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Development and Evaluation of a High-Performance Electrochemical Potentiostat-Based Desktop Application for Rapid SARS-CoV-2 Testing

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Abstract
The COVID-19 pandemic has necessitated the development of rapid and trustworthy diagnostic tools. Reverse transcription-polymerase chain reaction (RT-PCR) is the gold standard for detecting SARS-CoV-2 but has cost and time constraints. The sensitivity, specificity, and low cost of electrochemical biosensors make them an attractive alternative for virus detection. This study aims to develop and evaluate a high-performance desktop application for an electrochemical potentiostat-based SARS-CoV-2 test device, with a user-friendly interface that automatically interprets results, to expedite the testing process and improve accessibility, particularly in resource-limited settings. The application was built with the Electron framework and the HTML, CSS, and JavaScript programming languages. Our findings indicate that the developed electrochemical potentiostat-based desktop application demonstrates high accuracy compared to commercial software, achieving rapid detection within 30 seconds. The graphical user interface was found to be straightforward and user-friendly, requiring minimal training for efficient system operation. Our electrochemical potentiostat-based desktop application represents a valuable tool for rapid SARS-CoV-2 testing, particularly in settings with limited resources. This research contributes to developing rapid and reliable diagnostic tools for SARS-CoV-2 and potentially other pandemic-causing viruses, addressing the pressing need for improved public health surveillance and response strategies.

Author Keywords
Cross-platform apps; Desktop application; Electrochemical potentiostat; Rapid testing; SARS-CoV-2; User-friendly interface; Virus detection; Web technologies

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