Isemantic2020

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Submission date: 01-Jul-2020 02:17PM (UTC+0700)
Submission ID: 1352131392
File name: Isemantic2020_Rudatyo.pdf (861.55K)
Word count: 2506
Character count: 12973

Histogram Profile-Feature Extraction Methode for Analyse Sillouette Level of Datasets of Hand Gesture

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***Abstract*— There is a belief that good material will affect the quality of the results, as well as the process of recognizing hand gestures. The assessment of quality itself is very objective. On the other hand, some research literature based on hand gesture recognition is known to use standard data input in the form of data input from the dataset, both for comparative purposes or testing methods. The challenge is to see a general picture of hand draw visuals in general the input dataset of the hand gesture recognition system. This research tries to explore image quality through feature extraction of image histograms to get a picture of the range of values from image histograms. Image quality classification based on the herarchy method is based on histogram feature clusters. The feasibility of the built clusters is then tested based on the silhouette index method. The number of datasets used was 18 datasets from various dataset sources that were used in hand gesture recognition research with a total of 13 thousand test data. Based on the results of the interview, it is known that the three image clusters, namely C1, C2 and C3, do not have a feasible relationship or in other words the images are free.**

Keywords—hand gesture; dataset; feature of histo-profile; herarchical clusterring; silloutte index

I. INTRODUCTION (*HEADING 1*)

Hand gesture data input is the basic material processed in hand gesture recognition research [2] [6]. Outside the camera device, various hand gesture input data capture devices were tried to be observed by researchers. Gloves [3], radar [7], infra red [5], wifi [1] and audio [4] are devices whose potential has been tried, but camera devices are more popular. The camera requires several parameters to produce a good image, including: sufficient light level, sufficient level of color contrast between objects and background, sufficient image resolution format, image transmission towards noise free storage. All real parameters that accompany the input of hand gesture images are interesting things that researchers try to raise hand gestures, including the real parameters related to the visual quality of a hand gesture input image.

On the other hand, the use of input in the form of a hand gesture image from a dataset provided by researchers is a gesture image recognition that is general in nature and is quite often done for the sake of testing or comparing the performance of a method. When the hand gesture image dataset is quite widely available, the next question that arises is: what is the visual distribution of camera-based hand gestures based on the dataset already available?

Histogram presentation as a way to see the image of the actual image is a common thing to do especially by the image processing agent. Through color histograms, even the distribution of RGB values of pixels can be clearly identified [6]. But this certainly can only be done if the number of images that you want to observe is not so much, if the number of images reaches thousands, it is necessary to formulate a process to get a general picture of a large amount of data.

In this study, a six-step process was formulated to obtain a picture of the distribution of hand gesture-based data input models for camera devices through available datasets. The six stages of the process are: dataset collection, histogram profiling, histogram feature extraction, clustering and index silhouettes. Through the stages of clustering it is expected to be seen by the gesture image input groups that have been used and through the index silhouette process it is expected to be able to find the potential for gesture image input that is likely to be further investigated.

The explanation in this article is arranged in 4 parts, namely: the introductory part that raises a description of the problem following the steps of the solution approach, the method section that details the method at each stage of the process, the testing section displays the results of the test and the analysis section which shows the discussion of the test results.

The contribution of this study is a description of the distribution of hand gesture input models that have been studied and the potential of hand gesture input models that are rarely or even have not been studied.

II. Dataset Hand Gesture

Hand gesture dataset is a collection of test data in the form of hand gesture input data captured using a hand gesture data capture device and has been adapted to the needs of the case to be examined. Al-Shamayleh [12] in his systematic literature study raised the explanation that the camera device is a popular device used in capturing hand gesture input data (77.2%), so in this study the dataset studied was a dataset using a camera device. The acquisition results of the camera device referred to here are in the form of RGB images.

Fig. 1. Contoh dataset dari Cambridge-Hand Gesture database yang dipergunakan oleh T-K. Kim [8]

There are enough public datasets available and they have been used by researchers to test the performance of their proposed methods. Several datasets that use the camera as a hand gesture acquisition device are quite popular to use, including the Cambridge-Hand Gesture dataset from Cambridge University used by T-K. Kim [8], ASL FingerSpelling Dataset from the University of Surrey's Center for Vision, Speech and Signal Processing used by Brandon Garcia [10], GTI dataset from Universidad Politécnica de Madrid used by Maqueda [11] and ASL Dataset dataset. from IEEE Dataport used by Raimundo [14]

The availability of a hand gesture dataset is sufficient to help researchers who wish to test or compare hand gesture recognition methods. The challenge is to see a general picture of hand draw visuals in general the input dataset of the hand recognition system. Know the distribution of input models from the dataset that have been used in such a way as to predict the chance of hand gesture input models that do not yet exist.

III. Proces Stages

A. *Procesing Steps*

The process of analyzing the hand geture dataset involves several stages of the process. Take the assumption that hand shift input from the datasets is available, along with Figure 2. is the flowchart of the process.

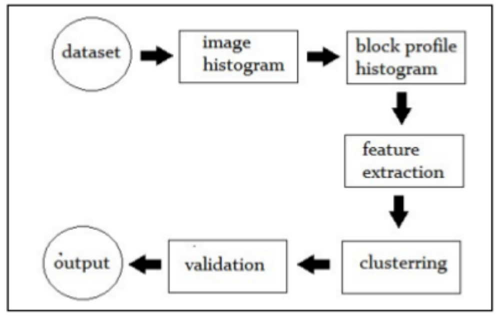

Fig. 2. Steps of prosessing sillouette validation

B. *Feature Extraction of Histogram Profile*

This process is one of the important processes in the dataset sillouete analysis, which is to formulate a feature extraction step to find the characteristic points of a hand gesture image histogram. Feature extraction is done by building a group of intensity ranges on the histogram into several blocks of intensity range. Furthermore, based on this block profile its value is obtained.

Furthermore, considering that the intensity of color or tone is an important factor in the presentation of the image, the division of profile blocks is decided based on 5 tone areas, namely: dark, light dark, middle tone, bright light, bright.

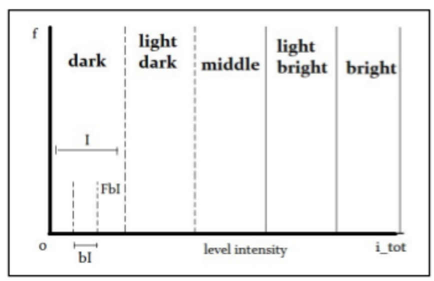

Fig. 3. Block profile for feature extraction proces.

Below is an explanation of Fig.1 and its characteristic extraction formula.

$$I = \frac{i\_tot}{5}, i_{tot}: total\ intensity \quad (1)$$

$$bI = \frac{I}{3} \quad (2)$$

$$\overline{bI} = \sum_{i=1}^{n} bI_i \quad (3)$$

$$FbI = \overline{bI} \quad (4)$$

C. *Agglomerative Herarchical Clusterring*

The formation of clusters by the Agglomerative Hierarchical Clusterring (AHC) method was chosen taking into account the size of the unknown group. Here are the computing steps from AHC:

1) Calculate the distance matrix between data

2) Combine the two closest groups based on the specified proximity parameters

3) Update the distance matrix between data to represent the closeness between the new group and the remaining groups

4) Repeat steps 2 and 3 until only one group is left

Calculation of the distance matrix in this study was carried out using the Manhattan method through computation shown in formula 5.

$$Dm = \sum_{l=1}^{n} |b_i - a_i| \quad (5)$$

Furthermore, considering that the image histogram profile blocks are formed sequentially and are contiguous with one another it is decided that the cluster approach is tested using the average linked method. The computation is shown in formula 6 below.

$$d_{uv} = average\{d_{uv}\}, D_{uv} \in D \quad (6)$$

D. Silhouette Coeffisient as Cluster Validation

Silhouette Index (SI) is used to validate a data, a single cluster, or even an entire cluster. This method is widely used to validate clusters that combine cohesion and separation values [4]. The range of SI values is -1 to +1. SI values close to 1 indicate that the data is not exactly in the cluster. SI is 0 or close to 0, so the data position is at the border of two clusters.

$$a_i^j = \frac{1}{m_j - 1} \sum_{r=1}^{m_j} d(x_i^j, x_r^j),$$

$$i = 1,2,..,mj \quad (7)$$

$$b_i^j = \min \left\{ \frac{1}{m_n} \sum_{r=1}^{m_n} d(x_i^j, x_r^n) \right\},$$

$$i = 1,2,..,m_n \quad (8)$$

$$SI_i^j = \frac{a_i^j, b_i^j}{\max\{a_i^j, b_i^j\}} \quad (9)$$

$$SI_j = \frac{1}{m_j} \sum_{i=1}^{m_j} S_i^j \quad (10)$$

$$SI_j = \frac{1}{m_j} \sum_{i=1}^{m_j} S_i^j \quad (11)$$

Where, ai is the average distance of the i-th data to all other data in one cluster; bi is the result of the average distance of the i-th data to all data from other clusters, then the smallest data is taken; $d\ (xij,\ xrj)$ is the distance of the i-th data with the r-th data in one j cluster, while mj is the amount of data in the j-cluster; k is the number of clusters; $SIij$ is the Silhouette Index formula; SIj is SI for each cluster; SI is a global SI.

The following is a measure of silhouette values according to Kaufman and Rousseeuw [13]. Silhouette coefficient (SC) value:

a. 0.7 < SC <= 1, strong structure

b. 0.5 < SC <= 0.7, medium structure

c. 0.25 < SC <= 0.5, weak structure

d. SC <= 0.25, no structure

IV. Results and Discussion

This study uses test data from public datasets as many as 5 sources of the hand gesture dataset (Table I.) with total test data of 13603 test data from various public datasets.

TABLE I. LIST OF DATASET INPUT

No.	Dataset Name	Num. input
1.	Cambridge Hand Gesture	1080
2.	Hand Gesture GTI	4618
3.	Kaggle Hand Gesture	1699
4.	Sign Language MNIST	1750
5.	Quan Yuan Hand Gesture (part 1,2 and 3)	4456

After the testing phase is carried out, it is obtained a cluster group where each cluster gives an approximate picture of the visual status of his hand gestures. Based on the dendogram shown in Figure 4, it is known that the test results show a visual status grouping of hand gestures into 3 clusters.

Then the level of relationship between clusters is tested using the sillouette index method to find the coefficient values that indicate the level of relationships between clusters. The more the coefficient value approaches 1, the greater the relationship between the clusters and this shows that the input of gesture image data in the cluster is quite often used for research data. Conversely the lower the coefficient value, the more it shows a strong dichotomy or a high level of cluster tolerance.

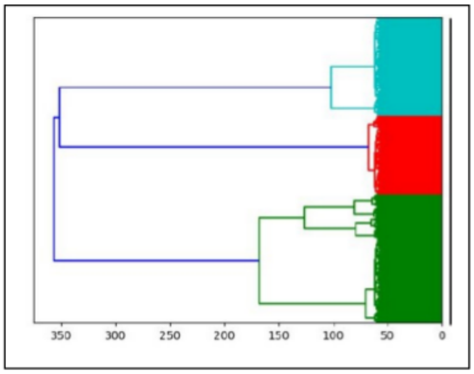

Fig. 4. Example of a figure caption. *(figure caption)*

TABLE II. HASIL SILLOUTTE INDEX

SI Clustter	0.53	04.6	0.31
SI Global	0.46		

Based on the size of SI values according to Kaufman and Rousseeuw, in Table II and SI column clusters, it can be said that the first cluster of 0.53 (C1) is included in the medium structure, while the second cluster (C2) of 0.46 is included in the weak structure, and the third cluster (C3)) equal to 0.31 included in the weak structure. A global SI value of 0.43 is also included in the weak structure.

V. CONCLUSION

Considering the results of the sillouette index which are in a weak structural state, it can be concluded temporarily that the three image clusters namely C1, C2 and C3 have no connection or in other words the image is free. This is possible because the feature extraction process is not strong enough so that the result of feature extraction has not shown a picture of an input pattern.

Based on the above it is planned in the next study to make changes to the feature extraction method while trying to make comparisons with other cluster methods such as K-Mean.

References

[1] Shahrukh J, Ghousia B S, J Aarthy S K, Ateequeur R. Wireless Glove for Hand Gesture Acknowledgment: Sign Language to Discourse Change Framework in Territorial Dialect. Robot Autom Eng J. 2018; 3(2): 555609. DOI: 10.19080/RAEJ.2018.03.555609

[2] Mitra, S., Acharya, T.: Gesture recognition: A survey. IEEE Transactions on Systems, Man and Cybernetics, Part C: Applications and Reviews 37(3), 311–324 (2007)

[3] Che-Min Chiu, Shuo-Wen Chen, Yu-Ping Pao, Ming-Zheng Huang, Shuen-Wen Chan & Zong-Hong Lin, A smart glove with integrated triboelectric nanogenerator for self-powered gesture recognition and language expression, Science and Technology of Advanced Materials, 20:1, 964-971, 2019, DOI: 10.1080/14686996.2019.1665458

[4] Jinhyuck Kim1 and Sunwoong Choi, Hand Gesture Classification Based on Nonaudible Sound Using Convolutional Neural Network, Journal of Sensors, Hindawi, Volume 2019, Article ID 1084841, https://doi.org/10.1155/2019/1084841

[5] Mantecón, T., Del-Blanco, C. R., Jaureguizar, F., & García, N. (2019). A real-time gesture recognition system using near-infrared imagery. PloS one, 14(10), e0223320 https://doi.org/10.1371/journal.pone.0223320

[6] Rafael C. Gonzalez, Richard Eugene Woods, Steven L. Eddins, Digital Image Processing Using MATLAB, Pearson Education, 2004, ISBN 8177588982.

[7] Z. Zhang, Z. Tian and M. Zhou, "Latern: Dynamic Continuous Hand Gesture Recognition Using FMCW Radar Sensor," in IEEE Sensors Journal, vol. 18, no. 8, pp. 3278-3289, 15 April15, 2018, doi: 10.1109/JSEN.2018.2808688.

[8] T-K. Kim, S-F. Wong and R. Cipolla, Tensor Canonical Correlation Analysis for Action Classification, In Proc. of IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Minneapolis, MN, 2007

[9] S. Naseri-Golestani, H. Rafei, M. Akbarzadeh-T, A. Akbarzadeh, A. Naddafshargh and S. Naddafshargh, "Robust Real-time Magnetic-based Object Localization to Sensor's Fault using Recurrent Neural Networks," 2019 9th International Conference on Computer and Knowledge Engineering (ICCKE), Mashhad, Iran, 2019, pp. 426-430, doi: 10.1109/ICCKE48569.2019.8964748

[10] Garcia, B. Real-time American Sign Language Recognition with Convolutional Neural Networks.

[11] A.I. Maqueda, C.R. del Blanco, F. Jaureguizar, N. García, "Human–computer interaction based on visual hand-gesture recognition using volumetric spatiograms of local binary patterns", Computer Vision and Image Understanding, Special Issue on Pose & Gesture, vol. 141, pp. 126-137, Dec. 2015. (doi:10.1016/j.cviu.2015.07.009)

[12] Ahmad Sami Al-Shamayleh, Rodina Ahmad, Mohammad A. Abushariah, Khubaib Amjad Alam, and Nazean Jomhari. 2018. A systematic literature review on vision based gesture recognition techniques. Multimedia Tools Appl. 77, 21 (November 2018), 28121–28184

[13] L. Kaufman and P. J. Rousseuw, Finding Groups in Data, New York: John Wiley & Sons, 1990

[14] Raimundo Farrapo Pinto Junior, Ialis Cavalvante de Paula Junior. (2019). Static Hand Gesture ASL Dataset. IEEE Dataport. http://dx.doi.org/10.21227/gzpc-k93

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