ABSTRAK

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Judul : **Sistem Pengenalan Wajah Berbasis CCTV Menggunakan MTCNN dan ArcFace dengan Penerapan *Face Image Quality Assessment* dan Pemrosesan *Multithreading***
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Sistem pengenalan wajah berbasis *Closed-Circuit Television* (CCTV) banyak digunakan dalam bidang keamanan, namun implementasinya masih menghadapi keterbatasan komputasi serta variasi kualitas citra wajah yang mempengaruhi performa sistem. Pengembangan ini bertujuan untuk mengimplementasikan sistem pengenalan wajah berbasis CCTV yang mampu bekerja melalui penerapan *multithreading* dan *Face Image Quality Assessment* (FIQA). Sistem dirancang menggunakan *Multi-task Cascaded Convolutional Neural Network* (MTCNN) untuk deteksi wajah, ArcFace untuk ekstraksi fitur, serta *cosine similarity* untuk pencocokan identitas, dengan arsitektur dua thread untuk memisahkan akuisisi *frame* dan pemrosesan wajah. FIQA diterapkan untuk menyaring citra wajah berdasarkan ukuran, *blur*, pencahayaan, sudut kemiringan, dan jarak antar mata, serta diuji pada lima skenario dengan variasi jumlah individu, pergerakan, dan pencahayaan. Hasil pengujian menunjukkan bahwa *multithreading* meningkatkan *Frame Per Second* (FPS) sebesar 19% hingga 38%, sedangkan FIQA meningkatkan FPS sebesar 16,8% dan mengurangi jumlah wajah yang diproses sebesar 18,3%. Namun, penggunaan FIQA juga menurunkan rasio pengenalan sebesar 5,28%. Selain itu, pencahayaan rendah terbukti menurunkan jumlah wajah yang berhasil dikenali. Dengan demikian, kombinasi *multithreading* dan FIQA mampu meningkatkan efisiensi sistem pengenalan wajah berbasis *Central Processing Unit* (CPU), meskipun terdapat trade-off antara efisiensi dan kemampuan pengenalan.

Kata kunci: CCTV, FIQA, *Multithreading*

ABSTRACT

Face recognition systems based on Closed-Circuit Television (CCTV) are widely used in the field of security; however, their implementation still faces computational limitations and variations in face image quality that affect system performance. This study aims to implement a CCTV-based face recognition system through the application of multithreading and Face Image Quality Assessment (FIQA). The system is designed using Multi-task Cascaded Convolutional Neural Network (MTCNN) for face detection, ArcFace for feature extraction, and cosine similarity for identity matching, with a two-thread architecture to separate frame acquisition and face processing. FIQA is applied to filter face images based on size, blur, lighting, face angle, and inter-eye distance, and is evaluated across five scenarios involving variations in the number of individuals, motion, and lighting conditions. The experimental results show that multithreading improves FPS by 19% to 38%, while FIQA increases Frame Per Second(FPS) by 16.8% and reduces the number of processed faces by 18.3%. However, FIQA also decreases the

recognition rate by 5.28%. In addition, low-light conditions are shown to reduce the number of successfully recognized faces. Therefore, the combination of multithreading and FIQA improves the efficiency of Central Processing Unit(CPU) -based face recognition systems, although there is a trade-off between processing efficiency and recognition performance.

Keywords : CCTV, FIQA, *Multithreading*