Bridging the gap between the forensic handwriting examiners and pattern recognition community

Linda Alewijnse
Netherlands Forensic Institute
Department of Digital Technology and Biometrics
The Hague, The Netherlands
l.alewijnse@nfi.minvenj.nl

There is a continuous need for new, unpublished data to train and evaluate new algorithms for signature verification systems. Handwriting samples that make up the current publicly available databases have all been collected under controlled conditions. Research databases constituted of case related forensic data in general are scarce. To suit forensic purposes, it is preferred to start building databases with forensically relevant data. When verification and identification systems are trained on this type of material, the output will be more suited for forensic examination purposes. The challenge is to bridge the gap between the forensic handwriting examiners and the pattern recognition community.

Offline signature verification is a biometric technique with promising results for the near future to aid the forensic handwriting examiner in drawing a conclusion. The pattern recognition discipline has made rapid developments in the last ten years [1]. Implementing an analysis tool in the forensic practice is the next challenge. Before automated signature verifications can be used, the forensic community must be ascertained that the systems are trained, evaluated and validated on data that is collected under appropriate environmental conditions.

In the past years, from 2009 until 2013, several signature data sets were collected by researchers from the Netherlands Forensic Institute for the Signature Competition (SigComp) [2, 3]. This competition allows researchers and practitioners from academia and industries to compare performance on signature verification on new and unpublished datasets. Because all participating parties in the competition are provided with the same data, results are comparable. While the competition provides an overview of involved parties and shows the performance of the available systems to the forensic community, the pattern recognition researchers are more concerned about which features are most discriminative. The aim of the SigComp is to improve the interaction and bridge the gap between the two communities. Nevertheless, much work still needs to be done to bring together researchers in the field of automated handwriting analysis and signature verification and experts from the forensic handwriting examination community.

Data for signature verification research aimed at forensic implementation have specific requirements. Data must reflect the variation of handwriting in the relevant population, and should represent the whole intra-writer variation. Additional forensic requirements are: known sex, age, handedness, level of education, profession, cultural origin of the writer, a substantial amount of reference signatures, specifications of the conditions under which a simulated or disguised signature was produced, and the time span over which the data was collected.

Where biometric systems usually have access to high quality and uniform data, in forensic practice the trace under investigation is often of poor quality. This is not represented by the currently existing handwriting databases. The next step in bridging the gap between the pattern recognition community and forensic handwriting examiners should logically involve the use of real forensic samples. Simulated data can be used in the training phase of system development, because the ground truth of the origin is known. The evaluation phase should at least contain real life handwriting samples. However, the validation of the system should completely be performed with real data samples [4]. The best would be using forensic casework data to evaluate and validate automated systems, but legal aspects regarding privacy form an obstacle, as well as uncertainty about the ground truth of the writing.

The best solution would be acquiring existing handwriting samples in a similar way as a forensic handwriting examiner collects specimen writings in a case investigation. All writing conditions (intrinsic and extrinsic factors) are represented in the dataset and the ground truth of the sample is known.