

# Application of Digital Image Processing in Healthcare Analysis based on Hand Image

P.Sreelatha, Mohana Priya.V.M, Jenifer.S, Muthumani.P, Minisha.M

**Abstract**— This paper explains an Automated Disease Prediction System (ADPS) as an application of digital image processing and analysis in the field of health care. In medical science, medical practitioners observe nails and palm of patient to get primary idea about diseases and health conditions of the human body. But human eye has limitation in case of minute observations. The proposed system is to detect various health conditions where the hand image is given as input to the system. By applying DIP techniques, the input image is segmented and certain features in the segmented palm and nail images are extracted. The knowledge base of medical palmistry is used to analyze the features extracted in order to predict probable diseases.

**Index Terms**— Medical palmistry; Automated Disease Prediction System (ADPS); Digital Image Processing; Feature extraction; Segmentation; Neural network.

## I. INTRODUCTION

In Medical science the health of human body can be identified through eyes, tongue, skin, nails, palm, etc. Every specific region in the hand explicitly defines the organ of our body. The palm contains more nerve cells than any other part of nervous system. So palm is the reflection of activities of brain and also the results of biological and psychological changes are indicated in the palm. The nails are the very good reflection of one's health.

Palmistry is a branch of science which observes human palm by different aspects and derives conclusions about nature of the person. It can forecast the future of an individual authentically. Ancient civilizations like Indian, Chinese, Egyptian, Persian, Roman and Greek used palmistry techniques which belong to historical approach. Palm reader deals with these palmistry techniques to read the palm and hence predict the future of an individual's health, psychology, intelligence, lifestyle and different related entities.

Medical palmistry is one branch of palmistry in the field of advanced science and technology. It observes the nails and palms. The palm can vary due to ageing and diseases. According to the principles of medical palmistry, there are symbols like island, star, square, spot, grille and circle and they indicate diseases. If one or more of them is/are found on specific region of palm, or on specific line of palm, it indicates probability of disease of respective organ of body. In

addition to these symbols there are some symbols like triangle, cross, circle which are more related to psychology. The palm traces shows the sign of disease which is very useful in the healthcare domain for identification of some diseases. Apart from symbols, color and texture of palm, color of nail also plays an important role in making decision. The color of nails is observed by many doctors to get assistance in disease identification.

In traditional/Ancient approach, the medical practitioners diagnose diseases carefully by observing nails and palms with naked eyes but they require more time and the results are less accurate due to limitation of human eye. Also the pathological tests involving blood samples, urine samples, etc. can take more than 24 hours by the examiner to establish name of the disease leading to physical and psychological sufferings and also requires the patient to be present for test. To overcome these problems, Automated Disease Prediction System is designed to give more accurate results in less time. It predicts or identifies disease with the help of digital image processing and analysis techniques. The system is developed using MATLAB tool. By using the knowledge base of medical palmistry, it analyzes certain features in the image and predicts probable disease.

In the proposed system, the algorithm is designed in such a way that segments the nail and palm regions from dorsal and palmar sides of input digital hand image. ADPS is based on extracting colors, textures, shape from segmented nail image and symbols, color, shape and texture from segmented palm image. On the basis of 7 parameters, ADPS will predict the diseases and health condition of human being. To increase the efficiency of whole ADPS, neural networks are used. It helps in identification of disease in advance without human intervention. It provides results with proper cautionary steps and remedy. Hence it saves cost and time of the user by reducing health risk and treatment cost. ADPS only requires hand image as input and does not requires the presence of patient. It will be beneficial in number of manner than the methods used today.

## II. RELATED WORK

In this paper, an Automated Medical Palmistry System (AMPS) is an application of digital image processing and analysis technique which can be useful in healthcare domain

to predict diseases and various health conditions for human being. By applying digital image processing techniques on input images, certain features in the images are identified. The knowledge base of medical palmistry is used to analyze certain features in images and predict probable disease. The accuracy is obtained using Neural Network Algorithm [1]. In this paper, DDS is based on medical palmistry using the techniques of digital image processing and analysis to identify or predict the disease in healthcare domain. It is developed using MATLAB. Prediction is made on several symbols for palm images and color for nail images. Using algorithm the computer system is able to predict some specific diseases which can be identified by observing nails and palm [2].

In this paper, a new scheme is proposed in the chiromlogy scheme of digital image processing and analysis technique of the human palm with the help of MPHJ technique. The diseases in human are analyzed with their palm through the application of digital image processing which is very useful in the domain of health care. The processing of input image is under the basis of medical palmistry. With the help of medical palmistry knowledge, the input image is processed and certain features in image are analyzed to predict probable disease [3].

In this paper, an Automated Medical Support System for detecting human health conditions is proposed based on Noval Bicluster method for nail. The dataset containing patients nail images is trained on well known classifiers like Decision tree, Neural Network and Support Vector Machine. For disease detection, some features of the nail are extracted. Color feature is extracted with the help of averaging color algorithm and the texture feature is calculated through texture analysis algorithm i.e. GLCM algorithm. Both of these features are given as input to the Neural network algorithm which results in 88% accuracy in prediction [4].

This paper explains a prototype based on digital image processing and analysis in the field of healthcare. It is fully automatic, i.e. there is no human intervention in the process of palm color analysis with the help of Digital Image Processing techniques. It gives results which are easy to understand by the user and overcome the limitations of human eye for color identification. It gives better assistance in decision making activity by medical practitioners [5].

The below TABLE I shows the Literature survey of the existing papers. All these papers have different parameters to predict health condition of human being. The input to the system will be hand image where as in other papers separate palm and nail images are considered. Hence we are going to propose a system which consider the combination of all parameters such as palm symbols, palm color, palm texture, nail color, nail texture, nail shape with palm shape as an additional parameter to increase the accuracy.

TABLE I. Survey Table

Paper Title	Input Image	Technique	Feature Extracted
An Automated Medical Support System based on Medical Palmistry and Nail Color Analysis	Palm and Nail	Automated Medical Palmistry System (AMPS)	Palm Symbols, Palm Texture, Palm Color, Nail color
Automated Prediction System For Various Health Conditions By Analysing Human Palm And Nails Using Image Matching Techniques	Palm and Nail	Disease Detection System (DDS)	Palm Symbols, Nail Color
Chiromancy in the field of Medical Science based Human health care using Digital Image Processing	Palm	Medical Palmistry in Human Health (MPHH)	Palm Symbols
An Automated Medical Support System for detecting human health conditions based on Noval Bicluster Method	Nail	Noval Bicluster Method	Nail Color, Nail Shape, Nail Texture
A System For Palm Color Analysis In Healthcare	Palm	Digital Image Processing	Palm Color

TABLE II. LIST OF SYMBOLS OF HUMAN PALM [2]

Symbols	Prediction
Chain	Lack of concentration, fluctuating alternation
Spot	Bright red spot on the line of head indicates a shock or injury from some blow or fall
Feathery line	Anxiety and worry
Island	On the of heart line indicates inherited heart disease, headache, dissipation of energy
Fish	Sinusitis type of problem, incident of drowning
Star	On the moon of mount indicates probability of ascites or urinal disease, injury on head, sudden death, poisoning
Broken lines	Injury on head, disappointment and rejection
Dot	Acute illness or accident
Tassel	Weakening of mental clarity, deteriorating heart condition
Grille	On the mount of venus indicates probability of problems with reproductive system

TABLE III. LIST OF NAIL COLORS [3] [4]

Color	Prediction
White	Jaundice, Liver trouble such as Cirrhosis, Anemia, Protein deficiency, Chemotherapy, Renal failure, diabetes mellitus, Hereditary (rare)
Yellow	Lung disease, Diabetes Orpsoriasis, Thyroid disease, Respiratory disorders, Lymphatic system problem, Liver problem
Blue	Heart problems such as Myocardial infarction, Hypotension, shock, Hypocalcaemia, Severe infection, Emphysema, High level of abnormal form of hemoglobin in the circulation
Pale	Anemia, Congestive heart failure, Liver disease, Malnutrition
Half White	Liver disease
Half Pink	Liver disease
Black	Anemia, Bacterial infection, Liver disease
Gray	Arthritis problems, Malnutrition, Lung problems
Purple	Oxygen deprivation, Circulatory problems, Congenital problems
Red	Brain haemorrhage, Heart disease, High blood pressure, Malnutrition, Angioma, Systemic lupus erythematosus
Dark Red	Polycythemia
Cherry Red	Carbon monoxide
Darkening of nails	Kidney disease
Dull nails	Vitamin deficiency

TABLE IV. LIST OF NAIL TEXTURE AND SHAPE [4]

Nail type	Possible Diseases
Nail pitting	Psoriasis, Alopecia areata Eczema, Lichen planus
Clubbing	Lung diseases such as emphysema
Thin and brittle nail	Metabolic bone disease, Thyroid disorder
Nail beading	Diabetes mellitus, Thyroid disorder
Ridge nail	Iron deficiency, protein deficiency
Beau's lines	Significant illness

### III. PROPOSED SYSTEM

In traditional approach, medical practitioners observe nails and palm to get assistance in diagnosis of diseases because different color and texture of palm and nail indicates different diseases. But due to limitation of human eye, it takes more time and the results are less accurate. Computer vision determines without any subjectivity. Hence the proposed system i.e. ADPS assists doctors in identifying human health condition.

The ADPS requires digital, high resolution and precision images for minute observation. The hand image is given as input to the system using High Definition camera. ADPS segments the palm region from palmar side and nails from dorsal side of hand image. Once the segmentation process is completed, the system applies different algorithms separately for processing palm and nail images as shown in Fig.1 & 2.

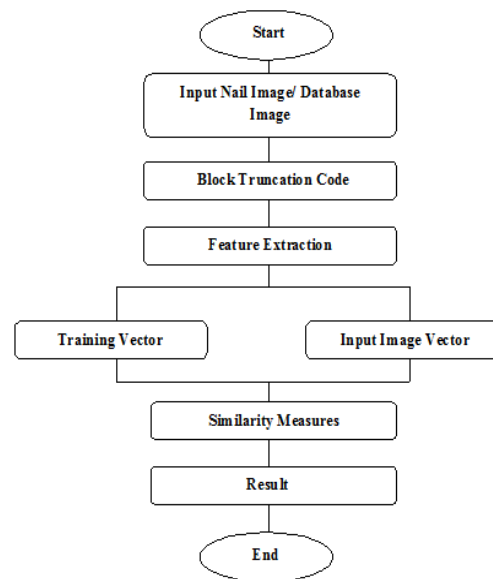


Fig. 1. Steps to process Nail image.

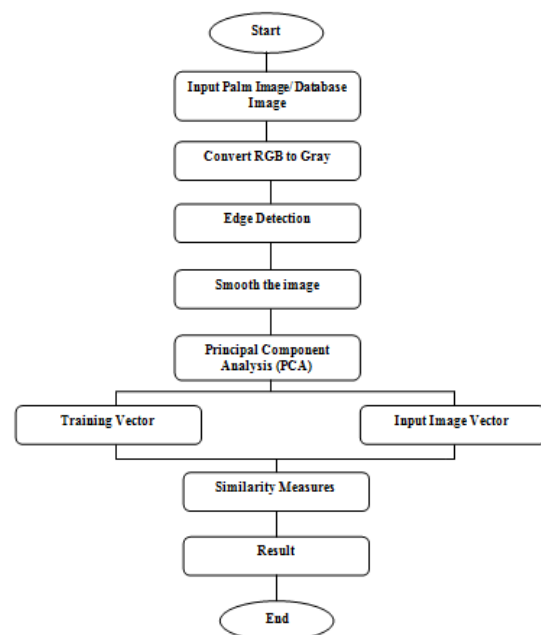


Fig. 2. Steps to process Palm image.

The nail regions are extracted from dorsal side using Entropy based segmentation. The segmented nail image is applied with block truncation coding. The features extracted from nail image are color, texture and shape. The color is extracted by calculating Mean, Standard Deviation and Skewness. The texture and shape are extracted by calculating Gray Level Directional Matrix. The palm region is segmented from palmar side. The features extracted are symbols, color, texture and shape. Principle Component Analysis (PCA) is used for vector generation of palm image.

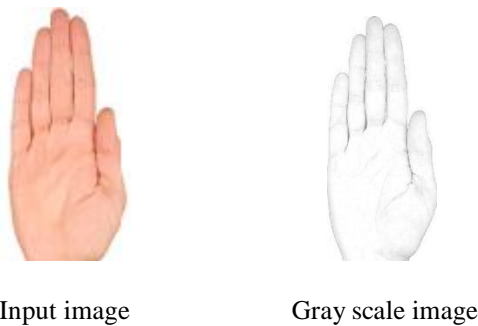


Fig. 3. RGB to Gray conversion



Fig. 4. Edge Detection of Palm Image

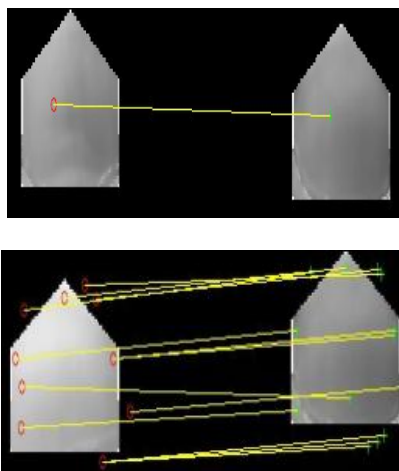


Fig. 5. Similarity Measures of Nail Image

The classification of features extracted is provided by neural network. Neural network algorithm has neural learning methodology which has desired to provide rules from learn weight. It is used for accuracy purpose and helps for unknown pattern.

Knowledge database will be collected from doctors and other useful websites. First we are collected all the affected samples of palm and nail. The generated vectors of input image and database image are compared using similarity measures. The result is generated based on similarity measures and the diseases are predicted.

#### IV. CONCLUSION

This paper presents an Automated Disease Prediction System to predict probable diseases. ADPS allows user to identify disease by taking user's hand image as input. Then, the system applies digital image processing and analysis techniques developed by using MATLAB tool. It uses the knowledge base of medical palmistry on input image to identify seven different parameters like palm symbols, palm texture, palm color, palm shape, nail color, nail texture, and nail shape to predict diseases. The accuracy of the ADPS system is obtained through neural networks. It is useful for doctors in decision making activity. It indicates disease in advance. The system is reliable and user friendly as the results are easy to understand by the users, satisfactory result is provided and convenient acquiring process is offered. The scope of ADPS can be further extended by increasing the number of image samples, symbols, colors, shapes and textures. It can also be used for the purpose of biometrics. It can outspread to embrace numerology and graphology methods for prediction.

#### REFERENCES

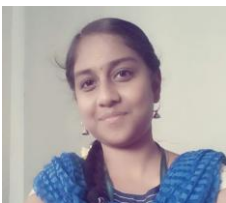
- [1] Shubhangi Meshram, Anuradha Thakare, Santwana Gudadhe, "An Automated Medical Support System based on Medical Palmistry and Nail Color Analysis", International Journal Of Engineering And Computer Science, Volume 5, Issue 6, June 2016, ISSN: 2319-7242, pp.17006-17009.
- [2] Nityash Bajpai, Rohit Alawadhi, Anuradha Thakare, Swati Avhad, Sneha Gandhat, "Automated Prediction System For Various Health Conditions By Analysing Human Palms And Nails Using Image Matching Technique", International Journal of Scientific & Engineering Research, Volume 6, Issue 10, October 2015, ISSN: 2229-5518, pp.609-613.
- [3] G.Chitra, "Chiromancy in the field of Medicinal science based Human health care using Digital Image Processing", International Journal for Research in Applied Science & Engineering Technology, Volume 4, Issue 2, February 2016, ISSN: 2321-9653, pp.21-26.
- [4] Anuradha Thakare, Shubangi Mashram, H.M. Baradkar, "An Automated Medical Support System for detecting human health conditions based on Noval Bicluster Method", IJCTA, Volume 10, Issue 8, 2017, ISSN: 0974-5572, pp. 223-228.
- [5] Dr. Hardik B. Pandit, Prof. Dipti Shah, "A system for palm color analysis in healthcare", International Journal of Advanced Engineering Technology, Volume 5, Issue 1, January-March 2014, E-ISSN: 0976-3945, pp. 30-32.
- [6] Hardik Pandit, Dr. D M Shah, "Application of Digital Image Processing and Analysis in Healthcare Based on Medical Palmistry", International Conference on Intelligent Systems and Data Processing, 2011, pp. 56-59.
- [7] Sneha Gandhat, A.D. Thakare, Swati Avhad, Nityash Bajpai, Rohit Alawadhi, "Study and Analysis of Nail Images of Patients", International Journal of Computer Applications, Volume 143, Issue 13, June 2016, ISSN: 0975-8887, pp. 38-41.
- [8] Vipra Sharma, Manoj Ramaiya, "Nail Color and Texture Analysis for Disease Detection", International Journal of Bio-Science and Bio-Technology, Volume 7, Issue 5, 2015, ISSN: 2233-7849, pp. 351-358.
- [9] Vipra Sharma, Aparajit Shrivastava, "System for Disease detection by analyzing finger nails Color and Texture", International Journal of Advanced Engineering Research and Science, Volume 2, Issue 10, October 2015, ISSN: 2349-6495.
- [10] Zainab Othman, Sarmad Saleem, "Diseases Diagnosis Using Medical Palmistry Fuzzy Model", MATEC Web of Conferences 76, 2016.

**P.Sreeladha**

The author holds a Masters degree in embedded systems and perusing research in the field of medical image processing. The author has 20 years of electronics industrial experience in textile equipment design and manufacturing. She has teaching experience of eight years and has publications in the field of embedded systems, medical image analysis. The author has a membership in IETE

**Minisha.M**

The author pursuing bachelor degree in the domain of Electronics and Communication Engineering. The author done a mini project titled as “distilled water level indication using battery” in fourth semester. Recently worked on project titled as “Application of Digital Image Processing in Healthcare analysis based on hand image”. The author has a membership in IETE.

**Mohana priya.V.M**

The author pursuing a bachelor’s degree in the field of Electronics and Communication Engineering. The author done a mini project titled as “Two in One Alarm” in third semester. Recently working on a project titled as “Application of Digital Image Processing in Healthcare analysis based on hand image”. The author has a membership in IETE

**Jenifer.S**

The author pursuing bachelor degree in the domain of Electronics and Communication Engineering. The author done a mini project “water level indicator” in third semester. Recently worked on a project titled as “Application of Digital Image Processing in Healthcare analysis based on hand image”. The author has a membership in IETE.

**Muthumani. P**

The author pursuing bachelor degree in the domain of Electronics and Communication Engineering. Recently worked on a project titled as “Application of Digital Image Processing in Healthcare analysis based on hand image”. The author has a membership in IETE.