



A capacitive touchscreen biosensor for label-free detection of electrolyte concentrations

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Abstract:

We are investigating the use of mutual projected capacitive touchscreens as a label-free sensing technique. It is projected that by 2021 the number of users of capacitive touchscreen-based mobile devices will have grown to 3.8 billion people worldwide, a 52% increase within just five years. Smartphone penetration is especially expanding amongst developing countries and has attracted attention for collecting a sensor's readout or interpreting sensed data in low-cost healthcare applications. In the medical technology sector, in-vitro diagnostics is the leading growth area and anticipated applications include biosensors will allow monitoring of drinking water quality or measurement of physiological parameters such as blood glucose levels. Here we report on the benefits and challenges of using the capacitive touchscreen for biosensing studies, a component of the mobile device often neglected in the literature. Capacitive fringe fields project above the touchscreen's glass surface to sense and interact with a stylus or finger. Instead, we examine interactions with fluid samples and specifically sensing the presence of electrolytes. This is carried out by studying the polarisation properties of electrolyte samples in response to different electrical perturbation frequencies up to the megahertz regime. Initial results show a linear response for static capacitance measurements of low ionic concentrations below 200 μM of sodium, magnesium, calcium or potassium chloride. This has potential to directly transfer to human sweat sensing for monitoring of chronic kidney dysfunction and opens the door to exploring more



complex biosensing with capacitive touchscreen displays.

Biography:

SEBASTIAN HORSTMANN received his BSc and MSc degree in Medical Physics from the Heinrich Heine University of Duesseldorf. He started his research on colloidal particles in laser potential fields in Prof Stefan Egelhaaf's Experimental Soft Matter Physics Group in Duesseldorf and focused on droplet microfluidics as a visiting graduate student in Prof David Weitz' Experimental Soft Condensed Matter Laboratory at Harvard University. He holds an MRes degree in Sensor Technologies and Applications and is currently pursuing an EPSRC funded PhD on capacitive touch sensing of electrolytes and biomaterials for healthcare applications in Dr Ronan Daly's Fluids in Advanced Manufacturing Group at the Institute for Manufacturing and in Prof Lisa Hall's Analytical Biotechnology Laboratory at the University of Cambridge.

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