

ABSTRACT

This study discusses the design and implementation of a non-invasive blood glucose meter based on Near Infrared (NIR) technology with various LED wavelengths. This system uses a combination of LEDs (green, blue, and infrared) as a light source and a photodiode as a receiver, with the measurement results displayed on an LCD. The working principle of the device utilizes the absorption properties of light by glucose molecules at certain wavelengths, thus allowing the estimation of glucose levels without taking blood samples. Testing was carried out using phantom blood solutions (aquadest, NaCl, and sugar) and on 25 human subjects with three data collection conditions (before meals, 1 hour after meals, and 2 hours after meals). The test results showed a correlation between the sensor output voltage and blood glucose levels measured using a glucometer, with infrared (IR) LEDs providing the highest coefficient of determination ($R^2 = 0.8719$), followed by green LEDs ($R^2 = 0.6907$) and blue LEDs ($R^2 = 0.3388$). From this research, the developed tool is able to detect changes in blood glucose levels non-invasively with high accuracy on IR LEDs, so it has the potential to be an alternative method for monitoring glucose levels that is more comfortable and safe for diabetes sufferers.