



IMMERSIX

Error < 0.5°. Zero Re-calibration. Power < 10 mW.
Retina-based eye tracking for XR.

IMMERSIX has developed an advanced eye-tracking system specifically designed for XR devices and glasses, delivering the first consumer-grade eye-tracking solution based on retinal imaging technology. This approach, combined with finely-tuned algorithms, provides exceptional eye-tracking performance, ensuring compatibility across diverse user groups and delivering outstanding accuracy.

Eye Tracking in XR

Traditional eye tracking falls short of modern wearable XR device demands

Common camera-based eye tracking technologies primarily employ computer vision to capture external eye features. These characteristics are then analyzed and monitored to infer the user's gaze direction, vergence, and distance to the target of their attention. However, these methods have limitations: they lack the accuracy needed for tasks that involve pointing at small angular objects (e.g., toggling a light switch), suffer from limited coverage across diverse populations, can be affected by movement of the device on the user's face, and require frequent recalibrations.

IMMERSIX Solution

Retinal eye tracking is fundamentally different

IMMERSIX employs a distinct approach by focusing on the retina, rather than tracking external eye features. The retina, located at the back of the eye, is a light-sensitive tissue rich in nerves and blood vessels. This intricate network of features remains consistent over time, making it a highly reliable source for tracking.

By capturing detailed retinal images, IMMERSIX leverages the abundance of visual landmarks to accurately determine gaze direction from a single frame, delivering exceptional accuracy.



HIGH ACCURACY

0.5° angular error at p50, and 1° at p95.



NO RE-CALIBRATION

Requires only single system enrollment per user. For life.



POWER < 10 mW

Use of retina allows for high accuracy at low frame rates.



OUTDOOR-READY

Handles 50,000 lux ambient — ~10,000 lux at the eye after AR lens filtering.



ULTRA-COMPACT

Single 1.8 x 1.8 x 2.2 mm module per eye — one camera, one LED.



SUPPORTS ACTIVE XR

Functions seamlessly, even if the device shifts relative to the eyes.



RETINAL IDENTITY

Enables secure and unique user identification.



IMMERSIX revolutionizes consumer-grade eye tracking by capturing retinal images directly through the pupil, delivering superior performance without relying on external eye features.

Operability

Once-per-lifetime Enrollment

IMMERSIX begins with a one-time enrollment process, guiding users to move their eyes in a pattern that enables the system to capture a detailed mapping of key retinal features. These features are saved as a reference. This process, which takes about 20 seconds, is required only once in a user's lifetime. Once the process is complete, the system is ready for immediate use by the user, with no further adjustments or recalibration needed.

Gaze Tracking

IMMERSIX has developed algorithms that translate retinal features into eye orientations independently of eye position. This unique property eliminates the device shift problem and ensures bias-free gaze estimation. Tracking retinal optical features is robust and accurate due to the rich details of the retina. Since a person's gaze is determined by the position of their fovea - the region of the retina that corresponds to sharp central vision - tracking retinal features is as close as you can get to directly tracking the gaze itself.

This implementation is packaged in a small form-factor subsystem, ideally suited to integrate with the next generation of wearable devices.



Target Specifications

Metric	Value		
Accuracy	< 0.5° @ p50, < 1° @ p90		
Single Lifetime Enrollment Time	20 seconds		
Field of View	71° (55° x 45°)		
Camera Module	1.8 * 1.8 * 2.2 mm		
Max Update Rate	120 fps		
Power:	@ 1 fps	@ 10 fps	@ 100 fps
Compute: Alif M55 + Hardware Accelerator	~1.7 mW	~2.6 mW	~14.9 mW
Cameras	~5.6 mW	~6.3 mW	~13.2 mW
Illumination (940nm Infrared LED)	~0.1 mW	~0.6 mW	~6.4 mW
Total	~7.3 mW	~9.5 mW	~34.5 mW