Chaos in Dynamic Handwritten Signature

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Signature is a physical demonstration of complex motor processes. The problem, generally stated, is how relative simplicity in behavior emerges from the considerable complexity of the perception-action system that produces the behavior within an infinitely variable biomechanical and environmental context. To solve this problem, we present evidences that indicate motor control dynamic is chaotic process. This chaotic dynamic may explain a richer array of time series behavior in motor skill of signature. In order to, nonlinear analysis is a powerful approach and suitable tool which search for characterizing dynamical systems through concepts such as fractal dimension and Lyapunov exponent. So adequate data sample for nonlinear analysis and results must be stable and reliable, with concatenation of 20 signature samples which provide time series long enough. As a result, they can be analyzed in the horizontal and vertical positions. From the results, we observed a noninteger values for the correlation dimension indicating low dimensional deterministic dynamics. This result is confirmed by using surrogate data tests. We also use the time series to calculate the largest Lyapunov exponent and obtain a positive value. These results make up important evidence that signature data is result of chaos in a nonlinear dynamical system of motor control