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Security Issues in Cyberphysical Digital Microfluidic Biochips

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Abstract

Among recent technological advances, microfluidic biochips have been leading a prominent solution for healthcare and miniaturized bio-laboratories with the assurance of high sensitivity and reconfigurability. The main challenge in design automation of microfluidic biochips is to incorporate on-chip mixing and dilution of biochemical reagents and samples to achieve a desired concentration required for bioprotocols. The heuristic must be able to minimize sample, buffer and wastage as much as possible in such a way that desired concentration factor is achieved in a minimum number of mix/split cycles. In last decades, Digital microfluidic (DMF) biochip industry has been grown exponentially due to its so many advantages in the field of healthcare firms. As a result, the chance of attacking biochip by malicious people to alter its operation and waste of more costly samples is increased day by day. Hence, researchers need to search new directions that will provide security aspects for DMF biochips. Moreover, on increasing more unreliable communication networks day-by-day, technological shifts in the fields of communication and security are now converging. In today's cyber threat landscape, these microfluidic biochips are ripe targets of powerful cyber-attacks from different hackers or cyber criminals. Different attacks specifically, hardware Trojans in microfluidic biochips can jeopardize the healthcare industries. As a result, securing such systems is of paramount importance. For past few years, checkpoints and error recovery mechanisms have attracted researchers' attention. Unfortunately, such research works are not sufficient to protect actuation sequence/activation sequence and layout of DMF biochip from intellectual property (IP) theft. Also, these works are incapable of handling more than one hardware Trojan insertion into chip. Those research works on checkpoint minimization does not guarantee about optimal solution. Hence, further research work is essential to meet the challenges of checkpoint minimization, hardware Trojans, man-in-the-middle attack, and IP piracy to DMF biochips and find out the respective actions which should be taken to offset the security vulnerabilities in biochip for its trustworthy and reliability before any attack jeopardizes the world of healthcare, biological and biochemical industries.

Biography:

Debasis Gountia received the Master of Technology degree in Computer Science and Engineering from the Indian Institute of Technology (IIT) Kharagpur, West Bengal, India in 2010. He received the Bachelor of Technology degree in Computer Science and Engineering from the University College of Engineering (UCE) Burla of Biju Patnaik University of Technology (BPUT) Rourkela, India. Presently, he is doing his Ph. D. programme in the Computer Science and Engineering department of the IIT Roorkee, Uttarakhand, India. He has more than 15 years of teaching and research experience in various organizations. His research interests include Algorithms and Foundations of Chip Design, Computer Security, Blockchain, Machine Learning, Cryptography, Internet of Things (IoT), and Distributed Systems. He has authored 11 international referred journals, 12 conference proceedings, 3 books, 2 book chapters for the CRC Press, one IEEE/ACM Transaction, and two filled patents in the aforementioned areas.

References

1. "Biochips Market, Type, End User, Fabrication Technology - Forecast to 2020," Available: http://www.marketsandmarkets.com/MarketReports/biochipsadvancedtechnologiesandglobalmarket54. html/.
2. G. M. Whitesides, "The Origins and the Future of Microfluidics," Nature, vol. 442, pp. 368–373, 2006.
3. K. Chakrabarty, and F. Su, Digital Microfluidic Biochips: Synthesis, Testing and Reconfiguration Techniques. CRC Press, 2007.
4. Y. Luo and K. Chakrabarty, "Design of Pin-Constrained General-Purpose Digital Microfluidic Biochips," IEEE Trans. Comput.-Aided Des. (TCAD) Integrated Circuits Syst., vol. 32, no. 9, pp. 1307–1320, 2013.

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