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Case ID:M16-142P
Published: 1/19/2017

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Using Sparse Representation for Weight Memory Compression in Neural Networks

Devices using biometric authentication such as fingerprint scanning lack liveness checks, resulting in devices that are vulnerable to spoofing and allow access to sensitive personal information. Using electrocardiographic (ECG) signals is an alternative to fingerprint scanning because ECG scanning has intrinsic liveness detection that provides increased security. The ECG tracing depends on the detailed electrical activity of the heart, making it difficult to deceive and bypass authentication. Most works on ECG biometric identification focus on improving algorithms and software features, but researchers have not studied efficient implementation of hardware, which is necessary to embedding an ECG engine onto a wearable device. Therefore, there is a need to design an ECG-based authentication system that minimizes area, power, and memory use.

Researchers at ASU have developed an ECG-based biometric authentication engine with low area and power usage. After the system filters outliers and extracts the essential incoming ECG signals, the system performs a normalization and neural network computation step to register features and compare them to previously registered features. Additionally, the extra steps reduce overall power consumption, memory requirements, and area usage by eliminating unnecessary calculations. Lastly, the system performs Cosine similarity for comparing features, improving the reliability of authentication. Overall, the ECG-based system provides reliable and secure authentication with minimized area and power usage, permitting implementation on smaller wearable electronic devices.

Potential Applications

- Wearable electronic devices
- Continuous ECG monitoring
- Remote ECG monitoring
- Remote access control

Benefits and Advantages

- Enhanced Security - The ECG-based system uses detailed heart signals unique to every individual, improving the reliability of the system
- Reduced Consumption - By removing extraneous calculations, the biometric authentication engine uses less power, memory, and area

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

Dr. Sarma VrudhulaÕs directory webpage Dr. Jae-sun SeoÕs directory webpage