

1035-42-2005

Micah J Smith (Micah_Smith@berea.edu), CPO 1335, Berea College, Berea, KY 40404, and
Jonathan Hunt* (Jonathan_Hunt@berea.edu), CPO 647, Berea College, Berea, KY 40404. *An
Examination of Fingerprint Analysis using the Fourier Transform*. Preliminary report.

Digital fingerprint analysis is commonly used for personal identification and seems generally believed to be a flawless process. However, certain cases, such as that of an Oregon lawyer misidentified as a terrorist suspect, show this conclusion to be inaccurate. Our investigation is primarily concerned with possible causes of such identification errors, as well as the introduction of measures that may reduce them. We examine principles of image processing involved with digital fingerprint analysis that grow increasingly influential as the field has become more commonly applied. The main mathematical tool used is the Fourier transform, which we present in terms of concepts from Integral Calculus and Linear Algebra. Through application of the Fourier transform, we focus on two factors that may affect digitized fingerprint images: the resolution at which an image is sampled (a minimum acceptable resolution for fingerprint images is estimated), and enhancements that may then be performed on the image. Detailed visual examples of the work are included in addition to the mathematical theory in the hope that viewers may gain a more concrete idea of how these issues affect digital fingerprint images. (Received September 21, 2007)