

ABSTRAK

Visualisasi organ sistem pencernaan manusia umumnya masih disajikan dalam bentuk gambar dua dimensi sehingga belum mampu menggambarkan bentuk organ secara lebih nyata. Selain itu, aplikasi *Augmented Reality* (AR) yang telah dikembangkan umumnya masih menggunakan pendekatan *marker-based*, sehingga bergantung pada *marker* dan belum mampu mengenali gambar ilustrasi organ secara otomatis. Penelitian ini bertujuan mengembangkan aplikasi *Augmented Reality* sistem pencernaan manusia berbasis Android menggunakan metode *Multimedia Development Life Cycle* (MDLC), menerapkan metode *Histogram of Oriented Gradients* (HOG) dan algoritma *K-Nearest Neighbor* (KNN) untuk mengenali gambar ilustrasi organ pencernaan, serta mengevaluasi tingkat *usability* aplikasi menggunakan *System Usability Scale* (SUS). Aplikasi dikembangkan menggunakan Unity, sedangkan proses *preprocessing*, ekstraksi fitur HOG, dan klasifikasi KNN dijalankan melalui server Flask. Pengujian model dilakukan menggunakan 200 citra organ yang terdiri atas 160 data *training* dan 40 data *testing*. Hasil penelitian menunjukkan bahwa model KNN dengan nilai $K = 3$ memperoleh *accuracy* sebesar 97,5%, *precision* 97,8%, *recall* 97,5%, dan *F1-score* 97,4%. Aplikasi mampu mengenali lima organ pencernaan melalui kamera *smartphone*, kemudian menampilkan model tiga dimensi beserta informasi organ yang sesuai. Hasil evaluasi *System Usability Scale* memperoleh skor rata-rata 85,25 yang termasuk kategori *Excellent*, Grade A, dan *Acceptable*, sehingga menunjukkan bahwa aplikasi memiliki tingkat kemudahan penggunaan yang baik.

Kata kunci: *Augmented Reality*, *Histogram of Oriented Gradients*, *K-Nearest Neighbor*, Sistem Pencernaan Manusia, *System Usability Scale*.

ABSTRACT

The visualization of the human digestive system is generally presented using two-dimensional images, which are unable to represent the actual shape of digestive organs effectively. In addition, most existing Augmented Reality (AR) applications still rely on a marker-based approach, making them dependent on markers and unable to automatically recognize digestive organ illustrations. This study aims to develop an Android-based Augmented Reality application for the human digestive system using the Multimedia Development Life Cycle (MDLC) method, implement the Histogram of Oriented Gradients (HOG) feature extraction method and the K-Nearest Neighbor (KNN) classification algorithm to recognize digestive organ illustrations, and evaluate the application's usability using the System Usability Scale (SUS). The application was developed using Unity, while image preprocessing, HOG feature extraction, and KNN classification were performed through a Flask server. The classification model was evaluated using 200 organ images consisting of 160 training images and 40 testing images. The results showed that the KNN model with $K = 3$ achieved an accuracy of 97.5%, a precision of 97.8%, a recall of 97.5%, and an F1-score of 97.4%. The application successfully recognized five digestive organs through a smartphone camera and displayed the corresponding three-dimensional model along with organ information. Furthermore, the usability evaluation obtained an average SUS score of 85.25, which falls into the Excellent, Grade A, and Acceptable categories, indicating that the application has a high level of usability.

Keywords: Augmented Reality, Histogram of Oriented Gradients, K-Nearest Neighbor, Human Digestive System, System Usability Scale.