INTISARI

ANALISIS PERANCANGAN TEKNIS DARI ALAT PENDETEKSI GULA DARAH NON INVASIF (GLUKOMETER) BERBASIS *SEMI-CYLINDRICAL CAPACITIVE SENSOR* (SCCS)

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Penelitian ini bertujuan untuk menganalisis kelayakan dari perancangan dan keandalan dari alat pendeteksi gula darah non-invasif (glukometer) *berbasis Semi-Cylindrical Capacitive Sensor* (SCCS) dengan basis mikrokontroller ATmega328P. Alat ini dirancang untuk mengukur kadar gula darah secara non invasif, tanpa memerlukan pengambilan sampel darah. Penelitian ini menggunakan SCCS untuk mengukur konstanta dielektrik jari tangan yang mengandung glukosa. Konstanta dielektrik ini kemudian dihubungkan dengan kadar gula darah melalui persamaan kalibrasi. Persamaan kalibrasi diperoleh dari data eksperimen yang menghubungkan konstanta dielektrik dengan kadar glukosa. Mikrokontroller ATmega328P digunakan untuk memproses sinyal dari SCCS dan menghitung kadar gula darah berdasarkan persamaan kalibrasi. Hasil pengukuran kadar gula darah ditampilkan pada LCD I2C. Uji keandalan alat ini dilakukan dengan membandingkan hasil pengukuran dengan hasil pengukuran glukometer invasif standar. Hasil penelitian menunjukkan bahwa alat ini memiliki akurasi sebesar 88,45-97,81% mendekati nilai Glukometer Invasif.

Berdasarkan hasil pengujian, alat ini menunjukkan beberapa kekurangan dalam hal keandalan. Alat ini kurang stabil dan rentan terhadap interferensi elektromagnetik dan kurang sensitifnya nilai kapasitansi dalam melakukan pembacaan serta minimnya kapasitas deteksi pada perubahan fisis dari kadar glukosa. Hal ini menyebabkan hasil pengukuran yang tidak selalu akurat dan konsisten. Penelitian ini menunjukkan bahwa alat pendeteksi gula darah non invasif berbasis SCCS dengan basis mikrokontroller memiliki potensi untuk menjadi alat yang mudah digunakan, aman, dan portabel untuk mengukur kadar gula darah. Namun, alat ini masih perlu ditingkatkan dalam hal keandalannya sebelum dapat digunakan secara praktis.

Kata Kunci: Akurasi, Non Invasif, *Semi-Cylindrical Capacitive Sensor* (SCCS), Studi Kelayakan, Glukometer.

ABSTRACT

TECHNICAL DESIGN ANALYSIS OF NON-INVASIVE BLOOD GLUCOSE DETECTION DEVICE (GLUCOMETER) BASED ON SEMI-CYLINDRICAL CAPACITIVE SENSOR (SCCS)

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This research aims to analyze the feasibility and reliability of a non-invasive blood glucose detection device (glucometer) based on semi-cylindrical capacitive sensor (SCCS) with ATmega328P microcontroller. The device is designed to measure blood glucose levels non-invasively, without requiring blood sampling. This research uses SCCS to measure the dielectric constant of the finger containing glucose. This dielectric constant is then linked to blood glucose levels through a calibration equation. The calibration equation is obtained from experimental data that links the dielectric constant to blood glucose levels. The ATmega328P microcontroller is used to process signals from the SCCS and calculate blood glucose levels based on the calibration equation. The blood glucose measurement results are displayed on an I2C LCD. The reliability test of this device is carried out by comparing the measurement results with the measurement results of a standard invasive glucometer. The results of the study show that the device has an accuracy of 88.45-97.81% close to Invasive Glucometer.

However, based on the test results, the device shows several shortcomings in terms of reliability. The device is less stable and susceptible to electromagnetic interference and the lack of sensitivity of the capacitance value in making readings as well as the minimal detection capacity for physical changes in blood glucose levels. This causes measurement results that are not always accurate and consistent. This research shows that the non-invasive blood glucose detection device based on SCCS with ATmega328P microcontroller has the potential to be an easy-to-use, safe, and portable tool for measuring blood glucose levels. However, the device still needs to be improved in terms of its reliability before it can be used practically.

Keywords: Accuracy, Non-Invasive, Semi-Cylindrical Capacitive Sensor (SCCS), Feasibility Study, Glucometer.