**A Robust Approach to Automatically Locating Grooves in 3D Bullet Land Scans**

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**Abstract**

Land engraved areas (LEAs) provide evidence to address the same source-different source problem in forensic firearms examination. Advances in technology have led to research applying image-analysis algorithms to automated analyses of bullet evidence. One prominent example, developed by Hare et. al ([1](#_bookmark1)), is based on 3D imaging data of LEAs. Collecting 3D images of bullet LEAs requires capturing portions of the neighboring groove engraved areas (GEAs). Analyzing LEA and GEA data separately is imperative to accuracy in subsequent feature comparisons. Existing standard statistical modeling techniques fall short when applied to the atypical structure of 3D bullet data, often failing to adequately separate LEA and GEA data. We developed a method for automated removal of GEA data based on robust locally weighted regression. This automated method was tested on high-resolution 3D scans of LEAs from two bullet test sets. This separation method outperforms current methods at separating LEA and GEA data.

*Keywords:* land engraved areas (LEAs), groove engraved areas (GEAs), 3D scans, bullet identification, automatic matching

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