ABSTRAK

Kemampuan membedakan warna berperan penting dalam proses belajar anak usia dini. Namun, metode deteksi konvensional seperti tes Ishihara kurang sesuai karena bersifat statis dan minim interaksi. Penelitian ini mengembangkan *Color Quest*, game edukatif Android untuk anak usia 4–6 tahun sebagai media skrining awal potensi buta warna. Sistem ini mengintegrasikan *Finite State Machine* (FSM) untuk mengatur transisi permainan dan *Fuzzy Logic* berbasis inferensi Mamdani untuk mengevaluasi kesalahan pemain berdasarkan jenis warna. Pengembangan mengikuti tahapan *Game Development Life Cycle* (GDLC), dari konseptualisasi hingga rilis. Pengujian dilakukan melalui *unit testing*, *black-box testing*, serta uji alpha dan beta terhadap 24 siswa TK *Happy Holy Kids*. Hasil menunjukkan sistem berjalan stabil dan mudah digunakan. Mayoritas anak terklasifikasi Normal (54,2%), namun hampir separuh populasi siswa menunjukkan indikasi parsial, dengan deuteranomali sebagai temuan terbanyak. Validasi medis mendukung pentingnya skrining visual sejak dini secara edukatif, selaras dengan perkembangan kognitif anak, namun tetap mempertimbangkan keterbatasan respons usia dini. Oleh karena itu, hasil *Color Quest* tidak dimaknai sebagai diagnosis final, melainkan pemicu kesadaran awal yang dapat ditindaklanjuti. Pandangan ini sejalan dengan tujuan pengembangan game sebagai sarana awal yang adaptif dan menyenangkan bagi pendamping dalam memantau persepsi warna anak.

Kata kunci: game edukatif, Android, buta warna, *fuzzy logic*, *finite state machine*

ABSTRACT

The ability to distinguish colors plays a crucial role in the learning process of early childhood. However, conventional detection methods such as the Ishihara test are considered less suitable due to their static nature and lack of interactivity. This study developed Color Quest, an educational Android-based game for children aged 4–6 years as an early screening medium for potential color vision deficiency. The system integrates a Finite State Machine (FSM) to manage game state transitions, and Fuzzy Logic with Mamdani inference to evaluate player errors based on color categories. The development process followed the stages of the Game Development Life Cycle (GDLC), from conceptualization to release. Testing was conducted through unit testing, black-box testing, as well as alpha and beta trials involving 24 kindergarten students from Happy Holy Kids. The results showed that the system functioned stably and was easy to operate. Most participants were classified as Normal (54.2%), although nearly half showed partial indications, with mild deuteranomaly being the most frequently observed condition. Medical validation supports the importance of early visual screening in educational contexts, aligned with children's cognitive development, while also considering limitations in response behavior at an early age. Therefore, Color Quest results are not to be interpreted as final diagnoses but as early awareness triggers that can be followed up. This perspective aligns with the game's objective as an adaptive and enjoyable initial tool to assist caregivers in monitoring children's color perception.

Keywords: educational game, Android, color blindness, fuzzy logic, finite state machine