

Sign Gestures Recognition for BISINDO and SIBI Alphabet using Morphology Algorithm based on Computer Vision

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Sign Gestures Recognition for BISINDO and SIBI Alphabet using Morphology Algorithm based on Computer Vision

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Abstract

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The system proposed in this research is sign language recognition system based on computer vision which in this study using several methods of data collection such as 1. Preprocessing, 2. Feature Extraction, 3. Classification, 4. Sign Recognition. The first stage, include several activities, i.e. Video Input, Convert to Frame, Filter Skin, Hand Segmentation. The second stage, In this stage, include activities, i.e. Centroid, Edge Detection, Smooth the contour. The Third stage, include activities i.e. Eigen Vector, Eigen Values and Euclidean distance. The final stage, where recognized gesture and then converted to text in form of BISINDO and SIBI alphabet.

Keywords :BISINDO, SIBI, Morphology

1 Introduction

Basically a sign language is the principal method of communication for the deaf people. In order to common people can communicate with the deaf so translator usually translate it into sign language. Main component that used in sign language is the use of hand and finger sign. While communication sign language used in there are two, namely Indonesian sign language (BISINDO) and Indonesian sign system (SIBI). Vision-based on automatic hand gesture recognition has many implementation for its application such as human-computer interaction, a sign language interpreter, remote control. One communications technology that can be applied is the image processing technology in sign language for candidates teachers for deaf students with or normal people in general with its main components, namely the use of hand and finger sign. This research aims to create a machine translator for dynamic sign language in which the machine is able to detect 26 gestures for each Indonesian sign language (BISINDO) dan Indonesian sign system (SIBI) that used for candidates teachers for deaf students or normal people in general using webcam and then the output is converted in text form.

2 Literature Review

2.1 Gesture

Wilson and Bobick [Wilson and Bobick, 1995] defines the movement as a gestures of the body that tend to communicate with other agents. Successful communication if sender and receiver must have the same set of information for a particular gestures.

2.2 Sign Language

The term sign language is similar with term of language because there are a lot of them scattered throughout regions of world. Sign language was developed a long time and has evolved over a long time, have the grammar and vocabulary of sign language and therefore considered as real language [Braem, 1995].

Lang et al [Lang and Raul, 2011a] sign language do not have sense of hearing that is required no sound required to produce it. It is common type of language among deaf people.

Nehemia and Febrilian [Sugianto and Samopa, 2015] deaf and speech impaired people in Indonesia communicate using sign language that refers to two systems namely, Indonesian Sign Language (BISINDO) and Indonesian Sign System (SIBI). BISINDO is developed by deaf people themselves through GERKATIN

(Indonesian Deaf Welfare Movement) while SIBI is developed by normal people, not deaf people. SIBI equal to sign language that used in America, namely, ASL (American Sign Language).



Figure 1: BISINDO Alphabets



Figure 2: SIBI Alphabets that refers to the ASL

2.3 Morphology

Sianipar [Sianipar, 2013] Morphology is one of techniques in image processing that is based on shape of segment or region in the image. There are 4 morphological operators i.e. dilation, erosion, opening and closing.

2.4 Related Work

Some research related on sign language i.e. [Sawant, 2014], [Rajeshree S. Rokade, 2014], [DivyaS and S, 2014], [JoyettaSingha and Das, 2013], [Capilla, 2012], [Omkar and Monisha, 2011], [Lang and Raul, 2011a], [Iqbal and Purnomo, 2011], [Maraqa and Abu-Zaiter, 2008], [Kountchev et al., 2008], [Holden et al., 2005], [Bowden and Brady, 2004], [Sekar, 2001] while relating to gesture i.e. [Haitham Sabah Badi, 2014], [JoyettaSingha, 2013], [M, 2013], [Mokhar M Hasan, 2012], [Zhang and Wang, 2012],

[27] iani and Susilawati, 2010], [Stergiopoulou and Papamarkos, 2009], [Nguyen et al., 2009], [Bailador and Troster, 2007], [Akmeliawati and Kuang, 2007], [Binh and Ejima, 2005], [Bowden and Brady, 2004].

3 Research Methodology

3.1 Proposed System

The proposed method in this research design which is shown in Figure 3 use several methods of data collection, i.e. 1. Preprocessing, 2. Feature Extraction, 3. Classification, 4. Sign Recognition.

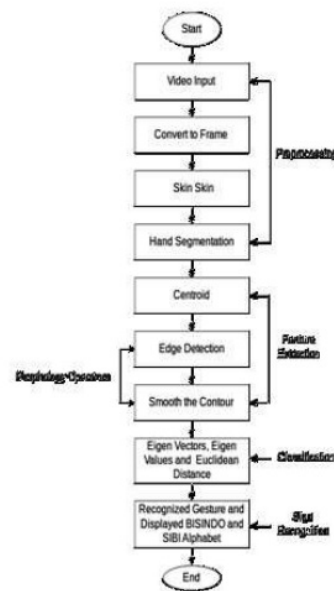


Figure 3: Proposed System

3.2 Preprocessing

In this stage, include several activities, i.e. Video Input, Convert to Frame, Filter Skin, Hand Segmentation.

• Video Input and Convert to Frame

In this stage, image capturing is done by webcam, image captured in form of Red, Green and Blue image (RGB). Gestures captured with various scale, translation and rotation and next performed convert to frame.

• Skin Filter

In this step, performed to get region of colors skin pixels from background with using processing technique of colors, which is shown in

Figure 4. Step being taken in filtering of skin, i.e.

1. Image in form of RGB (Red, Green, Blue) converted to HSV colors space.
2. Filter Image is used to reduce noise in the image using average filter.
3. Perform image conversion to grayscale image.



Figure 4: Skin Filter

• Hand Segmentation

In this step, perform to separation hand with other part by the way of cutting image because will be done processing is part of hand. Later, perform to examination (scan) againts image from vertical and horizontal position to determine white pixels

3.3 Feature Extraction

In this stage, include activities, i.e. Centroid, Edge Detection, Smooth the Contour.

• Centroid

In this step, calculate the centroid for partitioning the hand in to two parts one which represents the finger portion and other wh¹⁷ represents non finger region. Centroid is calculated using image moment, which is the weighted average of pixels intensities of the image.

• Edge Detection

In this step, Edge detection is used to perform separation between background with the object using morphology technique that is erosion operation.

• Smooth the Contour

In this step, morphology operations used are opening and closing. These operations use to smooth the countours of the object and eliminate all pixels in an area that is too small to be occupied by the structural elements.

3.4 Classification

In this stage, include activities i.e. Eigen Vector, Eigen Values and Euclidean distance.

• Eigen Vectors

In this step, it is used to detemine the angle of a hand gesture.

• Eigen Values and Euclidean distance

In this step, Eigen Values weighted by Euclidean distance to find the image (hand sign) that tested with image in the database.

3.5 Sign Recognition

This is the final stage, where recognized gesture and then converted to text in form of BISINDO and SIBI alphabet

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