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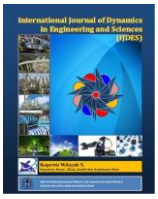

FACE EDGE DETECTION TO OPEN THE APPLICATION

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Abstract

Technological improvements are increasingly developing and increasing. Facial Expression Recognition (FER) aims to recognize internal human emotions from one or more observations. In human recognition and facial expressions, global and local approaches have a major role in biometrics. Digital image processing using faces as a tool for detection and recognition before using certain applications that are used as a first step to enter the system or in an application with the aim of monitoring security . Edge detection plays an important role in the image processing field. Various edge detection techniques were obtained including Sobel, PSO Preweitt. This technique uses several limitations such as fixed edge thickness and several parameters such as problematic thresholds to be applied. Although many different edge detection methods have been proposed for grayscale, color, and multispectral images, they still face difficulties when extracting edge features from hyperspectral (HSI) images containing a large number of bands with very narrow gaps in the spectral domain. The method used here is a method based on artificial intelligence in the form of edge detection, where the photo of the person concerned is used as an accurate input data as a face detection tool. The simulation results obtained for performance evaluation show that the proposed algorithm is safe, and feasible. The feature used here is the edge detection feature with various results.

Keywords: Face Edge Detection, Artificial Inteligent, Smart Technology

1. Introduction

Improvements in technology continue to develop where in our daily lives we often see human faces with various shapes and distinctive features of each, because every human face has different variations. Along with advances in information and technology, it is possible to develop applications that can help humans to recognize the types of faces. Recognizing human internal emotions can be observed based on Facial Expression Recognition (FER) which aims for one or more observations. (Aghamaleki & Ashkani Chenarlogh, 2019). In human recognition and facial expressions, global and local approaches have a leading role in biometrics Digital image processing is a growing field of digital technology with facial applications in science and engineering. One of the facial areas related to image processing is pattern recognition. In the last few decades we have seen significant practice as it has been incorporated in various applications such as human-machine interaction, affective computing, surveillance, robotic control and various other applications. Different facial expressions can be characterized by the appearance of different facial features,

and therefore a comprehensive description of the different looks is key to detecting the correct expression. (Iqbal et al., 2020). Edge detection plays an important role in the field of image processing. Various edge detection techniques were obtained including Sobel, PSO Preweitt, this technique uses several limitations such as fixed edge thickness and several parameters such as threshold are problematic to apply. Although many different edge detection methods have been proposed for grayscale, color, and multispectral images, they still face difficulties when extracting edge features from hyperspectral (HSI) images containing a large number of bands with very narrow gaps in the spectral domain (Dhivya). & Prakash, 2019).

There is a growing concern that the widespread use of facial recognition will lead to a decline in privacy and civil liberties

dramatically. The ubiquity of CCTV cameras and large databases of facial images, from public social network profiles to ID card registers, make it incredibly easy to identify individuals, as well as track their location and social interactions. Even without the knowledge of the subject, facial recognition can be used (Kosinski, 2021)

Face recognition is also one way to identify individual subjects. Facial recognition identifies anyone by comparing the physical characteristics of an item. There are two facial recognition modes, still image and live video. The first step in face recognition is face detection. Acquisition or face detection in performing face recognition, can be done by positioning the face first on the input image or video stream. (Deeba et al., 2019). To recognize a person's face by using a person's facial features, one way is used, namely by recognizing the pattern of the human face in question. Facial features can be extracted by several methodologies. One of these methodologies is edge detection. System. It is considered as one of the important sub-categories of artificial intelligence (AI), which has witnessed great progress and provided new innovation opportunities for research and academic applications in many fields. The main advantage of AI is to build predictive models without sophisticated assumptions. (Abd El-Rahiem et al., 2020)

The human face is an important entity that plays an important role in our daily social interactions, such as conveying individual identity. Facial recognition is a biometric technology that extracts facial features mathematically and then stores these features as facial prints to identify individuals (Khan et al., 2019). .Advanced camera technology advances as well as fast transmission medium, huge amount of image/video data is recorded and shared every day on social media. The development of sophisticated camera technology makes it easy to capture and analyze high-volume image / video data with ease.[4](Agarwal et al., 2020). (Li et al., 2020). Traditionally, facial recognition systems follow four main phases on which basic facial recognition is demonstrated namely: face detection, preprocessing, feature extraction and feature matching. The following image is the basic phase of face recognition. (Deeba et al., 2019).

2. METHOD

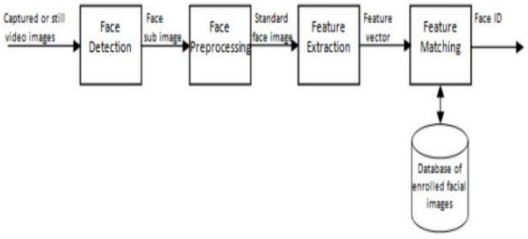

Figure 1. Face Detection

Image analysis is a very rich and active research topic in the field of shape analysis and computer vision, and many applications exist in areas such as authentication, human-machine interface, medical diagnosis, and treatment. Particular attention has been paid to the image of the face, as it is the part of the body that conveys most of the information about the person. (El Rhazi et al., 2019).

3. RESULT

To determine human facial features in opening an application, it will be tried to improve the recognition of human facial expressions. It can be seen that facial recognition is very widely used in our lives. To search for the presence and properties of edges that pass through pixels. Therefore, we calculate the gradient magnitude and orientation at each pixel of the input image using the Sobel operator because the edges through the pixels can be well characterized with appropriate gradient magnitudes and orientations. (Iqbal et al., 2020),(Dong et al., 2020).

Horizontal (S x) and vertical (S y) Sobel operators with me to get the response of the horizontal and vertical edges, G x, and G y, respectively, using :

$$G\,x = S\,x * i; \quad G\,y = S\,y * i, \qquad (1)$$

where S x and S y are the horizontal and vertical Sobel operators, respectively, expressed as :

$$S_x = \begin{matrix} -1 & 0 & +1 \\ -2 & 0 & +2 \\ -1 & 0 & +1 \end{matrix}; \quad S_y = \begin{matrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ +1 & +2 & +1 \end{matrix}$$

To calculate the magnitude of the gradient where Mg, and the orientation of the gradient,

$$Mg = G_2 \sqrt{}_{x + G_{y;}}{}^{2} \qquad \theta = \tan\left(G^{1}_{Y/} G_{X)} \right. \qquad (3)$$

If there is a deviation :

$$W(\theta) = \frac{1}{\sigma 2\,\pi} \sqrt{}\, e^{-(\theta_{saya} - \mu_{saya})\,2 / 2\,\sigma_{2,}} \qquad (4)$$

A very important measure of edgeness is the gradient magnitude because a higher value indicates a prominent edge.

$$S_{i=} \begin{cases} Mg_{saya} \times W(\theta), \text{ jika } Mg \geq \xi_{saya} \\ 0, \quad \text{jika tidak} \end{cases} \qquad (5)$$

Based on the edge-direction scores of the neighboring pixels, the two most prominent edge directions are selected using.

$$dir = \text{argmax2}\{S_{saya;} 0 \leq saya \leq 7\}, \qquad (6)$$

Tables And Figures

To achieve maximum results, many studies have carried out various methods for facial expression recognition, and some of them can achieve promising performance. Edge detection is an important process in selecting or separating an object in an image. To detect edges, it is necessary to have a derivative value of each edge, one of which is a gradient. The next result is the image output generated from the gradient image.

Figure 2. Example of Face Input Image

Figure 3. Gradient result from the input face above

Figure 4. Citra Hasil Robert

How to use it using angles of 45 degrees and 135 degrees. So that it produces results like the image above.

Figure 5. Image Result Sobel

Figure 6. Prewitt Image Results

The sobel and perwit operators in addition to calculating the gradient value combine by adding a smoothing filter to remove noise. The image above is the output image generated with Sobel and Prewitt. Detection of image polarity opens up new vistas in a wide area of computing. Sophisticated frameworks for polarity detection often prove computationally demanding, as they rely on deep learning networks. Thus, one faces a major problem while targeting its deployment on resource constrained embedded devices.(Ragusa et al., 2020).

Arsitektur	ANP40	MVSO40	T4SA
MobileNet v1_	80,50 (0,25)	76,58 (0,00) 50,68 (0,07)	
MobileNet v2_	82,75 (0,00)	77,10 (0,07) 49,83 (0,12)	
MobileNet v2_(1.4)	80,50 (-0,25)	77,55 (0,16)	49,94 (-0,01)
Res 101	82.25 (1.75)	78.19 (3.25)	48.27 (1.98)
Res 152	81,00 (5,75)	78,94 (3,29)	48.61 (2.12)
Vgg 16	80,75 (0,00)	75,90 (0,00)	48,89 (-0,01)
Vgg 19	80,00 (0,00)	75,71 (0,06)	48,69 (0,04)

Table 1. Mean accuracy on the test set for a single domain experiment.

In some studies performing continuous edge detection is considered a basic operation achieved in low-level image processing and various computer vision applications. The two main approaches for tep detection of an image are: thresholding/enhancement techniques and edge fitting techniques. (Mittal et al., 2019).

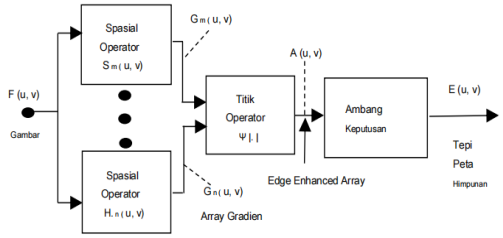

Figure 7. Enhanced edge detection system/thresholding

4. Conclusion

1. Face recognition is considered a challenging task due to its complex nature.
2. The human face is an important entity that plays an important role in our daily social interactions.
3. Edge detection is an important process in selecting or separating an object in an image. To detect edges, we need the derivative values of each edge.

References

[1] ABD EL-RAHIEM, B., SEDIK, A., EL BANBY, G. M., IBRAHEM, H. M., AMIN, M., SONG, O. Y., KHALAF, A. A. M., & ABD EL-SAMIE, F. E. (2020). An efficient deep learning model for classification of thermal face images. *Journal of Enterprise Information Management*. https://doi.org/10.1108/JEIM-07-2019-0201. (Scopus Q1, SJR 0.8)

[2] AGARWAL, A., CHATTOPADHYAY, P., & WANG, L. (2020). Privacy preservation through facial de-identification with simultaneous emotion preservation. *Signal, Image and Video Processing*. https://doi.org/10.1007/s11760-020-01819-9 (Scopus Q2, SJR 0.46)

[3] AGHAMALEKI, J. A., & ASHKANI CHENARLOGH, V. (2019). Multi-stream CNN for facial expression recognition in limited training data. *Multimedia Tools and Applications*, *78*(16), 22861–22882. https://doi.org/10.1007/s11042-019-7530-7. (Scopus Q1, SJR 0.46)

[4] DEEBA, F., AHMED, A., MEMON, H., DHAREJO, F. A., & GHAFFAR, A. (2019). LBPH-based enhanced real-time face recognition. *International Journal of Advanced Computer Science and Applications*, *10*(5), 274–280. https://doi.org/10.14569/ijacsa.2019.0100535. (Scopus Q1, SJR 0.8)

[5] DHIVYA, R., & PRAKASH, R. (2019). Edge detection of satellite image using fuzzy logic. *Cluster Computing*, *22*(September), 11891–11898. https://doi.org/10.1007/s10586-017-1508-x. (Scopus Q2, SJR 0.41)

[6] DONG, Z., WEI, J., CHEN, X., & ZHENG, P. (2020). Face Detection in Security Monitoring Based on Artificial Intelligence Video Retrieval Technology. *IEEE Access*, *8*, 63421–63433. https://doi.org/10.1109/ACCESS.2020.2982779. (Scopus Q1, SJR 0.78)

[7] EL RHAZI, M., ZARGHILI, A., MAJDA,

A., BOUZALMAT, A., & OUFKIR, A. A. (2019). Facial beauty analysis by age and gender. *International Journal of Intelligent Systems Technologies and Applications*, *18*(1–2), 179–203. https://doi.org/10.1504/IJISTA.2019.097757. (Scopus Q4, SJR 0.13)

[8] IQBAL, M. T. BIN, ABDULLAH-AL-WADUD, M., RYU, B., MAKHMUDKHUJAEV, F., & CHAE, O. (2020). Facial Expression Recognition with Neighborhood-Aware Edge Directional Pattern (NEDP). *IEEE Transactions on Affective Computing*, *11*(1), 125–137. https://doi.org/10.1109/TAFFC.2018.2829707. (Scopus Q1, SJR 0.78)

[9] KHAN, M. Z., HAROUS, S., HASSAN, S. U., GHANI KHAN, M. U., IQBAL, R., & MUMTAZ, S. (2019). Deep Unified Model for Face Recognition Based on Convolution Neural Network and Edge Computing. *IEEE Access*, *7*, 72622–72633. https://doi.org/10.1109/ACCESS.2019.2918275. (Scopus Q1, SJR 0.78)

[10] KOSINSKI, M. (2021). Facial recognition technology can expose political orientation from naturalistic facial images. *Scientific Reports*, *11*(1), 1–7. https://doi.org/10.1038/s41598-020-79310-1. (Scopus Q2, SJR 0.55)

[11] LI, Y., LU, G., LI, J., ZHANG, Z., & ZHANG, D. (2020). Facial Expression Recognition in the Wild Using Multi-level Features and Attention Mechanisms. *IEEE Transactions on Affective Computing*, *X*(X), 1–12. https://doi.org/10.1109/TAFFC.2020.3031602. (Scopus Q1, SJR 3,44)

[12] MITTAL, M., VERMA, A., KAUR, I., KAUR, B., SHARMA, M., GOYAL, L. M., ROY, S., & KIM, T. H. (2019). An efficient edge detection approach to provide better edge connectivity for image analysis. *IEEE Access*, *7*(c), 33240–33255. https://doi.org/10.1109/ACCESS.2019.2902579. (Scopus Q1, SJR 0.8)

[13] RAGUSA, E., GIANOGLIO, C., ZUNINO, R., & GASTALDO, P. (2020). Image Polarity Detection on Resource-Constrained Devices. *IEEE Intelligent Systems*, *35*(6), 50–57. https://doi.org/10.1109/MIS.2020.3011586. (Scopus Q1, SJR 1,32)