J4 Validation Testing for FLASH ID on the Chaski Writer Sample Database

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After attending this presentation, attendees will understand how to evaluate validation tests in general and specific validation testing results of testing FLASH ID (Walch et al, 2008) on a forensic handwriting database (Chaski 1997, 2001). Validation testing is a key component of developing new technologies in forensic science as well as a legal qualification for admissible scientific and technical evidence.

This presentation will impact the forensic science community by meeting a major requirement of the *Daubert* challenge to handwriting identification, i.e., demonstrating that FLASH ID has been validated on a forensically feasible database of known handwriting samples with a low error rate such that these results provide evidence of how well FLASH ID can perform on accurately classifying handwriting in actual cases.

Validation testing is a four step process. First, validation testing requires a database of known samples whose characteristics mirror as closely as possible the actual samples found in actual cases. Second, validation testing requires an objective method being repeated on all the samples. Third, validation testing requires a cross-validation scheme which tests the accuracy of the method for correctly identifying the known writers. Finally, validation testing requires a calculation of an error rate based on the cross-validated accuracy.

For the validation testing of handwriting identification methods, the first step of finding a database of known samples whose characteristics mirror actual data has been challenging. Some available handwriting databases do not contain known samples. It is impossible to test a method's ability to identify if there is any confusion at all about the identity of any of the samples. Some available handwriting databases do not contain samples whose characteristics mirror actual samples. Spontaneous text offers the best way to predict actual performance under actual conditions involving forensic document examination. Spontaneous writing is also important linguistically since it will mirror the actual phonotactics (frequency of letters, letter-positions, and letter- combinations) of the language, whereas copied handwriting only shows the artificial frequencies of the model. The available models do not accurately capture English phonotactics.

The Chaski Writer Sample Database (Chaski 1997, 2001) provides spontaneous handwriting from known writers. The database has previously been used to validate linguistic methods for determining authorship by research teams in the United States, Canada and Switzerland. This presentation describes the first use of the database to validate computational methods for identifying handwriting. The database contains approximately 175 known writers whose demographic information is known. This demographic information includes the age, race, sex, educational level, dialectal information, graphic type (cursive, print, mixed), and legibility. Each author has authored at least three texts on topics which are sociolinguistically determined to evoke different communicative functions and emotive states (e.g., describe a personal trauma or frightening experience, describe career goals). Some authors are not useful to this study since their documents are typed or computer- generated.

Each writer wrote on unlined paper, selected his/her own writing instruments and wrote at his/her leisure. Each writer produced as much on each topic as she/he desired. Thus, the Chaski Writer Sample Database mirrors the characteristics of actual forensic data because in actual cases, for the knowns, the writing instruments, the amount of handwriting, the communicative functions of the texts can vary, and the writers are writing freely without copying a standard text. For 100 writers, at least three writing samples and up to eight writing samples were extracted. The writing samples vary in length from quarter-page to full page.

Each writing sample was processed through FLASH ID using a leave-one-out cross-validation scheme. Further, varying amounts of text for each writer, in 150 character increments, were processed. Thus, this presentation reports the results of validation testing FLASH ID for writer identification in general and under specific conditions of text length, instruments, and graphic type.

Handwriting Identification, Validation Testing for *Daubert*, Forensic Database

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