Smartphone-based biosensing platform evolution: implementation of electrochemical analysis capabilities

Lab-on-Chip technologies offer great opportunities for the democratization of in-vitro medical diagnostics to the consumer-market. Despite the limitations set by the strict instrumentation and control requirements of certain families of these devices, new solutions are emerging. Smartphones now routinely demonstrate their potential as an interface of choice for operating complex, instrumented Lab-on-Chips. The sporadic nature of home-based in-vitro medical diagnostics testing calls for the development of systems capable of evolving with new applications or new technologies for Lab-on-Chip devices. We present in this work how we evolved the first generation of a smartphone/Lab-on-Chip platform designed for evolvability. We demonstrate how reengineering efforts can be confined to the mobile-software layer and illustrate some of the benefits of building evolvable systems. We implement electrochemical capabilities on our platform prototype and carry out cyclic voltammetry to measure dopamine concentrations over several orders of magnitude.