

Codesign for Broadcast Addressing Biochip Towards Tamper-Resistance and Enhanced Reliability

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Abstract:

Digital Microfluidic Biochips (DMFB), famous for their low manufacturing cost and high responsiveness, have shown vulnerability to actuation sequence tampering attacks with the motive of manipulating assay results. Broadcast addressing is a specialized pin-mapping scheme whose highly programmable nature can be leveraged to expose the effect of stealthy actuation tampering attacks via networks. State-of-the-art research producing tamper-resistant outcome do not ensure feasible wire-routing. Moreover, higher electrode switching activity degrades reliability of a biochip. There must be a codesign considering all these design, security, and reliability issues together for attaining safe and potential deliverables. As per our knowledge, this paper introduces the first pin-mapping method for broadcast addressing biochips addressing the problems of tamper-resistance, wire-routing, and switching toggles. Experimental results show that our method improves the design significantly in terms of well-known tamper-resistance metrics, provides a pin-mapping solution with feasible wire-routing, and potentially reduces switching toggles which in turn enhance reliability of the chip.

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