J20 Spectral Analysis of Canadian Currency as a Potential Tool for Counterfeit Detection

Eva Snirer, BA, Simon Fraser University, School of Criminology, Simon Fraser University, 8888 University Drive, Burnaby, BC, CANADA; Margaret Kalacska, PhD, Department of Geography, McGill University, 805 Sherbrooke Street West, Montreal, QC H3A 2T5, CANADA; and Rick B. Parent, PhD, School of Criminology, Simon Fraser University, 8888 University Drive, Burnaby, BC V5A 1S6, CANADA*

After attending this presentation, attendees will gain an understanding of a new technique of visible - near infrared spectrometry, and its application to the detection of counterfeit Canadian currency. This presentation will demonstrate how despite the efforts of counterfeiters, this tool can differentiate between genuine and counterfeit bills at 95% and 99% confidence levels, in a non - destructive, repeatable manner.

This presentation will impact the forensic science community by illustrating a novel application of remote sensing technology that increases the confidence in detection of counterfeit Canadian banknotes in a non-destructive repeatable manner.

Counterfeits account for a substantial value of banknotes in circulation. With the introduction of sophisticated scanners, color photocopiers, and ink-jet printers in the early 1990s there was a dramatic change in counterfeiting technology. There are a number of counterfeit detection methods utilized by law enforcement agencies; however, these suffer from various drawbacks: some are destructive in their nature, some too time consuming, and some simply imprecise. In addition, there have been very few studies that focused on Canadian banknotes. For this study a novel approach to counterfeit detection was chosen, focusing on how the banknotes – both counterfeit and legitimate – reflect specific wavelengths of visible and near-infrared light. Banknotes are composed of two primary parts – the paper and the ink, both of these components affect the spectral response for each of the banknote denominations. In the case of counterfeit the paper is of a varied nature. The first part of this research compared the four most common paper types used by counterfeiters in Canada in order to observe if it is possible to differentiate between the paper types and as well as seeing how the paper type impacts the spectral signature. This analysis showed that the overall spectral shape is significantly different between all paper types and it is possible to differentiate between the paper types commonly used by counterfeiters.

In the focal part of this study the spectral signatures were compared for the $5, $10, and $20 Journey series notes and the $20 Birds of Canada series. Banknotes from each denomination, both from legitimate and counterfeit, were sampled at specific points on the bills using a handheld spectrometer operating at the 325 - 1075nm wavelength range. For all denominations the spectral signatures were found to be significantly different between the counterfeits and the real notes at both 95% and 99% confidence levels, and therefore this technique may be a rapid and reliable method to use in counterfeit detection.

Hyperspectral Analysis, Counterfeit, Spectrometry

 ** Presenting Author*