A Study on PalmistryAnalysis using Deep Learning

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Abstract— Palmistry is an artifice of interpreting a person's characteristics and predicting their future by examining the palm of their hand. It is believed by most people and used all over the world. It uses palm lines, shapes, patterns, mounts, and fingertip position as the features for interpretation. It has been used since ancient times. It is also called Chiromancy, Chirology, and Palm Reading. Even though the technology evolved and is being used in all other fields, Palmistry is a field where it is lagging behind and not yet fully implemented. Most of the research concentrates on the size, shape, color, and structure of the palm, very little concentrates on the lines and that too concentrates only on the primary lines. Here we are attempting to create a fully implemented palmistry application with the help of deep learning and image processing algorithms, to use all the features in the palm and palm lines to give complete prediction results.

Keywords— Palmistry, Palm Reading, Deep Learning, Image Processing

I.INTRODUCTION

Since the olden days, palmistry is a popular method used by people for foretelling. Evidence in the stone age shows the interest in palm reading. Palmistry is also called palm reading, chiromancy, palm scrutinizing and chirology is the knowledge of interpretation of the palm for fortune telling. The contradictory interpretations of different palm readers and lack of evidence of palmistry predictions ended up in saying that palmistry is a pseudo-science.

Palmistry is the art of forecasting an individual's future in terms of personality, behavior, career path, and wealth. The professionals who do palm reading are called palmists, chirologists, etc. It is an art practiced in many different places on the Asian and Europe continents. The origin of palmistry is not certain but may have originated in India and spread over the world. It has been mentioned in the cultures of many countries like India, China, Tibet, Nepal, Persia, Babylonia, Sumerian, and Arabia. This field is not technically rich enough.[1]

No two palms are having the same line formation, every person has a unique palm print like a fingerprint. The human palm has certain features in the form of mounts which represent the planets. The power of the corresponding planets for that person is represented by the length of the fingers. Every planet has characteristics that a person who is under the influence of that planet inherits. Additionally, the length and width of the palm and finger reveal the traits and nature of a person. These features reveal a person's personality.[2]

The lines and patterns on a person's palm may be used to infer information about their personality, health, money, family, and other aspects of their life. We can also know one's personality type, the profession that best suits, and other hidden skills of the person. Even the color of the palm can be used to tell the personality of a person and health of the person. The color of the palm can be found and can be related to the character of the person.[3]

We make an effort to develop an effective palm reading system using deep learning, image processing, and palmistry knowledge.

II.RELATED WORKS

In [2], used a Ratio Based Approach tofindthe ratio of length and width of the palm for categorizing the palm as square and rectangle palm. After categorizing the palm images, they will be subdivided into four subcategories based on the palm length and finger lengthratio, and positive and negative characteristics were drawn for the given palm.

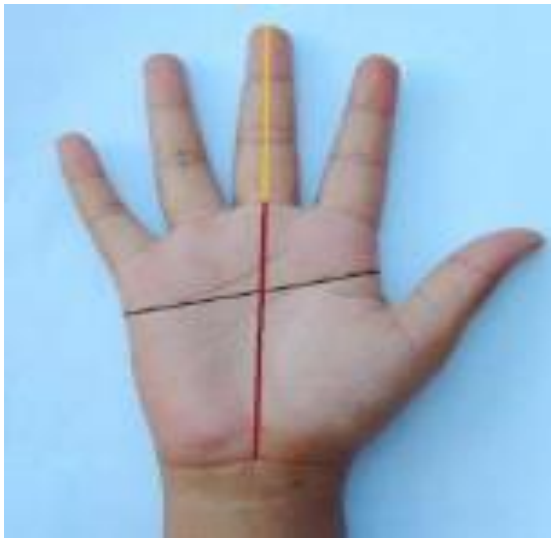

Fig 1. Palm Image showing width-length and finger length [2]

Fig 1 shows In [2], the Finger Length Comparison Based Approach was used, in which the finger is divided into three sections, and length of each section is calculated, and the characteristics of various people based on the planets were computed.
To get these they used Canny Edge Detection and pattern matching for detecting the lines in the palm. Hough-Transformation and pixel distance are used to compute the width and length of the palm, finger length, and their ratios.

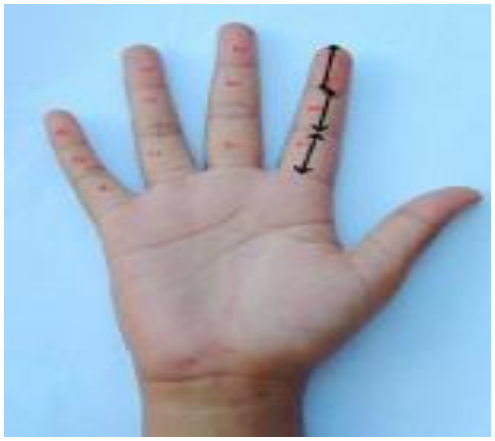

Fig2. Palm Image showing Finger's partition length [2]

Fig 2 shows in [3], Data Collection, Data Capturing, Image Processing, Median Filtering, Statistical Measurement, and Inference tests were implemented. In image processing, they cropped the regions of interest and resized them to a dimension of 50x50 pixels. In Median Filtering, they reduced noise in the image. Statistical analysis and Inference Tests were conducted for the prediction.

In [4], they converted the color image into a grayscale image and discovered the primary lines using Canny Edge Detection, and Extracted the features using Morphological Operation. Hough Transformation was used for measuring the length of the lines. Interpretation of the three primary lines, heart line, head line, and lifeline were done. And using the knowledge of palmistry and provided the results.

In [5], five steps for digital image processing, Image Formation, Image Enhancement, Image Segmentation, Feature Extraction, and Image Description, were used. Image Enhancement was implemented, in order to prevent visual motion and interference, such as blur. Edge sharpening, noise removal, increasing the contrast, etc. were done to improve the quality of the image. A feature extraction algorithm was used to extract the specific pattern from the segmented images. The symbols in the human palm were used to relate it with the prediction of diseases, which acted as the knowledge base to give the result for the respective palm.

In [6], they developed an android application and used Otsu's thresholding technique for adaptive segmentation which is used in collaboration with the flood filling algorithm. The median filter and the gaussian filter were used. They used Border Tracing Algorithm to trace the contour of the palm and enclosed it with Convex Hull with the help of Gift-Wrapping Algorithm. Then some pre-processing to remove the noise and sharpened the image. They extracted

the three principal lines using the Canny Edge Detector Algorithm. The Euclidean Distance Algorithm was then used to determine the length of the lines. Finally, they used some fuzzy logic and fuzzy rules for providing the results. They used SIFT Matching Algorithm for predicting the health status of the person.

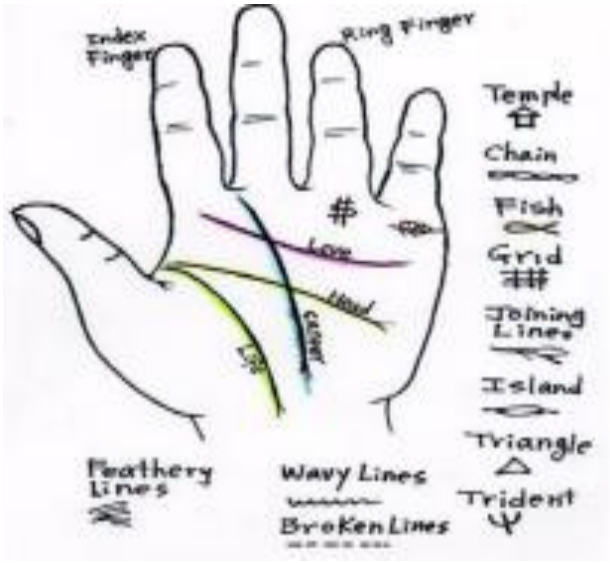

Fig 3. Human Palm Symbol

Fig 3 shows In[7],the color of the palm, the distance between the fingers, and the presence of palm lines were determined and implemented in a Python application utilizing dynamic programming, machine learning, and computer vision, using libraries like OpenCV. They used the Euclidean Distance formula for finding the distance between the fingers. They did pre-process like resizing, rescaling, smoothening, erosion, and segmentation. For the purpose of reducing excess noise in the picture, they applied a bilateral filter. To identify the coordinates that include the fingers and palm, they picked the contour with the largest area. They used K Means Clustering Algorithm for finding the color of the palm and extracted the region of interest. Then used the region of interest and detected the palm lines using Canny Edge Detection Algorithm. To detect the lines, they used Hough Lines Transformation. Used the color of the palm to find the disease they might have in **Fig 4.**

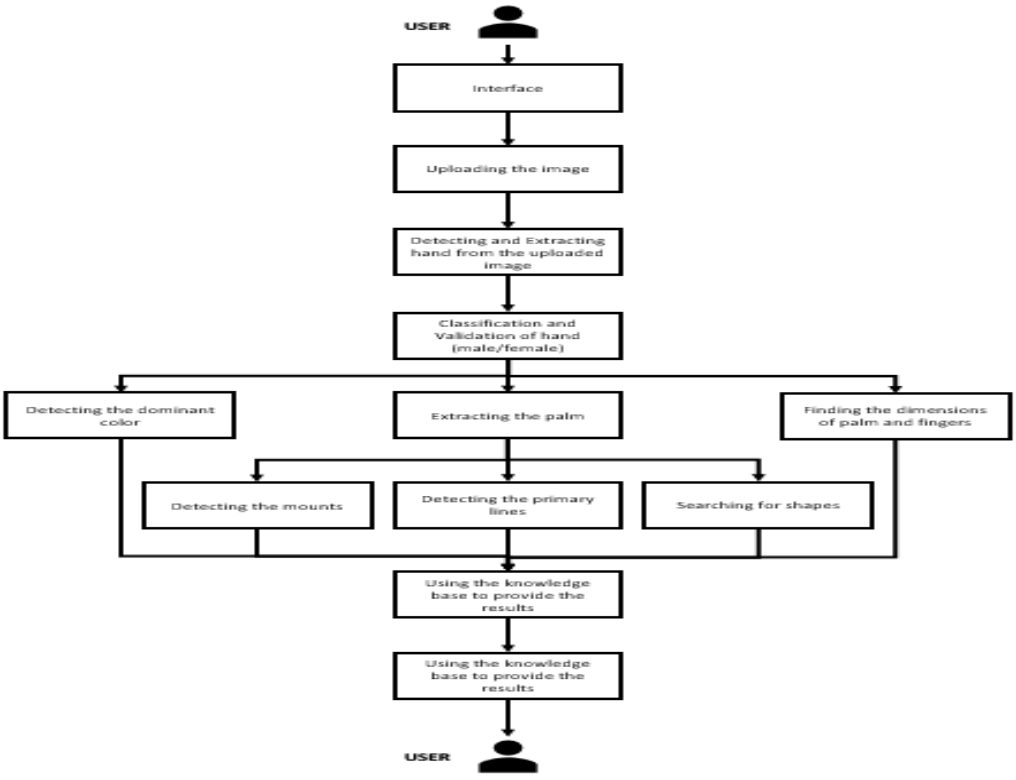

Fig 4. Solution Architecture

Fig 4 shows In [8], they used deep learning approaches like Convolutional Neural Networks. Their approach had three main phases, Semantic Segmentation of Palm Images, Palm Areas with Multiple Grid approach, and Multi-Class Classification. They used Fast Segmentation Convolutional Neural Network for segmentation which has four major steps, Learning to Down-sample, Global Feature Extractor, Feature Fusion, and Classification. They used the Multiple Grid Approach for finding the region of interest in the palm. They used Multi-Class Classification using Deep Learning, where SoftMax Activation Function is used to calculate the class likelihoods and Adam Optimizer for optimization. In this method, they used two frameworks AlexNet and ResNet, in which AlexNet had a training accuracy of 56.06% and a testing accuracy of 33.37%. ResNet had a training accuracy of 88.91% and a testing accuracy of 79.52%, which is considered the best framework for this application.

In [9], they used a deep learning approach in which they suggested a network with a new custom module called Context Fusion Module, which is integrated with the conventional U-Net Architecture. They used the U-Net architecture for the segmentation. They chose ResNet-34 architecture and experimented with ResNeXt-50 as a backbone architecture. They employed Feature Pyramid Network, which combines a top-down channel with lateral connections with a standard network with multiple high spatial resolution features. They used Gaussian Filter for removing the noise. They had given a solution for the image segmentation problem. In this had compared the UNet, FPN, and UNet-CF architecture and UNet had the highest accuracy of 99.442%.

In [10], they used Canny Edge Detector Algorithm for edge detection and K Means Clustering for finding the color of the palm. They used the Euclidean Distance Algorithm for finding the length of the lines. They also did Noise reduction. And Used the Palmistry knowledge base for providing the results. They also created a separate GUI Application using Python Tkinter.

III.PROPOSED METHOD

From the literature survey made and resources collected, here we propose our method for an efficient palm reading process. Our proposed method hasa solution for the end-to-end process from getting the image, detecting and extracting the hand from the image, classifying male and female palm image, then the main process of detecting the color of the palm, dimensions of the hand, and extracting the palm for primary lines, detecting the mounts and symbols in the palm and providing the final result using the knowledge base.

To do all these processes, we researched and experimented with several well-known algorithms and picked the best to build the processing pipeline.

Data Collection

For image acquisition, the user needs to take a quality picture of his hand, provided with an interface to upload the raw image, where the user needs to upload the picture of the palm. The image is sent to the backend (Deep Learning Model) for further processing.

Detecting The Hand and Extracting

The first step in the process is to detect the hand from the image and extract the hand meanwhile leaving out the background from the image.

For detecting the hand in the image, we found the architecture YOLOv7 which performs better than most of the popular object detection algorithms like ResNet, AlexNet, etc.

The YOLOv7 architecture has three main components: Backbone, Head, and Neck. It uses Extended Efficient Layer Aggregation Networks (E-ELAN) which can enhance the feature learned from different feature maps and improve the use of parameters and features.[11]**Fig 5** showsExtended Efficient Layer Aggregation Networks.

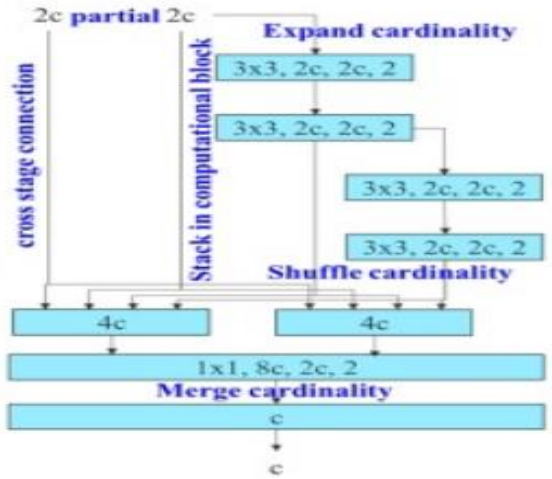

Fig 5. Extended Efficient Layer Aggregation Networks

Classification

After pre-processing and enhancing the image, the next step is to classify the image as the palm of a male or female. Because, in palmistry, we use the right hand of men and the left hand of women, we need to find and verify the image before moving to the next process.

To classify the palm image as male or female palm, we adapt the algorithm called CNN-b which performed well with the best test accuracy score of 90.70% on the CASIA palmprint dataset and correctness of 94.87% on the PolyU palmprint image dataset. [12]

The extracted image of the hand is passed to the CNN-b network and the image is classified as male or female hand, then the acceptance criteria

a. The left hand for female
b. The right hand for male

is used to validate the image and move to the next process.

Pre-Processing And Enhancement

Pre-processing and enhancing is the primary phase for any input image. In the image captured from the real world, there are high probabilities of having some noise like disturbance and blur due to motion and interference. We need to pre-process the image to make our data clean. Enhancement methods like edge sharpening, noise reduction, contrast boosting, etc. are used to raise the image's quality.

The image is resized to a fixed size and converted into a grayscale image. Then the image is smoothened using low-pass filters to remove the noise in the image and the filter signal proportional to a high-pass filtered version of the image is added to the original image to sharpen the edges.

Detecting The Colour

In palmistry, the basic preliminary phase is to give out the results based on the palm's color. The color of the palm is found in the original resized image. To find the color of the palm we use K-Means Clustering, the popular well-known algorithm for finding the dominant color in the image. The image is passed to the K-Means Clustering algorithm and the resultant color with the highest percentage is taken as the predominant color of the palm. This color is compared with the knowledge base and the closest color in the knowledge base is used to give the result.**Fig 6** shows i) Original palm ii) Cluster obtained through K-Means Clustering

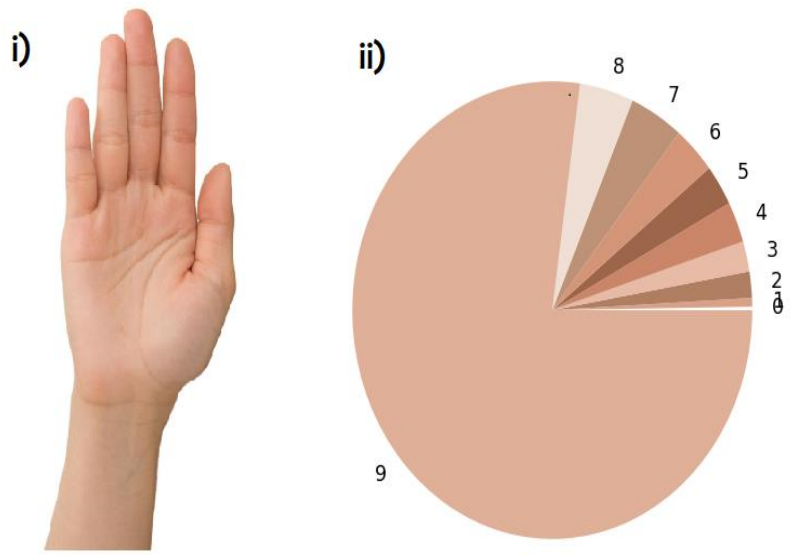

Fig 6.i) Original palm ii) Cluster obtained through K-Means Clustering

Extracting The Palm

To continue with the process, we need the palm to be extracted from the hand image. To extract the image from the palm we use the Dynamic Programming algorithm. The largest square having the dominant color is extracted using dynamic programming techniques, by tweaking the Maximal Square algorithm to work with the colors. **Fig 7** shows Palm extracted using Dynamic Programming

Fig 7. Palm extracted using Dynamic Programming

Detecting The Primary Lines

The main phase in the process is to find the primary lines in the palm which are mainly used for giving the results. Canny Edge Detector Algorithm is a well-known algorithm for the process of edge detection. It can be used to detect the primary lines in the palm.

The palm image is blurred and mean(u) and standard deviation(s) are calculated. Then low and high threshold for the Canny Edge Detection is calculated using the formula **Low = u – s, High = u + s**. Then the lines can be extracted using the Hough Transform Algorithm.

Detecting The Mounts

One of the important phases in palmistry is using the mounts in the palm, where each mount is linked with the planets. Detecting the mounts in the palm is a challenging phase. The image can be segmented into grids and each is used to find the presence of the mount. The grid can't perfectly separate the mounts in the palm all the time. So, it is a challenging phase, which needsto be worked on.

Detecting The Symbols

The symbols in the palm and fingers are special features in palmistry. The presence of certain symbols in the palm has a specific meaning where some are lucky symbols and some are not. The symbols in the palm can be found using the object detection techniques.**Fig 8** shows Symbols in the palm [13-14]

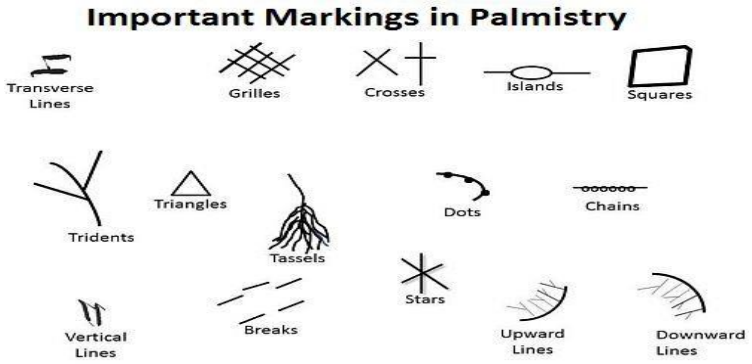

Fig 8. Symbols in the palm

Finding The Dimensions Of The Hand

To find the dimensions of the palm and the fingers like finger length, palm length, palm width, distance between fingers, etc. we can use the general Euclidean Distance Algorithm. The hand can be segmented into palms and fingers then the dimension can be found by applying the Euclidean Distance Formula.

Implementing The Knowledge Base

Finally, the knowledge base created using the knowledge of palmistry will be used to provide the final cumulative prediction results to the user.

IV.CHALLENGES INVOLVED

The major challenges faced in this problem involve, image collection and processing. All the images we collect will not be ready for training the model, the images should want to meet certain parameters like clear image, the right

position of palm, brightness of the image, clear background, etc. In Deep learning, we have challenges like computational cost, processor capacity, time, etc.

V.CONCLUSION AND FUTURE DIRECTIONS

From the various observations, palmistry was implemented using algorithms like Canny Edge Detection for Edge Detection, Hough Transformation for finding the lines, and K Means Clustering to find the color of the palm. Euclidean Distance for finding the length of the lines resulted in a more accurate prediction. On automating the palm reading process, there is no need for a human to interpret the palm lines. Much time will be saved as the algorithm takes less time compared to humans for predicting the results. This implementation can also be used in medical applications for predicting diseases using the color of the palm and based on various analysis results. This will be cost-beneficial for treatment and will be helpful for the doctors for disease identification. Though having various advantages in the medical field may face many challenges in providing accurate results. All the image processing challenges, poor image quality, occlusion conditions, and lighting conditions may affect the prediction accuracy. All these factors affecting efficiency must be considered for obtaining a proficient solution.

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