditions etc. preprocessing should be such that it could resolve these issues. Noise handling mechanism could be the need of the hour. These techniques are capable enough to handle such problems when in cooperated with preprocessing. The accomplishment of preprocessing is relevant in curing distorted image. The clarity of image is critical in detection of disease and stages associated with image. Hence more accurate image processing mechanisms are required to handle distortion which must be merged with preprocessing techniques for the better understanding of diseases within the humans and living things[14].

Existing Work

A. Expert System for Diagnosis of Skin Diseases

The spread of diseases in human body is common. The disease such as cancer can easily spread through the application of interaction. Such diseases has to be detected at early stage so that treatment is possible. In case disease spread beyond certain level then they cannot be cured. Expert system has been devised which can be used in order to provide method

of detection and suggest cure. This system required the user to input the symptoms and then repository is used to compare inputted parameters against inputted parameters. The result is being forecasted to the user. The system also suggest the first aid and nearby health care centers. Techniques like data mining and image processing are used in order to determine the problems. The graphical user interface is utilized so that user does not have to type lengthy commands in order to operate on the system. In other words easy to use interface is provided in this case. [15]

Research Gaps

- Only few diseases are detected by the use of existing system.
- Smart phones are required in order to use this system. GUI applications are supported by the same.
- Depends upon the distance for recording. The range must be below 5cm.
- Light effects should be absent for effective computation.
- Language dependency is present. In other words only English language is supported.

B. Woods Lamp algorithm is utilized in expert system which is more complex than all the other pattern matching algorithm.

This technique is heavily dependent upon the rule based system. The fuzzy system is supported in order to accomplish the cure based system. The forward chaining method is used in expert system to determine skin disease if any. The children skin diseases can also be detected and cure can be suggested through the application of this system. System also supports online and web based applications to provide timely information to the user so that cure can be suggested and disease can be detected at early stage of the disease. Modular approach is possible. There are two main module associated with the system. Diagnosis and management tools are merged together to generate optimal performance in child skin diseases detection. The cure is suggested on the basis of answers provided by the user. The symptoms associated with skin diseases are identified. The skin diseases of children can be identified efficiently. [16]

C. An efficient system automation for skin disease identification

The skin diseases are common among young and old community. This could also result in epidemics. Technique has been devised in order to tackle such situation. The researched technique known as grey normalized symmetrical simultaneous occurrence stencils (GLCM) which efficiently handles and suggest cure for skin diseases present within the human body. The merit of such system is cost effective approach. Medical diagnosis through this technique results in least errors. Application support is also present hence reliable service is associated with this system. Feature extraction is also supported hence complexity associated with this system is also reduced. The graphical interface is provided so that naïve users can also utilize such system. [17]

D. Mobile based applications to detect skin diseases within living things

Growth of technology and emergence of 5th generation computers help in resolving issues of health care. Image processing is one such area in which artificial intelligence is merged. Techniques of AI can be used in order to create

applications based on mobiles. The user creates IDs in the app and then input the parameters related to the disease. User will get the relevant information about the disease on the go. The image can also be inputted to detect the diseases within the human body. The parameters are extracted through the applications of feature extraction. Based on the parameters result is generated and given to the user. The studied paper detect 6 distinct diseases. The accuracy of such system is also quite high. The analysed paper presents the result of 90% accurate and authenticated information. [18]

E. *Skin Disease detection through analysis of coloured images*

Coloured images are great source of providing information especially in the medical field. The medical images can be analysed by the application of surveyed paper. The colour images can be extracted so that skin diseases can be clearly identified. Legion of techniques are available and are used in this regard. Most common technique utilized is known as histogram equivalence. The method is based upon the enhancement of contrast in order to determine the abnormal portion of the skin. The skin diseases can be efficiently identified by the use of analysed technique. Colour based image retrieval is another method used to extract the information from the image. Feature vector is utilized to extract the features to highlight the distorted part of the image in this technique. The motion sensibility and light source problems are not present in this case. Hence this method is efficient enough to handle the noise problems and detect skin diseases if any within the human body. The results shows that this technique is diversified enough to handle noises and provide better result in terms of skin diseases. [19]

II. RELATED WORK

Ignazio Stanganelli[20] et.al discussed the clinical determination of melanoma could be hard for a general expert and, in some cases dermatologists use computer-aided diagnosis for the skin lesion diagnosis. The diagnostic algorithms ADAM shows higher diagnostic performance as compared with the physicians, in terms of sensitivity and a lower one in terms of specificity.

Roberta B. Oliveira[21] et.al intends to display a survey of the present strategies, and layout a similar investigation with respect to distinct steps associated with image processing. The utilization of collection, pre-processing and modular approach utilized for betterment of image processing. The principle mechanism is utilized in order to partition the job into parts. This will help reduce the complexity of overall system. The result generated could be time effective and clearer as compared to traditional system. Image is smoothen below threshold values hence noise is considerably reduced.

G. Th. Papadopoulos[22] et.al discussed Region classification schemes. Singular value decomposition is one such technique. The technique enhances the performance and removes any distortion present. Along with this approach another scheme which is followed is support vector machine. All the techniques used are used in order to extract the features

in order to identify the regions in which particular pixel within the image falls. The regions are then expressed as batches providing sufficient information about the diseases that exist within the human body. Optimization algorithm such as swarm particle optimization is used to reduce the overhead associated with the system. The experiments result shows that the hybrid approach provide better performance and results in terms of skin diseases. Knowledge collection and extraction feature help improve image analyse process.

COMPARISON OF TECHNIQUES UTILIZED FOR SKIN LESION

Techniques to detect the skin problems like cancer and other deadly diseases are many. Each having their pros and cons. The comparison of various techniques are described through tabular structure as

Table 1:

Techniques	Year	Classes	Method	Features	Classifiers	Strength
Computer Aided techniques for analysis of skin diseases [23]	ScienceDirect 2016	melanoma	Threshold base Region based Pixel based Model based	Asymmetry Border Color Dermoscopic Structure or Diameter	Techniques of artificial intelligence including fuzzy, neural network	Gives better result as compared to existing system
Skin lesions analysis by the use of segmentation and classification techniques[24]	ScienceDirect 2015	Melanoma and distinct categories of skin cancer	Region Based (pixel based)	Color, Texture, RGB histogram(describes color context of the image)	Support vector Machines, k-Nearest Neighbour.	Fusion based classifier(SVM-KNN)
Image processing techniques to analyze skin cancer(Melanoma)and other problems associated with skins[1]	ScienceDirect 2015	Melanoma	Automatic interface with minimal user interaction, Threshold mechanism to provide clarity of result	Texture and size analyses. feature extraction , Geometry analysis like area , width etc	Melanoma cancer detection using rule based system	Graphical interface is provided
A Bag-of-Features Approach for detection of cancer through colored image analysis[25]	Springer 2014	melanoma	-----	Color And Texture Descriptors Gray Level Co-Occurrence Matrix (GLCM)	ABDC rule 7-point checklist Menzies' method	Color image analysis is performed better as compared to existing approach.
The Beneficial approach for analysis of colored images to detect skin cancer [13]	ScienceDirect 2014	melanoma	Image enhancement Image restoration	Mean filters Adaptive filters Order statistics filters Scaling and contrast enhancement such as histogram equivalence is utilized	-----	designing the automatic skin cancer detection system
Distinction between various filters utilized in order to detect skin cancers[14]	ScienceDirect 2014	Skin cancer images	Image enhancement Image restoration	Mean filters Adaptive filters Median filter Gaussian smoothing filter Salt & Pepper noise Adaptive Wiener filter	-----	Distorted image is smoothen by the use of suggested filters
Neural network based approach for the detection of skin cancer [26]	(IJCSIM) 2013	melanoma	Region based extraction and threshold mechanism are utilized to generate optimal performance	Modular strategy and region free approach	Back propagation mechanism is utilized for enhanced work.	the result achieved with highest accuracy for Curvelet with BNN of two layers. Mixture of noises are detected and handled by the tools specified. Mainly demographical images are

						handled by the use of suggested techniques.
Segmentation approach to detect skin problems within human body[3]	IEEE 2013	skin cancer and wound	Image segmentation based on edgeaccuracy' EAC. And Surface accuracy model is utilized	Infected skin along with edges are detected using this strategy	K-means segmentation FCM algorithm IFCM clustering algorithm Otsu's method Active contour	Allow demographist to detect disease in least time consumption methodology
Automated approach to detect skin lesions through segmentation[27]	Elsevier 2008	Skin Lesion Images	Evolutionary Strategy (Es) Es-Based Algorithm For Lesion	Region of interest technique along with texture analysis	Fuzzy c-mean. Sigmoid PCT PCT plus Sigmoid	More robust algorithm which is not affected by noise introduction
Automated Melanoma Recognition[28]	IEEE 2001	melanoma	region-based segmentation	Color and texture parameters, area, perimeter, Size, Shape descriptors	Mechanism of threshold, c means clustering etc is utilized	Performance of segmentation is better as compared to earlier approaches
Segmentation of skin cancer images[12]	Elsevier Science 1997	melanoma and non-melanoma	Double thresholding , Elastic curve, Region refinement	Boundary extraction Pigmented lesion Gaussian noise is handled and image is smoothens		Automated approach is followed to detect skin diseases with minimal user interaction

III. CONCLUSION

This paper provides state of the art comparison between the distinct techniques utilized to detect skin problems. Most of the techniques analyzed deals with skin cancers like Melanoma. The techniques provide automated approach for handling images which can be coloured or gray scale in nature. Through the comparison table efficient approach can be detected and utilized so that better results can be achieved in detection of skin problems. Future scope exists as no technology assures 100% accuracy of detection. Also skin diseases which can be detected through analysed techniques are limited. In future model can be devised to detect skin diseases in animals. Also it can be expanded to include all kinds of skin problems.

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