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Medical Image Enhancement Applying Modified Camel Algorithm

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Abstract: The enhancement of medical images is a composite image-processing formation due to the adverse impact of low-quality images caused by the acquisition, in addition to transmission on diagnosis by medical pictures with watching. Histogram Equalization (HE) is a commonly used method for significantly improving the contrast of photographs. However, its effectiveness is not equally beneficial for low-quality photos. It is employed to quantify the frequency of amount levels in a picture. CLAHE technique (Contrast Limited Adaptive Histogram Equalization) is a procedure of HE algorithm that operates locally. CLAHE effectively addresses the limitations of the standard HE algorithm. This research presents a new method for improving image contrast by utilizing an adjusted type of the Camel Optimization algorithm for selecting particular parameters and enhancing the contrast of medical pictures. The Modified Camel Algorithm (MCA) is a novel optimization approach that builds upon the traditional Camel Optimization Algorithm to improve performance in solving complex optimization problems. In applying CLAHE to achieve parameter selection for medical image enhancement, MCA addresses some of the limitations of traditional algorithms by incorporating specific modifications to enhance convergence speed, robustness, and accuracy. The effectiveness of the suggested method, which employs the MCA algorithm, was applied to X-Ray images as medical images and was compared with the PSO approach employing both HE and CLAHE for the medical pictures. The results of the evaluation for the proposed technique are applied using methods of Peak signal to noise ratio, Mean squared error, and Normalized absolute error to compare the results. It was shown to be highly effective for the enhancement of the local regions of the images. **Keywords:** : Enhancement of Image, HE, CLAHE Optimization Approach, PSO, MCA.

1. INTRODUCTION

The enhancement of pictures is the primary treatment step in various computer image practices. The purpose of this phase is to enhance the image's feature, hence improving its interpretability and the assessment of the information [1], [2], [3]. The presence of high noise levels, image fuzziness, and varying brightness levels posed significant challenges in the use of medical image improvement approaches [4], [5]. The enhancement of pictures can be achieved by utilizing the process of extracting data from a digital picture, which is not initially obvious but is still there in a picture. There is a capability to remove superfluous elements present in an image due to many factors, such as improper settings of image-capturing devices or the medium used for taking the photographs. By utilizing image enhancement techniques, we may effectively manipulate photos to reduce noise, improve contrast, adjust brightness levels, and provide a treated picture that may be utilized as a response for various numerical pictures for programs of image processing[6], [7], [8]. The purpose of employing the approach of enhancement was to alter the factors for the pictures with medical uses and convert these pictures to a more advanced mode. The low contrast issue is resolved by employing image enhancement techniques, namely by strengthening the region of interest [9], [10], [11], [12], [13], [14]. HE is a commonly exploited procedure for improving the contrast of pictures. HE are utilized to get the frequency of levels of intensity in the picture [15], [16]. The aim of utilizing HE is to allocate the intensity values in the picture so that the areas of the minor contrast can increase a greater contrast. The procedure of HE can be classified into local or global. A local HE procedure is the CLAHE method (Contrast Limited Adaptive Histogram Equalization). Improved contrast, that is vital for better picture interpretation and feature extraction, improves picture quality to a further vivid level [17], [18]. CLAHE is a recognized method for enhancing the local contrast of images. It adapts histogram equalization to smaller regions of an image, thereby avoiding noise over-amplification common with global histogram equalization techniques. CLAHE is an

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