Palm & Vein Technology - FAQs

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1. What is Palm Vein Scanning Technology?

Palm vein recognition is a biometric authentication method that uses near-infrared (NIR) illumination to capture the unique vascular pattern beneath the skin of the palm. Because these vein patterns are internal and invisible to the naked eye, they provide a highly secure biometric modality that is extremely resistant to replication and presentation attacks.

ClockedIn's solution extends beyond conventional IR-only systems by simultaneously capturing both NIR vein data and RGB surface imagery. By fusing internal vascular structures with external palm features, the system generates a high-entropy biometric template, significantly improving recognition accuracy, matching speed, and resilience against spoofing in large-scale identity databases.

2. What palm sizes can be reliably recognised?

There is no fixed size restriction within the supported capture range. The optimal scanning distance is 5–15 cm. Within this range, palms measuring approximately 5–10 cm in width and 15–22 cm in length can be captured consistently and reliably.

This range accommodates users from approximately 6 years of age through to adults with larger-than-average hand dimensions, ensuring broad demographic coverage in enterprise deployments.

3. How does the system handle partially covered palms?

The system incorporates advanced liveness detection and image quality assessment modules. These modules evaluate parameters including occlusion ratio, contrast levels, vein clarity, and signal integrity.

If captured data does not meet predefined liveness or quality thresholds, the transaction is automatically rejected. This ensures that only high-confidence biometric matches proceed, maintaining both security and recognition integrity.

4. Are there age limitations for users?

Palm vein and palm print patterns are generally stable from approximately six years of age. From a technical standpoint, there is no enforced lower age limit within the algorithm itself.

However, deployment policies may impose age restrictions depending on regulatory, compliance, or application-specific requirements (e.g., financial services or payment systems).

5. How does the scanner handle physiological changes in elderly users?

The device utilises 850 nm near-infrared LEDs in combination with high-sensitivity global-shutter CIS sensors, enabling penetration of 2–3 mm beneath the skin surface to capture vascular structures.

In cases where reduced blood perfusion affects image quality (e.g., in elderly users), the system can dynamically adjust exposure time (typically +10–20 ms) and sensor gain to compensate. This adaptive imaging capability helps maintain stable recognition performance across varying physiological conditions.

6. What is the sensor resolution?

Both RGB and NIR imaging channels operate at a resolution of 720 × 1024 pixels, providing sufficient detail for high-precision feature extraction and template generation.

7. Does the system require user guidance for positioning?

Yes. Proper positioning is required for optimal capture. The device incorporates distance sensing and automated palm Region of Interest (ROI) detection to evaluate hand placement in real time.

The user interface provides visual guidance to ensure consistent positioning, minimising acquisition errors and improving throughput in high-traffic environments.

8. How is natural hand movement handled during scanning?

The system employs multi-frame image fusion to compensate for natural hand motion during acquisition. It tolerates movement speeds of up to 0.5 m/s without materially degrading recognition accuracy.

This capability enhances usability in real-world deployment scenarios, including access control and high-volume transaction environments.

9. What environmental conditions affect recognition?

The system is designed for operation under the following environmental conditions:

- **Operating temperature:** −10°C to 50°C
- **Relative humidity:** 0–95%
- **Ambient illumination:** 0–50,000 Lux

Direct sunlight exposure on the sensor module should be avoided to maintain optimal capture performance.

10. How many transactions can be processed per hour under high load?

Under standard hardware and network conditions, each recognition cycle completes within approximately 1–1.5 seconds. This includes image acquisition, liveness verification, quality filtering, feature extraction, secure transmission, and server-side matching.

Actual hourly throughput depends on deployment architecture and concurrency configuration but supports high-volume enterprise environments.

11. What is the recognition accuracy?

The overall system recognition accuracy is approximately 99.5% under recommended operating conditions and within licensed database capacity limits.

12. What are the FAR and FRR values?

- **RGB palm print:** FRR 1.002% at FAR 1e-6
- **NIR palm vein:** FRR 1.52% at FAR 1e-6
- **Combined RGB + NIR fusion:** The statistical probability of simultaneous failure is approximately 1e-11.

The dual-modality fusion significantly reduces false acceptance risk while maintaining a practical false rejection rate for operational environments.

13. What is the power consumption?

- **Standby mode:** 1.5 W
- **Peak consumption during capture:** Up to 7.5 W
- **Average operating consumption:** Approximately 2.5 W

This low power profile supports integration into embedded and edge-based enterprise systems.

14. How are biometric templates protected at rest and in transit?

Biometric data is encrypted on-device using AES-256 with licence-bound cryptographic signatures. All data transmitted between device and backend systems is protected using SSL/TLS encryption.

This ensures confidentiality and integrity of biometric templates during both storage and transmission.

15. What is the data retention strategy for biometric and transaction data?

The system provides algorithmic matching services and stores encrypted palm feature vectors and index references only.

All additional data management responsibilities — including transaction records and any stored biometric images — remain under the control of the customer. Customers are responsible for ensuring storage and retention policies comply with local regulatory and data protection requirements.

16. Is end-to-end encryption used?

Yes. All device-to-server communications are secured using HTTPS with SSL/TLS encryption to ensure secure end-to-end data transmission.

17. How are palm templates stored?

Palm feature templates (both vein and print data) are encrypted using AES-256-CBC encryption before storage, ensuring protection against unauthorised access.

18. What is the size of one palm record?

Each biometric record is slightly over 4 KB in size, comprising approximately:

- 2 KB for palm vein features
- 2 KB for palm print features

One million records require approximately 4 GB of storage. If raw image caching is enabled, storage requirements may increase to approximately 1 TB per million records.

19. What primarily affects recognition speed?

Recognition performance is influenced by:

- Network bandwidth and latency
- Server-side CPU/GPU computational capacity
- OnTime radius and matching configuration parameters

Proper infrastructure provisioning is recommended for large-scale deployments.

20. What is the typical recognition delay?

Under standard conditions, total recognition time is typically under 1 second, including both client-side preprocessing and server-side matching operations.

21. What internet bandwidth is recommended for stable operation?

A minimum dedicated bandwidth of 100 Mbps is recommended to ensure stable and consistent performance in enterprise environments.

22. Has anti-spoofing been tested?

Yes. The system has been tested against a range of presentation attack vectors, including:

- High-resolution palm photographs
- Screen replay attacks
- 3D-printed hand models
- Artificial coverings such as gloves

Liveness detection is enforced through combined RGB and NIR imaging, significantly strengthening resistance to spoofing attempts.