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## FOCUS VARIATION WITH INTEGRATED FORM REMOVAL FOR FORENSIC COMPARISON OF BULLET STRIATIONS

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This paper presents a novel focus variation FV instrument method to acquire and process bullet surface datasets for forensic comparison. The objectives of the current work are to apply new 3D instrument technology with integrated form removal and processing with wavelet filtering to improve ballistic striation matching. In the field of firearm identification much work has been done on methods to measure and discriminate between the characteristic striations which are imparted to a bullet during firing.

The test bullet group for the current work comprised 19 bullets fired forensically from 9mm pistols, 8 designated test object bullets, and 11 designated test sample bullets. Each test object was compared with 1 test sample fired from a different pistol (known non-matches). Three of the 8 test objects were also compared with 1 test sample fired from the same pistol (known matches). An AliconaTM IFM G4 focus variation instrument with rotary 4th axis was used to acquire point cloud (3D) data sets for bullet comparisons. The acquired data sets were annular (1.4mm wide) and initially processed with an integrated script written to operate on the FV instrument. This initial processing is termed "unwrapping". The unwrapped files are then processed in SurfstandTM software to isolate the D5 wavelet surface frequency band; between Fn/32 and Fn/16 (where Fn is the highest frequency of the surface). At optimal alignment "cross correlation max" CCFmax and difference parameter Ds are calculated as correlation metrics to compare surface striations for discrimination. For the bullet test group presented, unambiguous individual discrimination is achieved by applying the criterion; values of CCFmax >66% indicate a match unless they are combined with a Ds >100 then a non-match is indicated. CCFmax offers spatially sensitive point for point surface correlation but is scale insensitive while Ds lacks any spatial information it is sensitive to scale. Thus it is clear that for reliable discrimination these two correlation metrics need to be considered together. The current method has the advantage over many existing techniques that a given region of bullet striations can be compared with the whole surface of test bullet in a single process to give single best match correlation. It also helps to avoid the possible adverse effects on correlation from the distorting influence of Gaussian filters. A larger sample of bullets will be required to show the general significance of the technique but good individual discrimination is seen for the presented test sample.

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## THE APPLICATION OF QUESTIONED DOCUMENT EXAMINATION IN THE AUTHENTICATION OF CHINESE PAINTING

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Chinese painting, also known as *guóhuà* (meaning "national painting"), is an ancient and unique painting genre of China. After thousands of years of development, Chinese painting has accumulated rich and mature techniques of expression and retained a large number of exquisite masterpieces of art. It is an important carrier of traditional Chinese culture. Chinese painting is generally classified as figure painting, flower and bird painting, and landscape painting. The critical elements of a Chinese painting include composition, brushwork, inscription and seal, and the artistic conception is the spirit. In modern times, masterpieces created by famous artists such as Wu Changshuo, Qi Baishi and Pan Tianshou are of unique styles and appeal to both refined and popular taste. Taking chicken, birds, fish, insects and other "farm treasures" as the theme, contemporary artists have created a variety of art works. Due to the special artistic value and considerable economic value of Chinese painting, the art market is filled with fakes of famous art works. Once litigation arises, the authenticity of questioned paintings needs to be determined. Different from traditional painting and calligraphy appreciation, the forensic expertise of calligraphy and painting use the methods for examining handwriting, seals, printed documents, altered documents and document materials comprehensively, as well as the traditional methods of calligraphy and painting appreciation, to make a scientific judgment on the authenticity of the questioned art work. In this paper, the forensic examination of 130 questioned calligraphy and painting art works was introduced. The questioned art works were claimed to be created by a well-known late contemporary artist of Chinese painting. The characteristics of inscription, name seal, composition and brushwork of the questioned art works were compared with those of the original paintings preserved by the relatives and the printed copies issued by official publishing houses. The formation of inscriptions and name seals, and the characteristics and changes of handwriting and seals of the questioned and known paintings were elaborated comparatively. Learning from the traditional methods of calligraphy and painting appreciation, the typical paintings that took chicken, birds and fish as the theme were further analyzed from the aspects of composition, brushwork and expression form of lines and colors. This practice explores an approach to the application of questioned document examination technology in the authentication of Chinese painting, and provides a way of thinking and examination for the authentication of calligraphy and painting works.

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## RULER DROP TEST AS A TOOL TO DETERMINE POOR REACTION TIME IN DRUNKEN DRIVERS OF SRI LANKA

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**Introduction:** Sri Lankan law recognizes drunk driving as an offence. However, determination of drunkenness is either by performing a medical examination to determine that he/she is under the influence of alcohol or performing a breath test by an approved device. The ruler drop test, a simple test to assess the reaction time, has been introduced to the Guidelines for Clinical Examination for Drunkenness by Government Medical Officers prepared by the College of Forensic Pathologists of Sri Lanka. However, no formal study has been carried out in Sri Lanka to assess the response to this test among normal Sri Lankan population. **Objective:** The aim of the study was to determine the standard reference norms for ruler drop test as a test of reaction time among the general public of Sri Lanka, in order to use it as a tool to assess poor reaction time among drunken drivers. **Study design:** This cross sectional descriptive study was carried out among randomly selected 903 individuals of different ages, with and without non communicable chronic diseases and who had not consumed alcohol within the last 12 hours. The test was explained and demonstrated by the investigators. The examinee conducted the ruler drop test three times on dominant hand and the best was taken as the value. **Results:** Out of 903 individuals 768 (85%) were less than 60 years of age while 135 (15%) were 60 or more than 60. 415 (46%) of the sample were having some form of chronic diseases. 113 (12%) showed a poor reaction time or could not catch the falling ruler at or before 22cm level, which is identified as a positive point for alcohol consumption according to the guideline. 97.5% of the individuals could catch the falling ruler at or before the level of 13.7 cm. There was no significant association