A portable and autonomous magnetic detection platform for biosensing

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Abstract: This paper presents a prototype of a platform for biomolecular recognition detection. The system is based on a magnetoresistive biochip that performs biorecognition assays by detecting magnetically tagged targets. All the electronic circuitry for addressing, driving and reading out signals from spin-valve or magnetic tunnel junctions sensors is implemented using off-the-shelf components. Taking advantage of digital signal processing techniques, the acquired signals are processed in real time and transmitted to a digital analyzer that enables the user to control and follow the experiment through a graphical user interface. The developed platform is portable and capable of operating autonomously for nearly eight hours. Experimental results show that the noise level of the described platform is one order of magnitude lower than the one presented by the previously used measurement set-up. Experimental results also show that this device is able to detect magnetic nanoparticles with a diameter of 250 nm at a concentration of about 40 fM. Finally, the biomolecular recognition detection capabilities of the platform are demonstrated by performing a hybridization assay using complementary and non-complementary probes and a magnetically tagged 20mer single stranded DNA target. © 2009 by the authors; licensee Molecular Diversity Preservation International, Basel, Switzerland.

Author Keywords: Biomolecular recognition detection; Digital signal processing; Lab-on-chip; Magnetic nanoparticles; Magnetoresistive sensors; Portable platform

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