Smudged Palm Prints; Identity Left over Documents in Latent Form
Amit Chauhan1 Dr. Jyoti Singh2 Dr. K. P. Singh Kushwaha3
1Research Scholar 2Assistant Professor 3Assistant Professor
1,2 Amity Institute of Forensic Science, Amity University; Sec-125, Noida (U.P.), India
3National Institute of Forensic Science & Criminology, Rohini; Sec-3, Delhi, India

Abstract— Evidential value of Palm prints is obvious which a challenging task that is recovered; is in latent form, partial or smudged form from the crime scene. The current standard in forensic application of identification from such type of prints is minutiae based recognition moreover rigorous quantification of evidential value faces a vital role that is essential in modern forensic science. A Palm print not only carries unique illumination about a suspect but also has far more details in terms of identification. In the present study, identification of suspects was done successfully on the basis of smudged palm prints present on documents which ever are questionable for identity.

Key words: Latent prints, minutiae, identification, suspect, evidential value

I. INTRODUCTION
Before any type of scientific criminal identification, impartial justice community used substantial visible methods to stationed identity of suspects which involves tattoos or any scarification of criminals. But with the passage of time, these were replaced by the characteristics which are unique, perpetual for personal identification and accepted world wide due to their reliability. Fingerprints that understood very reliable unique, perpetual and remain unchanged since birth to the end of life take place in phase of identification but for face of authentication, people still have to work with problem of pose and information in variance where as smudged prints which are ever in problem for the correct identification of suspect. Smudged prints, which becomes because of the prints over-lapping that destroy the ridge details or relative illumination and remain questionable. Smudging of prints may be present in any form such as visible, partial, or in latent form that is needed treatment of intensification to visualize the prints.

In the present study, the identification of suspect was done on the basis of latent palm prints present on documents which not only has the unique illumination available as on the fingerprints (individual essences) but has far more details in terms of some statistical parameters. It must keep in our mind that when an individual writes or works on art, a lower part of the hand (Hypothenar area) comes in the contact of writing surface to facilitate the move of hand. The ridges and furrows of the palmar surface which keeps ridge moist by the secretion of sweat comes in the contact of the surface of document and expected to left over their identity on form of latent form that could be intensified. Whenever, we writes on documents it occurs that with every pen lift; the lower part of the palm (Hypothenar area) also moves to facilitate at that time the latent prints left on the paper without the knowledge of writer below the writing or signature, or in the line also overlapped to each other and destroy the ridge information. When these prints are intensified with the help of battery of developers; the result obtained in smudged form; from which the identification could be done neither by class or individual essence and the identity remains questionable.

To identify the suspect from such type of smudged prints, some parameters were set up from the intensified palm prints to the line of writing. In which we don’t have no need to go through the individual characteristics nor other ridge details for conclusive identification. These parameters were used to identify the author ship or individual from document (Chaudhary S., & et al., 2003; Chauhan A., & et al., 2014).

II. MATERIAL AND METHODS
For this pilot study, 22 samples including male and female were collected form the population of District- Baghapat, Western part of Uttar Pradesh. Sample selection was done randomly and the consent of subjects was taken before the sample collection.

A. Material
All the subjects were asked wash their hand so that the extract of contamination such as dust or any coloured material could be removed from the hands and than to dry them. After this all were asked to write something with their own choice on A4 size white paper sheet with the Blue ball point pen after putting the paper on a table upto the height of elbow at ease and atmospheric condition. All the samples were kept in white paper envelope separately to protect from atmospheric contamination at room temperature for 4 hours.

B. Method
To intensify the prints on documents, all samples were treated with the black powder; which is easily available and understood the best developer for fresh sample reacted to the lipids materials present in sweat. It was noticed that all the samples were successfully intensified; the prints below the writing or signature was overlapped Smudged in which the ridge details were not identifiable. The intensified prints were preserved with the help of fingerprints cello tape and were further analyzed for statistical parameters.

Fig. 1: Intensified prints on document below the writing
III. STATISTICAL ANALYSIS:
The aim of the study is to identify suspect from the smudged palm prints present on documents (Ashbaugh D. 1999). First of all, we will allocate three centers of curvatures in the developed palm prints and to correlate them with the line of writing, where signatures/writing was put on. It was described method for taking the parameters by (Chaudhary R., & et al., 2003, Chauhan A., & et al., 2014). In which centre of curvature from line of writing, inter distances from centre of curvatures, angle from the centre of curvature to line of writing and normal distance from line of writing to centre of curvature was included for making the identification from a smudged palm prints.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Radius of Curvature(Cm.)</th>
<th>Normal distance of curvature from Line of Writing (cm.)</th>
<th>Angle of centre of curvature from line of writing</th>
<th>Inter-distance of centre of curvature (cm.)</th>
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<td>S.no.</td>
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Table 1: Parameters for taking measurement from smudged palm prints

The correlation of these points (Wu Xiagqian & et al. 2003) with respect of writing’s line is cumulative and was measurable. It was noticed that all the parameters for each individual were unique, which fixes the identity of an individual with respect of line of writing. The position of latent palm print was below the signatures. It’s also considered that all the obtained parameters were enough for the identifying suspect.

IV. RESULT AND DISCUSSION
From the study of intensified smudged palm prints and their inherent relation with the writing leads to the identification the suspect (Alston J & et al. 1987). The obtained 12 parameters for each subject in sample were identifiable with natural variation, and having enough information about their identity. It was noticed that, smudged palm prints superimposed on each other and from them the identity of suspect was not possible on behalf of ridge details.

If any suspect tries to disguise his handwriting, unknowingly the suspect will also put their latent palm prints on the document. During the intensification process numerous smudged prints will visualize. Identification of suspect (Kumar Ajay) from the smudged palm prints is not always possible, but from this disposal forgery of documents along with smudged prints can also be detected with dilatation the identity.

During the study of parameters, it was noticed that the variation in the parameters occurred because of natural variation, but the variation was noted up to the limit (±0.2cm). Now, in parameters of inter distance between centre of curvatures AB, BC & CA that distance between the centers B & C are relatively smaller than AB, CA. Inter-distance may vary, it depends on the health of subjects. These observations are cogent of natural variation (Gutierrez-redomero Esperanza & et al. 2011), which in turn allows the identification of the suspect and gives the inherent relation of an suspect’s identity with respect of line of writing. The error in the measured distance is within the limits of (±0.2cm), which can be attributed to the instrumental error/constant error and are due to natural variation.

V. CONCLUSION
By the analysis of the sample it was noticed that the conclusive identification of suspect is not possible from the intensified smudged palm prints because of lack of ridge details and individual essences, which only could be possible from the statistical parameters. Since natural variation occurs in everything so it will impress their effect on the disposal of writing and along with that the prints which comes in latent form below the writing will also be influected and variation will come in notice yet the way of impressed prints and their measurements from line of writing will conclude the identity of suspect. It was a trail run for smudged palm prints and identification of suspect from them which will continue in a large number of samples to verify it.

REFERENCES
