Reliable On-Line Human Signature Verification Systems

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On-line dynamic signature verification systems were designed and tested. A data base of more than 10,000 signatures in (&I, y(t))-form was acquired using a graphics tablet. A 42-parameter feature set at first, and advanced to a set of 49 normalized features that tolerate inconsistencies in genuine signatures while retaining the power to discriminate against forgeries. Orthogonalizing features. A modified version of our majority classifier yielded 2.5% equal error rate. An asymptotic performance of 7% FAR at 0% FRR, was robust to the speed of genuine signatures, and used only 15 parameter features.

DATA ACQUISITION –

A total of 5,603 genuine signatures were collected from a population of 105 human subjects which included 22 women and five lefthanded writers. Some subjects contributed as few as 13 genuine signatures while one subject wrote his signature more than 1,000 times. About 90% of the genuine signatures were collected under ”normal” writing conditions. A signature verification system must be robust with respect to variations in writing speed, so a set of 240 ”fast” signatures from nine subjects who were asked to write their genuine signatures as fast as possible.

FEATURE EXTRACTION –

The first feature set consists of 42 personalized parameter features - 13 static and 29 dynamic. Preliminary experiments showed that the 42-feature set is highly sensitive to variations in size and speed of genuine signatures. Therefore, a second set consisting of 49 normalized features was constructed with the objective of rectifying these deficiencies.

CLASSIFIER –

Majority classifiers, which implement the majority decision rule described below, have the advantage of being simple to implement while providing performance satisfactory for POS applications. It was modified in this paper. The problem of inconsistency of genuine signatures can be attacked by using normalized features. This reduces the false rejection rate of the majority classifier for fixed a and a fixed set of n features but also reduces the forgery rejection rate. A good statistical model for signatures would advance signature technology by quantifying interclass and intraclass variability among signatures.

EXPERIMENTAL RESULTS AND CONCLUSION –

The key performance requirement for POS applications is that the Type 1 error must stay small (say, 5 25%) as the decision threshold is adjusted to drive the Type I error to zero. Using a large genuine data base when selecting common feature results in better classifier performance. Performance is satisfactory for POS application. The feature selection algorithms provide optimum individualized subsets of 10 features that yield excellent discrimination. For POS – a threshold of 2.5 was set. Type 1 error was less than 1% and a Type 2 error of 20%. Upon selecting a threshold between 2.5 and 3.0, Type 1 and Type 2 errors are least. They are now suitable for robust applications in POS applications.