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Rapid communication

Development of latent fingerprints on compact disc and its effect on subsequent data recovery

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Abstract

Chance fingerprints may be found on every type of surfaces of contact and when they are latent, need to be developed by various methods. The type of surface on which latent prints are to be developed is one of the important factors when a choice for a method of development is to be made. The matter becomes more crucial when the surface is unique like a compact disc containing digital data. In this case, to develop the fingerprints is not the only matter to be taken care of but also, is very important to select such a method which may not effect the stored data and its retrieval. In present investigation, various methods have been tried to develop fingerprints on the writing surface of a CD and results are discussed with respect to their development as well as its effect on stored data and data retrieval.

Keywords: Forensic science; Personal identification; Fingerprints; Latent; Unusual surfaces; Compact disc

1. Introduction

The latent fingerprints may be found on all those surfaces to which a perpetrator may come in contact with and touches. These surfaces may vary from a paper or metal sheet to a door or a polished surface to human skin or fruit and vegetable surface. Another surface, which an investigator may come across for latent fingerprints, is a compact disc (CD or DVD). These are most commonly used storage media to store the data to be used in the computers. Therefore, due to this high level of use their presence can be expected at the scene of crime as a physical clue material and may be required to be treated for development of latent fingerprints also. To develop latent fingerprints on both the surfaces of CD is not difficult but the problem of protecting the data from damage when developing fingerprints on the writing side of the CD is also of paramount importance. While going through the literature, we could not find any answer to this question and therefore, in present paper it is attempted to develop latent prints on writing side of the CD with an aim that data are not damaged and could be retrieved effectively.

A compact disc (CD) is an optical disc used to store digital data, originally developed for storing digital audio [1]. Compact disc's main constituting material is polycarbonate plastic, into which cyanine azo and phthalocyanine dyes are mostly incorporated. Discs are coated with super purity aluminium, which is protected by a lacquer layer. The commonest of all specifications for a CD is 120 mm diameter with 650 MB of available data storage space. The clip/clamp device of the player, which aids in rotating the disc, uses the hole provided in the center of the disc. Information is encoded in form of spiral tracks of pits moulded into the polycarbonate layer. A semiconductor laser (780 nm wavelength) is focused through the polycarbonate layer to read the data. The intensity of the focused beam is measured through photodiode and in turn converted into signals.

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Two forms of compact discs are prevalent, i.e. CD-R (recordable) and CD-RW (rewritable). CD-RW is a re-recordable medium that uses a metallic alloy as compared to CD-R in which a dye is used. The CD-RW discs have a phase change-recording layer made of silver, indium, antimony and tellurium with additional aluminium reflecting layer.

The writing surface of the CD is very much prone to damage by scratches or similar physical force causing damage of stored data in the disc. Therefore, it is possible that when a particular method is being used to develop fingerprints, it may cause such damage to the data.

It is best not to attempt to repair scratched discs, but one can try car polish or commercial scratch repair kits to recover the data [2]. Although visible results may appear to be satisfactory, performance in the CD-ROM drive actually degrades as several small scratches are produced and the focusing accuracy of the laser is affected.

2. Materials and methods

In the present study, compact discs of following types were used as given in Table 1.

Data were written on the CD using the NERO express Version 6 burning ROM with speed ranging from 4× to 40×. All types of data files mentioned in Table 1 were written on each CD. Latent prints were made on the writing surface of the CD and checked for any loss of data. CD could be accessed by auto play mode or through 'My Computer' folder. The latent fingerprints were developed by various methods, namely black powder method, iodine-fuming method, small particle reagent (SPR) method and cyanoacrylate fuming method.

2.1. Black powdering method

Activated charcoal (Ranbaxy laboratories) powder was dusted with the help of feather brush for the development of latent fingerprints [3]. Developed prints were recorded by lifting and photographing the same (Figs. 1 and 4).

2.2. Iodine-fuming method

Compact disc requires a more localized application of fumes as direct application of heat can harm the CD surface. Iodine-fuming gun was used to develop latent fingerprints and photographed immediately [3].

Fig. 1. Lift of fingerprint developed with black powder on CD.

2.3. Small particle reagent

A modified SPR based on black powder [4] was used for processing the latent fingerprints on the CD surface. The black powder used for SPR was the same as used in powder method. Solution was applied on the CD surface by pouring the solution from one side of the CD. This particular step was repeated several times to get the desired contrast along with subsequent washings. Developed prints were photographed and lifted with adhesive tape (Figs. 2 and 5).

2.4. Cyanoacrylate fuming

Sirchie™ fuming chamber was used for the cyanoacrylate fuming. For the proper application of the superglue on the CD, the same were hanged in the chamber with the help

Table 1
Descriptions of compact discs used

S. no.	Brand of CD used	Color of writing surface of CD	Type	No. of CD's used	Type of files saved
1	Amigo (52×)	Golden	Recordable	6	.ppt, .doc, .rtf, .wmv,
2	Samsung (10×)	Golden, silver grey	Rewritable	3	.pdf, .jpeg, .html, .mp3,
3	Sony (1–4×)	Silver grey	Rewritable	1	.mpeg
4	Moserbaer (4–10×)	Silver grey	Rewritable	1	