Online signature verification by spectrogram analysis

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Time speed captured during signing is converted in frequency domain. The frequency spectrum along the signing process is stealthily extracted and spectrograms are created by short-time Fourier transforms. Since the spectrograms are found as RGB images, providing valuable information about frequency vs time, grid histograms are formed by quantization for the real signature sample. Given the discrimination purposes, a fuzzified surface is designed for computing closeness of grid histograms.

POINTERS –

1) Short time Fourier Transform (STFTT) is used for converting analysis from time domain to frequency domain.
2) Spectrograms are found as RGB images.
3) Grid histograms are formed by quantization for the real signature sample.
4) A fuzzified surface is designed for computing closeness of grid histograms.

ONLINE DATA COLLECTION –

1) An interface is written in MATLAB to turn the signing process into a signal for extracting the frequencies.
2) Image is saved as 600 × 355 JPG file.
3) Throughout the analysis, the same Hamming windowing function is used.
4) 25 ms, 100 ms, 250 ms and 500 ms window sizes are taken separately. Smaller window size looks like the signal itself but upside down. On the other hand, as the window size is increasing, the spectrograms are tuning into regular Fourier transforms, but into a transposed version. Finally 250 ms window size is selected.
5) Grid histogram technique for similarity matching. They are arbitrarily colorized just for better presentation of higher values and the grayscale colors have no impact on the results.
6) Fuzzy Classifiers are used for final prediction.

PERFORMANCE –

1) EER = 4.82%
2) Given the complete uniqueness of the whole mythology, there is no possibility to benchmark the accuracy of the results.

PROSPECTS –

1) 250 ms window size, which is proper for signing process, however it could be smaller for better precision. Any window size between 100 ms and 250 ms would give satisfactory outcomes.
2) Hamming window is also not mandatory for windowing the whole signal, so Blackman, Hanning, Kaiser-Bessel, Blackman-Harris, Gaussian or similar windowing functions may change the dynamics of the discrete signal to reach better results.
3) the main kernel is the frequencies disregarding the geometrical features, the EER would be lower when the number of trials increase.