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EEG-Based Biometric Identification

In the current digital world, most people have far too many online accounts and passwords to remember; in fact, it has been found that the average user has at least 90 online accounts. Further, many accounts require frequent password changes, making it difficult, if not impossible, for password memory recall. Along with an increased number of accounts and passwords is a need for secure access to the personal information that is associated with those accounts. Biometrics is an alternative method to passwords for digitally identifying and securely authenticating a person so that they can access their unique and sensitive information. Common biometric examples include fingerprints, facial patterns, retinal imaging, voice or keystroke dynamics and more. However, many biometrics are incompatible for people with certain diseases, can be forged without consent and are easy to interpret and decipher the true identity of the user.

Researchers at Arizona State University have developed new biometric methods to classify individuals based on their electroencephalogram (EEG) response. With these methods, a user can be identified with a precision of over 99% by brain signal analyses. A novel signal processing approach analyzes the EEG response of a user performing a simple task, and then extracts biomarkers which identify the subject. This signal processing architecture can be easily implemented on commercially available devices and the entire process chain can be implemented on a field-programmable gate array (FPGA) or other hardware for real-time identification. These methods were validated with 48 human subjects and showed high accuracy, precision and recall (>99%).

EEG-based biometrics feature unparalleled universality, enhanced privacy, precision, accuracy, and recall, as well as minimized risk of forgery, making them well suited for many applications, particularly where enhanced security is important.

Potential Applications

- Personal identification/biometry scan
- Reaction time estimation
- Attention related disorder monitoring

Benefits and Advantages

- High accuracy, precision and recall (>99%)
- Easy to implement on hardware
- Unparalleled universality - EEG-based biometrics can be acquired from all humans
- Reduced risk for circumvention – difficult to forge EEG-based biometrics
- EEG can be easily collected and the entire process chain can be implemented on FPGA for real-time identification
- Greater user privacy – it is difficult to decode EEG

For more information about the inventor(s) and their research, please see

Dr. Bliss' departmental webpage

Dr. Blais' laboratory webpage