



embracing a better life



WEARABLE EYE-TRACKING

Imec's new ergonomic eye tracking technology paves the way for high-quality, low-cost AR and VR applications

Glasses that can monitor eye movement can be used for different applications: to identify and treat ocular diseases and potentially also for early diagnosis of Alzheimer; for human machine interface e.g. managing notification in smart glasses display; for virtual reality; for neuromarketing.

EYE TRACKING TODAY: EXPENSIVE, BULKY AND OFTEN NOT FAST ENOUGH

Today's commercial eye movement detection technology makes use of high-resolution cameras embedded in eye-tracking glasses or other (non-wearable) hardware solutions. Though these camera-based solutions can accurately determine the direction of users' gaze, their frame rates are often not fast enough to match the eyes' most rapid movements. They are also rather power-hungry, thus requiring large batteries that are hard to integrate into AR/VR glasses' design due to their size. In addition, these systems are fairly expensive, which limits their commercial potential.

Imec developed a new eye tracking technology that is at the same time significantly faster, cheaper and more compact than existing solutions. Instead of using cameras, imec researchers use electrooculography (EOG), an alternative way of tracking eye movements with four electrodes positioned around the eyes. The technology is wireless and can be fully integrated into a set of AR/VR glasses, thus providing optimal user comfort and a high-quality AR/VR experience.



imec's newest prototype with enhanced EOG performance and an optimized, ergonomic design

OUR EOG HEADSET: A LOW-COST, HIGH-QUALITY SOLUTION

Imec's scientists are fine-tuning a prototype AR glasses based on a new technology that uses electrooculography (EOG) to track eye movement. Instead of a camera, four comfortable, dry contact electrodes are built into the frame of typical glasses. Parallel to that, an advanced algorithm was developed to translate the signals into a concrete gaze position, based on the angle the eye is making with its central point of vision.

This new approach can achieve a sampling rate of 256 samples per second, meaning that it can detect the eye's position in real time more than twice as fast as current camera-based solutions. Another important asset is its efficient use of resources: it is much more energy-efficient than camera-based solutions, requires less processing power and - on a large scale - it can be produced at a much lower cost. By using imec's miniaturized, low-power solutions, the complete system including a battery can be integrated into two small boxes behind the user's ear. Whereas current VR headsets with integrated eye tracking are rather bulky, our solution can easily be integrated into an ergonomic design that looks very similar to regular glasses, thus greatly enhancing users' comfort. Finally, imec's prototype also has one additional feature that differentiates it from other solutions: in addition to EOG tracking, the prototype also uses EMG to detect facial expressions. These provide valuable information to determine a user's emotional state, which can be used to enhance personalization, to give feedback, or even to diagnose potential muscle diseases.

LOOKING FOR PARTNERS FOR JOINT DEVELOPMENT

Our imec researchers - both hardware and software specialists - are currently fine-tuning and testing the prototype headset to illustrate and optimize the potential of eye tracking. We are looking forward to collaborating with research and industry partners that are interested in applying and jointly developing the next-generation of eye movement detection systems. This technology can be used in many fields, ranging from entertainment to health applications. We are looking for companies that want to further develop and use these EOG glasses for their specific application field.

KEY BENEFITS

- Cheaper than current market solutions
- Twice as fast due to lower processing time (no need to process images off-board)
- Enhanced energy-efficiency (8-10 hours without charging)
- Wireless (via Bluetooth)
- Compact & ergonomic design
- Detection of facial expressions

APPLICATION FIELDS

- Healthcare
- VR/AR training applications
- Virtual gaming
- Entertainment
- Neuromarketing



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