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Abstract

System Architecture for IIoT-Based POC Molecular Diagnostic Device †

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Abstract: In this paper, we investigate the efficient structure for point-of-care (POC) molecular diagnostic system based on of the industrial-internet-of-things (IIoT). The target system can perform automated molecular diagnosis including DNA extraction, PCR amplification, and fluorescence detection. Samples and reagents are placed in a multi-room cartridge and loaded into the system. A rotating motor and a syringe motor control the cartridge to extract DNA from the sample. The extracted DNA is transferred to a polymerase chain reaction (PCR) chamber for DNA amplification and detection. The proposed system provides multiplexing of up to 4 colors. For POC molecular diagnostics, World Health Organization demands features such as low volume, low cost, fast results, and user-friendly interface. In this paper, we propose a system structure that can satisfy these requirements by using PCR chip and open platform. A distributed structure is adopted for the convenience of maintenance, and a web-based GUI is adopted for the user's convenience. We also investigated communication problems that may occur between system components. Using the proposed structure, the user can conveniently control from standard computing devices including a smartphone.

Keywords: point-of-care molecular diagnosis device; industrial-Internet-of-Thing; system architecture; distribute computing