ABSTRAK

Paparan sinar *ultra-violet* (UV) berlebihan dapat menyebabkan gangguan kesehatan kulit, mulai dari penuaan dini hingga kanker kulit. Namun, penggunaan *sunscreen* saat ini umumnya dilakukan tanpa mempertimbangkan intensitas UV aktual di lingkungan, sehingga perlindungan kulit menjadi kurang optimal. Penelitian ini bertujuan merancang sistem rekomendasi *sunscreen* adaptif berbasis *Internet of Things* (IoT) yang memanfaatkan data intensitas UVA dan UVB. Sistem menggunakan sensor VEML6075, mikrokontroler ESP32, RTC DS3231, dan LCD I2C sebagai tampilan lokal. Data diklasifikasikan menggunakan metode *K-Nearest Neighbor* (KNN) untuk menghasilkan rekomendasi *Sun Protection Factor* (SPF) dan *Protection Grade of UVA* (PA), yang disimpan pada *Firebase Real-time Database* dan ditampilkan melalui aplikasi Android. Hasil pengujian menunjukkan sensor memiliki kesesuaian 97,93%, model KNN (K=5) mencapai akurasi 99,75% pada klasifikasi SPF dan akurasi 99,85% pada klasifikasi PA, pengujian *black box* mencapai keberhasilan 100%, dan skor *System Usability Scale* sebesar 75 (*Acceptable*, *Grade* B). Sistem mampu memberikan rekomendasi *sunscreen* secara adaptif, konsisten, dan akurat.

Kata kunci: *Internet of Things*, *K-Nearest Neighbor*, sinar *ultra-violet, sunscreen*, VEML6075.

ABSTRACT

Excessive ultraviolet (UV) exposure can cause skin problems, ranging from premature aging to skin cancer. However, sunscreen is generally used without considering the actual environmental UV intensity, resulting in suboptimal skin protection. This study aims to design an adaptive, IoT-based sunscreen recommendation system that utilizes UVA and UVB intensity data. The system uses a VEML6075 sensor, an ESP32 microcontroller, a DS3231 RTC, and an I2C LCD for local display. The data is classified using the K-Nearest Neighbor (KNN) method to generate Sun Protection Factor (SPF) and Protection Grade of UVA (PA) recommendations, which are stored in the Firebase Real-time Database and displayed through an Android *application. Test results show the sensor achieves 97.93% agreement with reference data, the KNN model (K=5) achieves 99.75% accuracy in SPF classification and 99.85% accuracy in PA classification, black box testing achieves a 100% success rate, and the System Usability Scale score is 75 (Acceptable, Grade B). The system is able to provide adaptive, consistent, and accurate sunscreen recommendations.*

Keywords: Internet of Things (IoT), K-Nearest Neighbor (KNN), sunscreen, ultraviolet radiation, VEML6075