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**Forensic sciences - Forged video and image of a person -
Source identification**

法庭科学 伪造人像 来源检验

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1 Scope

This document specifies the examination equipment for the source identification of forged video and images of a person in the field of forensic science, describes the examination procedure, and specifies the types of expert opinion, the basis of judgement and the wording.

This document applies to the source identification of forged video and images of a person in the field of forensic science.

2 Normative references

The contents of the following documents constitute indispensable provisions of this document through normative reference in the text. For dated references, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies to this document.

GB/T 29360 Forensic sciences - Specifications for the forensic examination of electronic data recovery; GB/T 29362 Forensic sciences - Specifications for the forensic examination of electronic data search; GB/T 45429 Forensic sciences - Forged video and image of a person - General rules for examination; GA/T 1018 Technical specification for the examination of images of objects in video; GA/T 1019 Technical specification for the examination of images of vehicles in video; GA/T 1023 Technical specification for the examination of images of persons in video.

3 Terms and definitions

The terms and definitions given in GB/T 45429 and the following apply to this document.

Source characteristic: an indication contained in a video or image that relates to the process by which it was formed, that is to its capture, its production or its forgery.

Source information: information in a video or image concerning the person in the picture, the time-and-place environment, the image file, the capture device and the forgery tool.

Source identification: the process of extracting and analysing the source characteristics of a questioned item in order to determine its source information.

4 Examination equipment

Routine examination equipment. The routine examination equipment includes computers, image scanners, video players, image viewers, hash calculation tools, metadata viewers, audio and video editing software, and compilers for programming languages.

Source examination equipment. Hardware and software that assist in examining the source characteristics of a video or image in respect of the person in the picture, the time-and-place environment, the image file, the capture device and the forgery tool, including but not limited to equipment for examining forgery-model noise, equipment for examining sensor pattern noise, equipment for authenticity examination, equipment for comparing images of persons, vehicles and objects, equipment for image processing, equipment for image searching and equipment for image restoration.

5 Examination procedure

Securing and preserving the questioned item. Where the questioned item is a paper image, it is scanned with an image scanner at a resolution of not less than 1200 dpi and converted into a digital image. Where the questioned item is digital media, the appearance of the carrier holding it is recorded photographically and the storage location of the item within the carrier is recorded. The questioned item is given a unique number and its file attributes and hash value are recorded. Enquiry is made as to whether the questioned item has a suspected source in terms of the person in the picture, the time-and-place environment, the

image file, the capture device or the forgery tool.

Collection of samples. According to the requirements of the examination and the state of the questioned item, sample video or images are collected as follows: in the examination of the source of the person in the picture, other images of the person suspected of appearing in the picture should be collected as samples; in the examination of the source of the time-and-place environment, video or images of the suspected same time-and-place environment should be collected as samples; in the examination of the source of the image file, the suspected source image file should be collected as a sample; in the examination of the source of the capture device, other video or images captured by the suspected source device should be collected as samples; and in the examination of the source of the forgery tool, other video or images produced by the suspected source forgery tool should be collected as samples. The appearance of the carrier holding the sample is recorded photographically and the storage location of the sample within the carrier is recorded. The sample is given a unique number and its file attributes and hash value are recorded. Where necessary, in accordance with the relevant provisions of GB/T 29362 and GB/T 29360, a data search or data recovery is carried out on the carrier of the questioned item in order to obtain, as samples, other video or images that may share its source.

Examination of metadata. The metadata of the questioned item and of the samples are inspected, including format, duration, resolution, frame rate, recording time, encoding time, marking time, software and copyright. Source characteristics are then extracted from those metadata, including but not limited to: characteristics related to the source of the person in the picture in fields such as the file name and the record of operations; characteristics related to the source of the time-and-place environment in fields such as the file name, the latitude and longitude and the timestamp; characteristics related to the source of the capture device in fields such as the device type, the lens, the image size and the encoding method; and characteristics related to the source of the forgery tool in fields such as the software, the copyright and the record of operations.

Analysis of source characteristics - person in the picture. The source characteristics of the person in the picture are analysed, including but not limited to: characteristics of the splicing of the person; the shape and proportions of the hair, facial features, neck, trunk and limbs; behavioural characteristics such as expression and movement; characteristics of the consistency of face and body; characteristics of the plausibility of clothing and accessories; and characteristics of subtitles, watermarks and sound related to the source of the person in the picture.

Analysis of source characteristics - time-and-place environment. The source characteristics of the time-and-place environment are analysed, including but not limited to: characteristics of the consistency of illumination between the person and the background; the time-and-place characteristics reflected by roads, buildings, vehicles, furniture and decoration in the picture; the date, time and spatial position reflected by clocks, signs and

plaques in the picture; the splicing and perspective characteristics of persons, vehicles, objects and scenes in the background; the consistency of weather phenomena such as rain, snow and fog with the date and time of capture; and characteristics of subtitles, watermarks and sound related to the source of the time-and-place environment.

Analysis of source characteristics - image file. The source characteristics of the image file are analysed, including but not limited to: the course of the events shown; the positional relationships of persons, vehicles and objects in the picture and how they change; the characteristics of the scene, the lighting arrangement and the composition; phenomena closely bound to a single act of imaging, such as noise, blur and occlusion; editing characteristics such as the video cover, subtitles, transitions, end titles, sound effects and filters; and watermarks, marks, blockchain traceability codes and similar characteristics related to the source of the image file.

Analysis of source characteristics - capture device. The source characteristics of the capture device are analysed, including but not limited to: the encoding characteristics of the video or image; trace characteristics such as lens artefacts, chromatic aberration, dead pixels and dirt shown in the picture; noise characteristics such as the photo-response non-uniformity and the fixed pattern noise of the device; characteristics of local pixel correlation produced by the arrangement of the colour filter array and the interpolation algorithm of the device; and traceability characteristics such as metadata and watermarks related to the source of the capture device.

Analysis of source characteristics - forgery tool. The source characteristics of the forgery tool are analysed, including but not limited to: forgery characteristics reflected in the person, for example defects at the hair or the teeth; trace characteristics closely bound to the forgery tool, such as ghosting and blur in the region of the person and in the background; noise characteristics introduced by forgery models such as generative adversarial networks; and traceability characteristics such as metadata and watermarks related to the source of the forgery tool.

Comparison of source characteristics. The source characteristics of the person in the picture in the questioned item and in the samples are compared: the questioned item and the samples are cropped, rotated and rescaled; the similarity of the images of the person in the questioned item and in the samples is calculated; and, in accordance with the relevant provisions of GA/T 1023, the characteristics of the images of the person are compared by measurement, splicing, superimposition and similar methods. The source characteristics of the time-and-place environment are compared: the questioned item and the samples are cropped, rotated and rescaled; characteristics related to a particular time of capture and to the background environment are compared, for example traces of light and shadow on buildings, particular arrangements of signs and symbols, and the relative positions of persons, vehicles and objects; and, in accordance with the relevant provisions of GA/T 1018 and GA/T 1019, the image characteristics of vehicles and objects are compared. The