Project Parterns

Politecnico di Milano, IT

Fraunhofer-Gesellschaft zur Foerderung der angewandten Forschung e.V, DE

Heriot-Watt University, UK

Micro Photon Devices s.r.l., IT

Centro Ricerche FIAT scpa, IT

EMZA Visual Sense LTD, IL

CF Consulting Finanziamenti Unione Europea s.r.l., IT

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MiSPiA

Microelectronic Single-Photon 3D Imaging Arrays
for low-light high-speed Safety and Security Applications

MiSPIA consortium consists of 7 partners, who are among the leading European research groups in the fields of SPAD arrays and single-photon instrumentation (Politecnico di Milano, Italy), CMOS sensors fabrication and advanced SOI processes (Fraunhofer-Gesellschaft zur Foerderung der angewandten Forschung e.V, Germany), design and fabrication of microlens arrays (Heriot-Watt University, United Kingdom), development of time-correlated single-photon counting detection modules and cameras (Micro Photon Devices s.r.l., Italy), safety applications in automotive field (Centro Ricerche Fiat scpa, Italy), then a leader in the security surveillance monitoring (EMZA Visual Sense Ltd, Israel) and finally CF consulting srl (Italy) with vast experience in the management and dissemination of European projects.

MiSPiA illuminator for the indirect iTOF laboratory tests

www.mispia.eu

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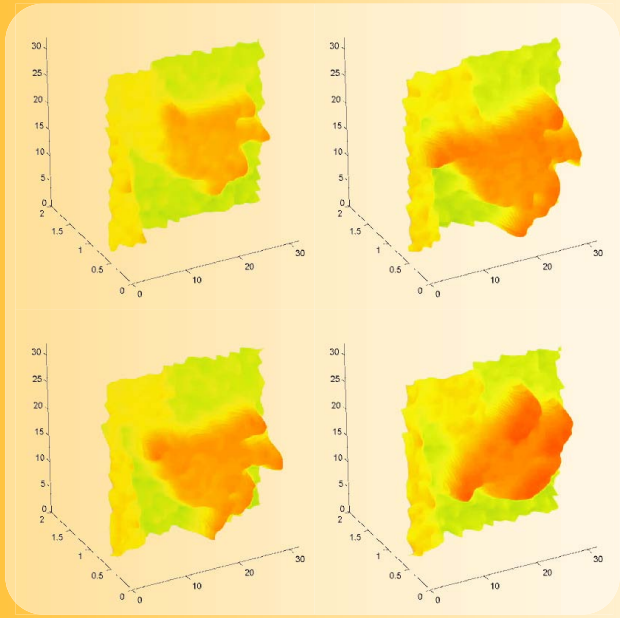
Information and Communications Technologies
Seventh Framework Programme

SEVENTH FRAMEWORK PROGRAMME

MiSPIA Project

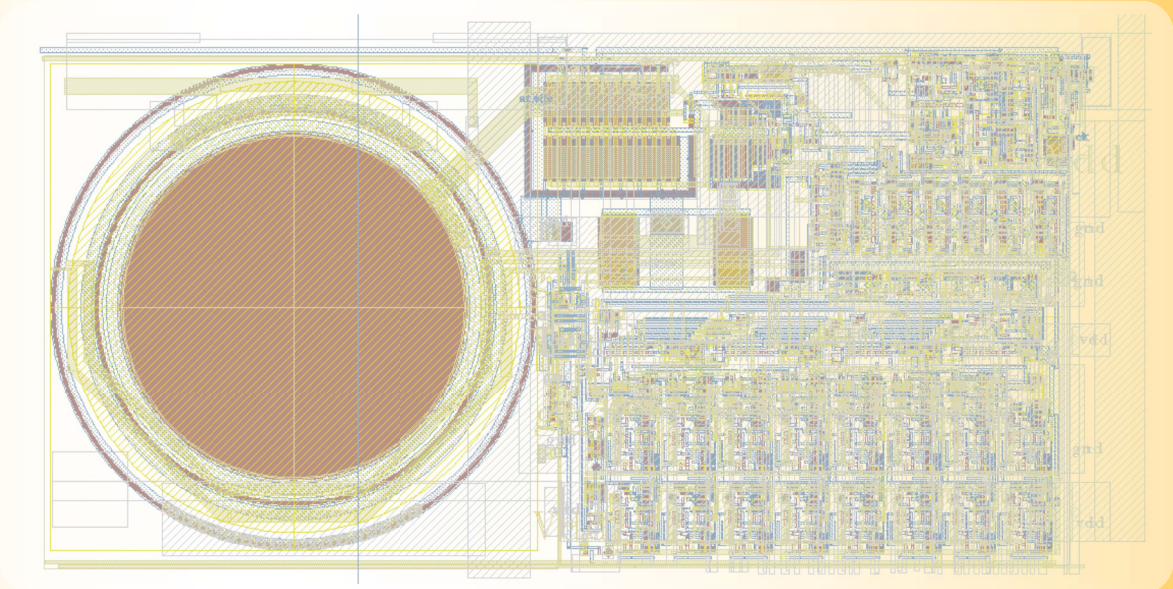
MiSPIA idea is to develop advanced micro-electronic SPAD array chips able not only to count single photons (“single-photon counting”), but also to accurately tag them with their arrival time (“single-photon timing”) and so provide a full image (“single-photon imaging”) of the object under investigation. Therefore, MiSPIA aims to conceive, develop and fabricate photonic and microelectronic technologies for cost-effective manufacturing of very fast, highly sensitive, two-dimensional (2D) and three-dimensional (3D) SPAD cameras running at higher speed than standard video-rate.



Example 3D acquisition at 25 fps.
A hand is moving in front of the camera

MiSPIA results of the first two years

- ✓ Definition of the requirements for long-range 2D intruder imaging, long range 3D surveillance, short range 3D range for automotive
- ✓ Design and layouts of the first test-structures to be used for the fabrication of SPADs and smart pixels to be used in the project
- ✓ Design and fabrication of several different types of SPAD detector
- ✓ Identified the most promising SPAD structure and the trade-offs among performances and operating conditions (mainly the excess bias)
- ✓ Design of the analog front-end electronics and the overall smart-pixels and miniarrays for 2D imaging, based on photon couting
- ✓ Design of smart-pixels and miniarray for dTOF and iTOF 3D ranging
- ✓ Design and fabrication of final FrontSPAD arrays for iTOF and dTOF 3D ranging
- ✓ Design and fabrication of prototype iTOF illuminator
- ✓ First experimental trial of iTOF 3D ranging camera



Smart pixel for 3D dTOF ranging with integrated 100µm diameter SPAD