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IDENTITY RECOGNITION OPTIMIZATION BASED ON LBP FEATURE EXTRACTION

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ABSTRACT

Unimodal systems have limited information that can be used for identity recognition systems. The multimodal system was created to improve the unimodal system. The multimodal system used in this study is the combination of the face and palms at the matching score level. Matching scores is done using the Weighted Sum Rule method. Extract features from each sample using the Local Binary Pattern (LBP) method. Meanwhile, large data dimensions are reduced by using the Principal Component Analysis (PCA) method. The distance between face and palm data is measured using the closest distance, namely the Euclidean Distance method. Benchmark dataset using ORL, FERET and PolyU. Based on testing on each database, an accuracy rate of 98% (ORL and PolyU) and 95% (FERET and PolyU) is obtained. The test results show that the multimodal system using the Hybrid method (PCA and LBP) biometric system runs well and optimally.

Keywords: Artificial intelegency, recognition, LBP, multimodal

I. BIOMETRIC

A biometric system is a system that uses specific data in the process of verification, identification, detection and recognition. The characteristics used in this system are human physical characteristics (fingerprints, eyes, iris, face, retina, voice, ears, DNA). This system done by manipulating a decision. Biometric systems are used in identity identification, facial recognition, fingerprints, and others. Systems that use one characteristic are called unimodal biometric systems. Unimodal biometrics in identity recognition systems have very limited information. This is due to the presence of nonlinear information. However, nonlinear information on unimodal systems can be minimized using a multibiometric system transformation.

Biometrics is a method for recognizing humans based on physical characteristics and behavior. The goal is to obtain someone's data through the unique characteristics they have. The data obtained includes voice recordings, fingerprints, facial photos, retinas, and palms. Captured data is stored and compared with other people's biometric data. With this biometric data, the system will recognize that the data provided is genuine or fake. These data can be used in biometric technology systems such as fingerprint, retina, facial and voice recognition scanners. In general, this system functions as a registration, verification and identification system. Registration system, biometric data that has been taken is stored in a database for use in the biometric system to be built. Verification System, confirming identity through physical

characteristics and human behavior. Meanwhile, the identification system processes validation and matching of a person's identity by comparing a person's recorded biometric sample data with biometric data stored in a database.

Unimodal system is a system that uses one human characteristic. This system has been implemented in various sectors and various purposes, such as banking, access control, and mobile computing. This system is certainly very useful and easy to implement. However, this system has limitations when the amount of data is large. This system also has weaknesses with data that has noise, illumination, and facial expressions. The unimodal system scenario can be seen in Figure 1.

Based on Figure 1, the biometric system inputs data for only one characteristic. Furthermore, the data is censored first. If the input data has noise, the data is entered into the preprocessing stage. At this stage the data is normalized data. Then the data is extracted using the appropriate method. Data matching with the database is done to ensure that the input is correct or not. Decisions are made based on accuracy when data is matched. The end result of this system is high accuracy reaching 99.99% of the 100% percentage range.

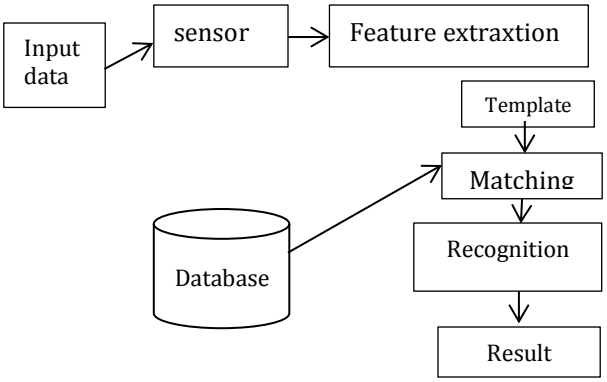

Figure 1. Unimodal System

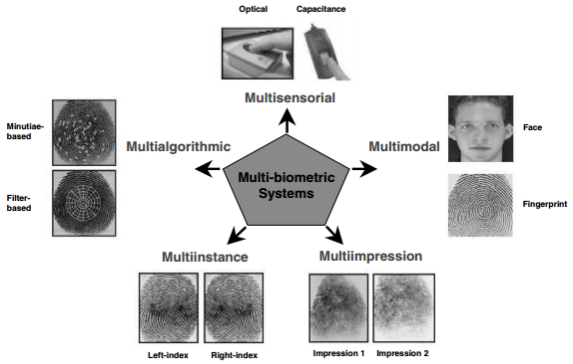

Figure 2. Multimodal system

II. MULTIMODAL SYSTEM

The multimedia system is an attractive system and has been involved in web and mobile applications. multimodal systems use two or more human characteristics such as a combination of face and fingerprint, palm to face, and fingerprint to ear. The input multimodal system can be in the form of multi-algorithm, multi-sensor, and multi-expression. Multi-algorithm systems are systems that can process biometric information with two or more algorithms. A multi-sensor system is a system that can retrieve biometric data with two or more sensors such as ultrasonic sensors. While the multi-expression system is a system whose biometric data is in the form of two or more human facial expressions, for example smiling, sad, happy, scared, and angry. Various kinds of biometric systems can be seen in Figure 2.

Multimodal systems can be used as identification, verification, and recognition systems. Every system built using biometric multimodal information has several levels including sensor level, feature extraction, value matching, and decisions like a unimodal system. In addition, in this

system there is a fusion technique. This technique is used to increase the accuracy as high as possible. At every level of the biometric multimodal system, fusion techniques can be applied. However, each level has its own merging rules that are carried out before or after the matching process.

III. METHOD

This study uses the Hybrid method which combines the Local Binary Pattern (LBP) and eigen Face methods. Merging data is done by matching scores and normalization using the Z-score method. Facial biometric data uses 2 databases, namely FERET and PolyU. While the palm database uses one biometric data, namely PolyU. Matlab is used to process images from these various biometric databases. Furthermore, the stages of this research are divided into several stages, namely pre-processing, feature extraction, reducing dimensions, fusion, decision, and the final result.

In the first stage, facial images and palm images were extracted using the Local Binary Pattern (LBP) method. The facial and palm features were matched by measuring the distance using the Euclidean Distance algorithm. Each data information is stored in the database system to be used as comparative data between the training image and the test image. The next stage, looking for a score value using the Z-Score algorithm for the decision making process. If the score between the training image and the test image is declared suitable, then the recognition is declared accurate. Accuracy is the end result of this system. Detail stage is discussed below:

1. Preprocessing
   The preprocessing stage is carried out to improve image quality, namely crop, resize, and color. In detail, the stages of the preprocessing process are as follows:
   a. Cropping, is done to take the required part of the face and palm images. The part taken is the part that has ROI (Region of interest) information.
   b. Resize is done to ensure that the size of the matrix is the same length and width.
   c. Color change, done by changing the RGB color to grayscale. This is done to simplify the extraction process of facial features and palms
2. Feature Extraction
   Facial and palm feature extraction using the LBP method. The feature extraction stages are as follows:
   a. Labeling is done with the x,y coordinate points.
   b. A 3x3 LBP block was divided to extract facial features and palms.
   c. The pixel value is determined based on the coordinates of the center of the LBP block and is used as a comparison for the value of the block next to it using the equation:

$$S(x) = \begin{cases} 1, & x \geq 0 \\ 0, & x \leq 0 \end{cases} \qquad (1)$$

To determine the correlation between two objects by using the following Euclidean Distance formula:

$$d_{Euclidean}(x,y) = \sqrt{\sum_{i=1}^{n}(x_i - y_i)^2}$$

note :

$d(x,y)$ = distance x to y

x_i = data i to n

y_i = data j to n.

IV. RESULT AND DISCUSSION

In this study using the PCA and LBP methods. The benchmark dataset uses two public databases, namely FERET and ORL (face images) and PolyU (palm images). The face and palm images are combined at the score level fusion. Face images used as many as 40 samples consisting of 10 images for each sample. Likewise with the image of the palm. The sample data is then divided into 2 (two) stages consisting of training and testing stages. Each stage uses a different image. At the training stage, 7 (seven) images are used, while at the testing stage, one image is used. Before the data is included in the category of training and testing data, the two types of images go through a pre-processing process first. The results of pre-processing, each dataset is cropped with a size of 70x70 pixels. It aims to eliminate unwanted, inconsistent, and unequal size information. Furthermore, the Euclidean distance is obtained which is used to measure the success rate of identity recognition. The results of measuring the eucledian distance with the closest distance between the face and palm images are 0.5961, 0.4814, 0.3283, 0.2529, 0.2145, 0.1094, 0.2154, 0.2464, 0.3476, and 0.5421. while the identity recognition process can be seen in Table 1.

Table 1. Identify on Unimodal System

Modalities	Databases	Method	Precentage
Facial	ORL	PCA	80 %
	FERET		60 %
Palm	PolyU		83 %
Facial	ORL	PCA dan LBP	89 %
	FERET		85 %
Palm	PolyU		88 %

Based on the table above, it can be concluded that the combination of the PCA and LBP methods has a fairly high percentage of 89% (ORL). However, the percentage of identity recognition can still be increased by using a multimodal system. The results of increasing the level of identity recognition can be seen in Table 2.

Table 1. Identify on Multimodal System

Modalities	Databases	Method	Precentage
Facial and palm print	ORL dan PolyU	PCA	89 %
	FERET dan PolyU		81 %
Facial and palm print	ORL dan PolyU	PCA dan LBP	98%
	FERET dan PolyU		95 %

Based on Table 2, the average recognition rate of identity using a multimodal system has a high recognition rate of 98% and 95% for each database. However, the FERET database needs special treatment so that the recognition rate can be close to 100%.

REFERENCE

Mulyadi,R. Zaini. 2019. *Identifikasi Pengenalan Wajah Perokok Menggunakan Metode Principal Component Analysis*. Jurnal Rekayasa Sistem dan Teknologi Informasi. Vol. 4 No. 892 – 898.

Z. Rahmi, M. I. Ahmad, M. N. M. Isa and Z. I. A. Khalib, "Matching Score Level Fusion for Face and Palmprint Recognition System on Spatial Domain," 2019 IEEE 9th International Conference on System Engineering and Technology (ICSET), 2019, pp. 45-49, doi: 10.1109/ICSEngT.2019.8906321.

Z. Rahmi, M. I. Ahmad, M. N. M. Isa and Z. I. A. Khalib, "Texture Development Through Lossless Compression of Biometric Representative for Palmprint Recognition System," 2019 IEEE 9th International Conference on System Engineering and Technology (ICSET), 2019, pp. 41-44, doi: 10.1109/ICSEngT.2019.8906382.

Mujib, Khusnil. Achmad Hidayatno. Teguh Prakoso. 2018. Pengenalan Wajah Menggunakan Local Binary Pattern (LBP) Dan Support Vector Machine (SVM). TRANSIENT, VOL. 7, NO. 1, MARET 2018, ISSN: 2302-9927, 124.

Zebua, Lisander, Efan. 2018. Implementasi Metode Nearest Feature Midpoint(Nfm) Pada Pengenalan Wajah. Jurnal Riset Komputer (JURIKOM), Vol. 5 No. 5. ISSN 2407-389X.

Prathivi, Rastri. Yunita Kurniawati. 2020. Sistem Presensi Kelas Menggunakan Pengenalan Wajah Dengan Metode Haar Cascade Classifier. Jurnal SIMETRIS, Vol. 11 No. 1. P-ISSN: 2252-4983, E-ISSN: 2549-3108.

L. Fei, G. Lu, W. Jia, S. Teng and D. Zhang, "Feature Extraction Methods for Palmprint

Recognition: A Survey and Evaluation," in IEEE Transactions on Systems, Man, and Cybernetics: Systems, vol. 49, no. 2, pp. 346-363, Feb. 2019, doi: 10.1109/TSMC.2018.2795609.

E. Thamri, K. Aloui and M. S. Naceur, "New approach to extract palmprint lines," 2018 International Conference on Advanced Systems and Electric Technologies (IC_ASET), 2018, pp. 432-434, doi: 10.1109/ASET.2018.8379895.