B.Sc./ M.Sc. Thesis

Activating a CMOS Pixelated Capacitive Sensor Platform by Inkjet Printing

Interested in CMOS-based sensor platforms, sensor electronics, and hands-on experiments? This project combines these challenges to functionalize the CMOS platform via a desktop inkjet printer.

Background
Complementary metal oxide semiconductor (CMOS) technology is employed in producing most of the modern-day electronic gadgets owing to its low cost and energy efficiency. However, the adaptability of CMOS technology in manufacturing a diverse range of sensors is constrained because of the prerequisites like a cleanroom environment for dedicated depositions, and the low compatibility of sensor materials in CMOS manufacturing technology. It is necessary to introduce an easy and generic approach to make CMOS surfaces responsive to different external stimuli. In this context, inkjet printing technology can deposit various transduction materials for functionalizing CMOS surfaces and detecting diverse signals. Here, we will use a commercial inkjet printer to deposit functional materials directly onto a CMOS Pixelated Capacitive Sensor (PCS) array (developed by NXP Semiconductors).

Research Question
Is it possible for a CMOS PCS platform to detect and interpret multispectral signals (Visible/IR)?

Your tasks
- Understanding/improving the existing code to control nozzles and stage of the desktop inkjet printer.
- Using the inkjet printers to functionalize CMOS capacitive sensors.
- Building optical measurement setup and acquire real-time sensor data using embedded MCUs.
- Optimising the sensing inks to achieve fast response and high sensitivity.
- Analysing multispectral signals by machine learning and PCA.

Inkjet printer

Inkjet printing of different materials on CMOS-PCS array

Exposure of different input stimuli and acquiring data from CMOS PCS platform

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