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Towards to an automatic authentication method based on eye movement by using scanpath comparison algorithms

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Nowadays, automatic authentication is still an important issue. This paper presents a relatively new approach towards a construction of a secure method to authenticate people by using their eye movements. Our method is based on a simple scanpath comparison. Ten volunteers were asked to evaluate our proposal. People's eye movements were recorded by using an eyetracker when they were drawing a numeric personal identification number (PIN) in a screen numeric pad. Scanpaths were compared using the simple linear correlation algorithm proposed by Liu & Gao, et. al. (2015). We also used an eye analysis which consists of measuring the similarity of scanpaths by calculating and normalizing the distance in pixels for each point in the scanpaths proposed by Mathot & Cristino, et. al. (2012). Preliminary results are promising. We got an average acceptance rate of 70% with our second approach and a low false acceptance rate under 25%. However, the study should be continue in order to generalize our results toward the construction of a complete method to be follow as an automatic authentication approach.

Magnitude and Nature of Variability in Eye-tracking Data

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Existing precision measures do not adequately describe the magnitude of variability (e.g. noise) in eye-movement data, because they are also affected by the nature of the variability in the signal. For instance, sample-to-sample RMS of an "ant trailing" signal would be low, indicating good precision, while the signal could spread over a large spatial extent. Conversely, for sawtooth signal artifacts that are for instance produced by a spurious corneal reflection, the spatial standard deviation (STD) can be small while RMS can be very large. We have developed two new complementary measures of variability that unambiguously indicate the magnitude of variability independent of its nature, and orthogonally the nature of the variability independent of its magnitude. We hypothesize that the nature of the variability is a constant property of an eye-tracker, while the magnitude varies with many factors specific to the situation when data are recorded (such as gaze position on the screen and pupil size). Data quality studies benefit from such a distinction. Our measure could further be employed to test how robust event detection algorithms are to increases in the magnitude of variability in the eye-movement signal, and which algorithms are most suitable for which type of signal variability.