ABSTRAK

Bahasa isyarat tangan merupakan salah satu bentuk komunikasi yang digunakan oleh kaum tunarungu dan tunawicara, namun keterbatasan pemahaman masyarakat umum sering kali menyebabkan diskriminasi terhadap penyandang disabilitas. Untuk mengatasi masalah ini, penelitian ini bertujuan mengembangkan alat penerjemah bahasa isyarat menggunakan teknologi *vision-based hand gesture recognition* berbasis pengenalan *static gesture* dan *dynamic gesture* dengan menerapkan metode ekstraksi *key point coordinates*. Teknologi ini diharapkan mampu mengatasi kekurangan pada metode sebelumnya yang membutuhkan perangkat keras khusus dan mahal.

Metodologi penelitian ini meliputi beberapa tahap. Pertama, pengumpulan data dilakukan melalui koordinat titik kunci (*key point coordinates*) menggunakan MediaPipe. Selanjutnya, data diproses melalui beberapa tahapan *pre-processing*, seperti *convert to relative coordinates*, *convert to one-dimensional list*, *normalize value*, serta *data splitting* untuk pelatihan dan pengujian. Model *Multi-layer Perceptron* (MLP) kemudian dilatih dengan data yang sudah diproses, dan dievaluasi menggunakan metrik performa seperti *accuracy*, *precision*, dan *recall*.

Hasil evaluasi menunjukkan bahwa model MLP memiliki akurasi yang tinggi dalam mendeteksi bahasa isyarat, baik pada *static gesture* maupun *dynamic gesture* dengan mengimplementasikan metode ekstraksi *key point coordinates*. Pada model *static gesutre*, *accuracy* keseluruhan mencapai 0,98, dengan sebagian besar kelas memiliki nilai *precision* sebesar 1,00 dan *recall* tertinggi sebesar 1,00, serta *recall* terendah sebesar 0,91. Sementara itu, untuk *dynamic gesture*, *accuracy* mencapai 0,98. Nilai *precision* tertinggi pada kelas 'j' dan 'z' dengan nilai 0,99. Kemudian, nilai *recall*, kelas 'stop' memiliki nilai tertinggi yaitu 1,00, diikuti kelas 'j' sebesar 0,99, dan kelas 'z' sebesar 0,96.

Kata Kunci: *Computer Vision, Hand Gesture Recognition, Multi-layer Perceptron, Key Point Coordinates,* MediaPipe

ABSTRACT

Sign language is a form of communication used by the deaf and mute communities. However, the general public's limited understanding often leads to discrimination against people with disabilities. To address this issue, this research aims to develop a sign language translator tool using vision-based hand gesture recognition technology, focusing on both static and dynamic gestures by applying a key point coordinates extraction method. This technology is expected to overcome the shortcomings of previous methods that required specialized and expensive hardware.

The research methodology consists of several stages. First, data collection is conducted through key point coordinates using MediaPipe. The data is then processed through several pre-processing steps, such as converting to relative coordinates, converting to a one-dimensional list, normalizing values, and data splitting for training and testing. The Multi-layer Perceptron (MLP) model is then trained with the processed data and evaluated using performance metrics such as accuracy, precision, and recall.

The evaluation results show that the MLP model has high accuracy in detecting sign language, both for static and dynamic gestures by implementing the key point coordinates extraction method. For the static gesture model, the overall accuracy reached 0.98, with most classes having a precision value of 1.00 and the highest recall value of 1.00, while the lowest recall was 0.91. Meanwhile, for dynamic gestures, the accuracy reached 0.98. The highest precision values were found in the 'j' and 'z' classes with a value of 0.99. As for recall, the 'stop' class had the highest value at 1.00, followed by the 'j' class at 0.99, and the 'z' class at 0.96.

***Keywords**: Computer Vision, Hand Gesture Recognition, Multi-layer Perceptron, Key Point Coordinates,* MediaPipe