

# A new algorithm for using Mojette transform in image processing applications

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## Abstract

The Mojette Transform is a mathematical transform that has approximately 20 years of research history. There are several fields where the researchers tried to apply this transform. The examples include medical tomography, distributed databases, data encryption, watermarking. The transform has a really simple mathematical background. In fact the Mojette transform results from the radon transform using a set of discrete projection angles. The essence is to transform the 2D image into different vectors (projections) and after that the Inverse algorithm can reconstruct the image from these transformed vectors. Despite of the simplicity of its mathematics, this transform is a really computationally intensive procedure. Several algorithms have already been constructed that can be used for image processing purposes, such as Sliding window, and Stepping window algorithms. This paper presents a new algorithm that we made for real-time image processing purposes. The implementation proves that this kind of procedure can be implemented effectively – without any parallelism- even on a simple single-core computer processor. The key is an algorithmic change where the reconstruction is made easier by reducing the number of vectors that we needed to handle in the previous implementations. In addition we developed a new stepping order to be used during the reconstruction. Thanks to this technique the execution time approximates the requirements of real-time processing. Since the Mojette Transform is based on simple arithmetical operations and it may be parallelized advantageously, the next target is to implement the algorithm on FPGA, where further considerable speed gain is expected. After that we can apply this method in several practical cases. The bottleneck here is clearly the Inverse case, where the vectors highly depend on each other. However, these dependencies are known, so it is possible to parallelize also the Inverse algorithm. The algorithms have been implemented using the NI LabVIEW development environment. The application of this powerful environment is advantageously, because it has a set of toolkits of different kind that we can apply on numerous fields, including image processing, and it also allows a seamless transition when implementing the algorithm in hardware.

*Keywords:* Mojette transform, Inverse Mojette transform, LabVIEW.