Edison Vein ID (EVID) System: User Authentication through Peripheral Vein Biometrics

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While biometrics have become a vital part of user authentication in technological platforms, they suffer from issues like inaccuracy, high costs, and vulnerability to physical damage that make them difficult to implement in low-cost scenarios. To meet this need, this project authenticates identities through inexpensive peripheral vein biometrics with the Edison Vein ID (EVID) system. EVID consists of a low-cost NIR camera and low-power NIR LED array. The array emits ~850 nanometer light, which is absorbed by the finger veins' deoxygenated blood and detected by the camera. Through the Intel Edison Compute Model, a computer vision algorithm captures a raw image, performs contrast-limited adaptive histogram equalization to increase the veins' contrast, and reduces image noise through a Bilateral Gaussian Filter that preserves the veins' edges. Finally, a binary threshold segments the image and extracts the unique vein structure, which is then registered as a biometric template. A MATLAB normalized cross correlation algorithm computes a matching score [0-1] to compare an input image against a template for authentication. This process was repeated with all registered templates to test EVID's ability to use input images to identify individuals. A 0.573 match score threshold for the verification and identification processes was determined based on False Acceptance Rates and False Rejection Rates according to Biometric Evaluation Standards. EVID captured, processed, and stored peripheral vein images from 30+ samples, using these templates to authenticate and identify individuals from over 170 images. Future work includes using multi-modular biometrics to create the most secure identity verification system.

Awards Won:

Second Award of $2,000