

# Automated Medical Palmistry System based on Image Processing Techniques

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**Abstract:** *An application of digital image processing and analysis techniques has been discussed, that can be useful in healthcare domain to predict some major diseases for human being. The application is an image processing system, which works based on medical palmistry. The images of human palm form input to the system. Then, system applies digital image processing and analysis techniques on input images to identify certain features in the image. By using knowledge base of medical palmistry, it analyzes certain features in image and predicts probable disease. Palmistry is a science which observes human palm by different aspects and derives conclusions about nature of the person. By observing nails and palm to indicate specific diseases, based on their position on lines, mounts and fingers describes an Automated Medical Palmistry System (AMPS). This can be useful in healthcare domain to predict diseases for human being.*

**Keywords:** Palm Reader; Medical Palmistry; Automated Medical Palmistry System (AMPS); Image Processing and Analysis (IPAA); Palm Colour Detection

## 1. Introduction

Palmistry is in itself a complete science which can forecast the future of an individual authentically. Medical palmistry is one branch of palmistry, which works on identification of probable diseases by observing nails and palm to indicate specific diseases, based on their position on lines, mounts and fingers. According to principles of medical palmistry, there are some symbols like Iceland, cross, star, square, grill, spot, and circle. 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<sup>1, 2</sup>.

Apart from symbols, color and surface of palm and nails, shape of palm and fingers also plays important role in decision making. The color of palm and nail is observed carefully by many doctors to get assistance in disease identification. It is possible to observe color of palm and nail by naked eyes, but it may become subjective. Computer vision helps us to determine this color without any subjectivity<sup>3</sup>.

This paper presents an approach towards diagnosis of diseases based on Medical Palmistry. AMPS increases accuracy of such observations of palm and nails. AMPS apply digital image processing techniques on input palm images to identify certain features in the image using MATLAB. By using knowledge base of medical palmistry it analyzes certain features in image and predicts probable diseases and provides preventive measures for the same. The rest of the paper is organized as – Section 2, covers the Review of Existing Systems which gives the overview of the existing systems used for medical palmistry. Section 3, presents the Symbols in Human Palm That Indicate Certain Diseases. Section 4 gives the Automated Medical Palmistry System which covers the idea and objectives of proposed system. Section 5, is about the Design and Implementation, it explains the design and module wise implementation of AMPS. Section 6, describes the Evaluation and Results. This

section also explains the constraints of the AMPS. The paper ends with conclusion and the future scope.

### 1.1 Existing Approaches

#### a) Traditional Approach

Since ancient time, in many civilizations like Indian, Chinese, Persian, Egyptian, Roman and Greek, people used to get guidance about their present and future by means of Palmistry. “Palm Reader”, who is a human being used to predict attributes of human, like: health, psychology, intelligence, and lifestyle and other related entities based on his/her knowledge<sup>4</sup>.

#### b) Web based Approach

Various web applications are being developed for palmistry. In some web applications, “Palm Reader” is required. Here it is possible that image may be degraded during file transfer. Also human perception has limitation in image resolution, object identification and color perception<sup>4</sup>.

#### c) Mobile Application Based Approach

In case of Mobile Application based applications, sample images of palm are shown and users have to compare their own palm with the most suitable sample image. Predictions are displayed based on the selection of image by user. It is user’s responsibility to identify the nearest matching image. It is difficult for user to compare the given image with his/her own palm, because every person has different set of symbols and lines on palm. If user selects wrong image, then he/she may get wrong prediction, which may be not suitable to him/her Using Image Processing and Analysis (IPAA) techniques, a system can be developed to overcome these limitation, and predict the disease/s based on medical palmistry automatically<sup>5</sup>.

## 2. Related Works

### Palm print Indexing Based on Ridge Features

Palmar skin of human is covered with two unique patterns, namely, the palmar friction ridges and the palmar flexion creases. These two types of patterns are claimed to be permanent and unique to an individual, indicating the value of palmprints for personal identification. Palmprints have a much larger valid area and contain much more minutiae than fingerprints, indicating that palmprints are more distinctive than fingerprints. In addition, more than 30% of the prints obtained from crime scenes are from palms. Developing a national palmprint identification system has become a main objective of the FBI's Next Generation Identification (NGI) program. Early palmprint recognition systems for civilian applications were developed mostly based on low-resolution (about 100 ppi) images. These palmprints are generally captured with contactless devices and some of them use pegs to fix the position of hands for pre-aligning different palms. In these systems recognition is mainly based on comparing crease features [1].

### Chiromancy in the field of Medicinal science based Human health care using Digital Image Processing

Medical palmistry is one branch of Palmistry in the field of advanced science and technology. It observes the nails and palms that has lines and mounts. According to the medical palmistry principles there are some symbols like Iceland, cross, star, square, grill, spot and circle. Every specific region in the hand explicitly defines the organ of our body. Palm characteristics indulge in color, fingers, nail, and surface of palm. Many doctors carefully observe the palm and nail color with naked eyes and judge his disease as assistance. A computer vision determines the color without any subjectivity. Medical Palmistry in Human Health MPH diagnose the disease in accurate way. Certain features of the image are identified by MATLAB. The image features are analysed using palmistry knowledge and probable diseases is predicted and provides remedy [2].

### Palm Vein Technology Security

Palm vein ID authentication, which uses an infrared sensor to capture the user's vein pattern unique to every individual's palm for an exquisitely sensitive biometric authentication technique. The palm vein scanner has no deleterious effect on the body, nor does it require that the device be touched, unlike current fingerprint scanners, other limitations of various other technologies are related to measuring external features. On the contrary, palm vein recognition seems not to be affected by aging; neither cuts, scars, tattoos, nor skin color affect the scan's outcome; and, given that veins are internal, they can hardly be tampered with. As we increasingly rely on computers and other machines in our daily lives, ensuring the security of personal information and assets becomes more of a challenge. To help deal with this growing problem, Fujitsu has developed a unique biometric security technology that puts access in the palm of your hand and no one else's. In all these applications, the key to securing your assets and data will be in the palm of your hand. The new technology has many potential applications such as an ultra-secure system for ATMs and banking transactions, server log in system, an authorization system for front doors, schools, hospital wards, storage areas, and

high security areas in airports, and even facilitating library lending, doing away with the ageold library card system [3].

### Biometric Palmprint Recognition System

Biometric modality that could work well even with a commodity camera is palmprint. It has coarse lines which can be easily detected using a low-resolution camera and it is easy to present due to the free mobility of our palm. On most surveys, hand as a biometric modality rates high on user acceptance. It is very easy and convenient to integrate palmprint into an already existing Biometric Recognition System since it does not need a dedicated capture device. Because of the presence of coarse distinguishing lines, it is possible to capture palm lines even at a low resolution, using a digital camera. All this combined with a moderate recognition accuracy on large datasets makes palmprint the ideal choice as an add-on in a multi biometric system. All the factors defined above make palmprint a very useful biometric [4].

## 3. Symbols in Human Palm that indicate Certain Diseases

Fig.1 shows the list of Symbols on human palm which indicate specific diseases, based on their position on lines, mounts and finger's Island 1 - 3.

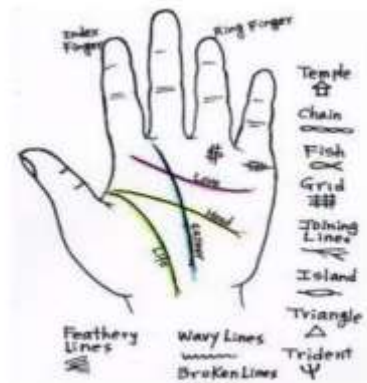


Fig. 1 List of symbols on Human Palm

Table 1 lists the symbols in human palm and describes prediction of diseases for the given symbol.

Table 1: Symbols in Human Palm & Prediction

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
Triangle	Creative, success in scientific research
Featherly line	Anxiety and worry
Square	Detection or incarceration
Island	Inherited heart disease, headache, dissipation of energy
Fish	Sunstroke type of problem, incident of drowning
Star	Injury on head, sudden death, poisoning at age specified
Grid	Being stuck or stifled
Broken lines	Disappointment and rejection, injury to head
Dot	Acute illness or accident
Tassel	Weakening of mental clarity, deteriorating heart condition
Transverse line	Obstacles and failures in one's career
Grille	On the mount of venus indicates probability of problems with reproductive system
Star	Star on the mount of moon indicates probability of ascites, or urinal diseases.

In additions to these symbols/marks there are some other patterns like cross, circle, etc. They are more related to

nature and psychology of a person rather than physical characteristics.

#### 4. Automated Medical Palmistry System

Based on the limitations mentioned in the review of existing system. AMPS propose a new system with following improvements: 1. No palm - reader required:

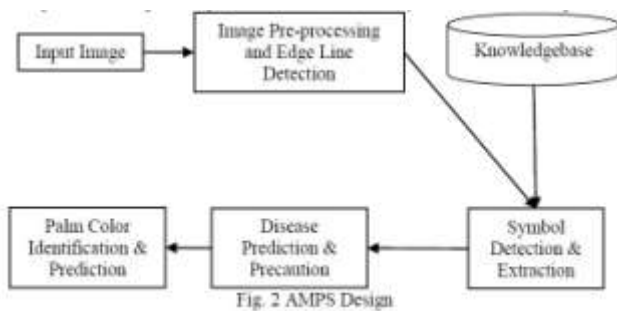
All the predictions based on palm image are done by the system only, so there is no need of sending image to a palm reader and hence the probability of image distortion is reduced.

2. Comparison of palm with sample image is eliminated:

The proposed system takes image of a palm as input and gives prediction as output. Since the system processes the image and extracts features accurately, it reduces the probability of wrong prediction and provides optimal solution. Automated Medical Palmistry System allows users to diagnose the diseases in human body by taking image of users palm as input. Then, system applies digital image processing and analysis techniques on input images to identify certain features in the image. By using knowledge base of medical palmistry it analyzes certain features in image and predicts probable disease. Thus, user can rely on predictions done by the system.

#### 5. Design and Implementation

The main function of the AMPS is to take as an input, the image of human palm, process it and as an output, predict diseases, using knowledge of medical palmistry. The architecture of the system is shown in Fig.2.



##### a) Input Image

The image of palm is captured by the camera/web - cam with 300dpi resolution in .jpg format and is provided as input to AMPS. Fig.3, shows the sample input image.



Fig. 3 Input Image

##### b) Image Pre - processing and Edge, Line Detection

The input image is pre - processed by applying enhancement techniques like contrast intensification, noise leaning. The Region of Interest (ROI) is determined and lines and edges within the ROI is extracted. The image obtained is saved for further functioning. Following steps are charted during Image Pre - processing and edge, line detection 7 - 9:

- Palm Area marking is done based on gray image segmentation.
- Then, Gray Image Distribution from a fixed rectangle area is taken.
- After that, Gaussian distribution is applied to mark the whole area with  $5 \cdot \sigma$ .
- Segmented palm image is then enhanced with edge distance based Distance Image algorithm.
- Next, Hessian based Frangi filter is applied for enhancing and detecting lines, this filter will enhance and detect the vessel - like objects, to increase processing speed, a box filter is applied from SURF algorithm to replace Hessian matrix. Fig.4, shows the output after preprocessing and edge, line detection.

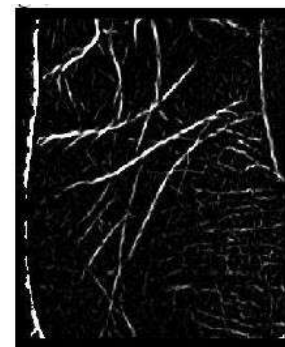


Figure 4: Output after Pre - Processing and Edge, Line Detection.

##### c) Symbol Detection and Extraction

The output image obtained at step 2 is further used to detect and extract symbols form it. The symbols are detected using template matching as follows:

- Function corrMatching is used which performs Template Matching using Correlation Coefficients
- corrMatching takes following Inputs:
  - “frameImg” stores gray or color frame image,
  - “templateImg” stores gray or color template image, and
  - “thresh” stores threshold to decide the region rejection or detection, thresh = 0.5 is the default value.

E.g. if the region has  $\square \text{corrCoef} > \text{thresh}$ , then the corrMatching accepts it as detection, Otherwise rejects it as a false alarm.

- corrMatching gives following Output:
  - “corrScore” is a 2D matrix of correlation coefficients and
  - “bounding box: is given as [upperLeftPixel.y upperLeftPixel. x height width] Fig.5, shows the output after Symbol Detection and extraction stage

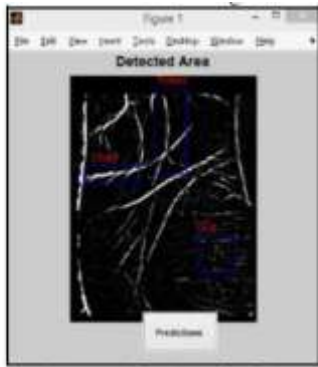


Fig. 5: Output after Symbol Detection

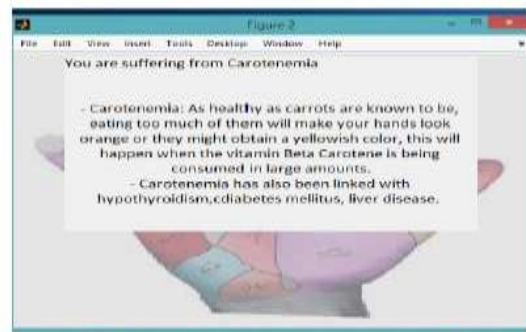


Fig. 7. Output of Palm Color Detection & Prediction

**d) Disease Prediction and Precautions**

Based on symbols detected, disease prediction is done. Also, precautionary measure for the same is provided. In this stage each symbol is assigned to a Boolean variable (i. e. flag value is set to 1 if symbol is detected). If the value is found to be 1, its corresponding prediction and precautionary measures are displayed in a text box. If other symbols are also detected, then its prediction and precaution is concatenated with the previous result3 - 6, 8 - 11. Fig.6, shows the Output of Disease Prediction & Precautions stage respectively.

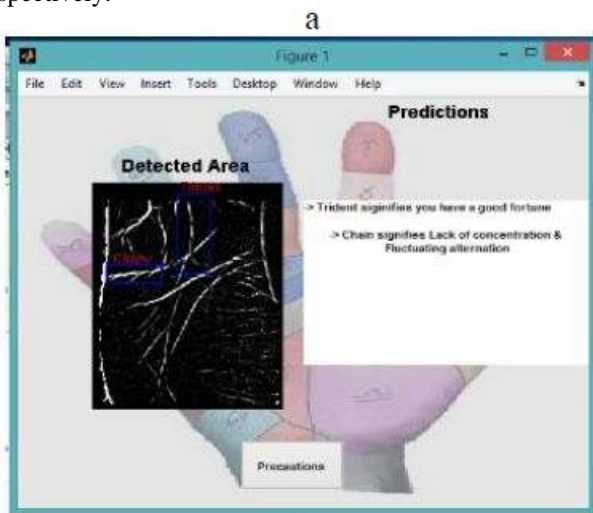


Figure 6 (a): Output of Disease Prediction

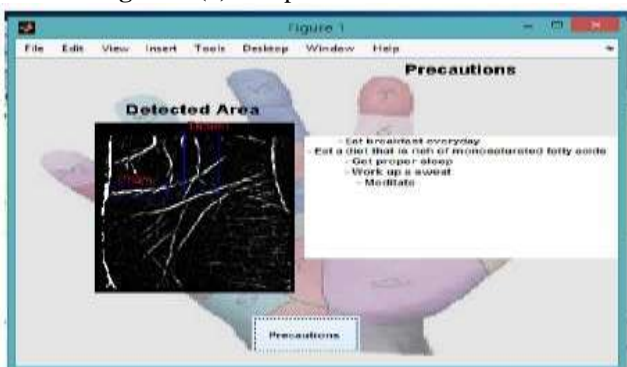


Figure 6 (b): Output of Disease Precautions

**e) Palm color identification and prediction**

In this step, RGB image of palm is taken as input and is processed to identify the color of palm. Based on the no of red pixels in the image, prediction is made on the health of a person. Fig.7, shows the Output of Palm Color Detection & Prediction.

**6. Evaluation and Results**

**a) Benefits of AMPS**

- 1) AMPS can be very useful to human being to get indication of disease in advance.
- 2) It can save cost of treatment as well as physical and psychological suffering of the person.
- 3) Doctors can use this model to have assistance in disease identification.

**b) Results**

Out of ten test images, the system predicted for 8 correctly. In the other two it made a cumulative of 6 mistakes. Thus in a test bed of approximately 100 images of different people, it predicted for 94 out of 100 images correctly thus producing an accuracy of about 94%. Thus, it can be projected that, given a leeway of 1%, the system will deliver a 95% accuracy. The secondary aspect of the system, which is the speed, was also statistically studied. The system predicted an output for 20 images in about 300 seconds. This translates to roughly 15 seconds per image which is around the well accepted median of 15 seconds per image which most commercial software adhere to.

**7. Conclusion**

This paper proposes a new approach in the field of Medical Palmistry with the help of Digital image processing and analysis technique. AMPS allow users to diagnose the diseases in human body by taking image of users palm as input. Then, system applies digital image processing and analysis techniques and uses knowledge base of medical palmistry on input images to identify certain features in the image. In this paper, prediction is made on several symbols (see Table 1) for 100 palm images. The experimental results demonstrate that AMPS is reliable if the images represent a distinct view of the palm and are of 300dpi resolution or more. Scope of AMPS can be further extended by trying out AMPS for images of different type of people, increasing the number of symbols to be detected and show the future of an individual along with medical prediction. Also AMPS can outspread to embrace numerology and graphology methods for prediction.

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