INDIAN JOURNAL OF SCIENCE AND TECHNOLOGY

RESEARCH ARTICLE

An Efficient Transform based Low Rank Tensor Completion to Extreme Visual Recovery

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OPEN ACCESS

Received: 31-01-2022
Accepted: 20-02-2022
Published: 09.04.2022

Citation: Jyothula SK, Talari JCP (2022) An Efficient Transform based Low Rank Tensor Completion to Extreme Visual Recovery. Indian Journal of Science and Technology 15(14): 608-618. https://doi.org/10.17485/IJST/v15i14.264

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Funding: None

Competing Interests: None

Published By Indian Society for Education and Environment (iSee)

ISSN
Print: 0974-6846
Electronic: 0974-5645

Abstract

Objective: To propose an optimization approach in recovering of the corrupted tensors in the high dimensional real time data. **Methods:** The recovering of corrupted tensors is performed by low-rank tensor completion methods. The tensor decomposition methods are used in tensor completion methods. These Tensor decomposition methods; candecomp / parafac (CP), tucker and higher-order Singular Value Decomposition (HoSVD) are used to minimize the rank of a tensor data. The limitations are in finding the rank of a tensor. **Findings:** The recovered data using the lifting transform induced tensor-Singular Value Decomposition (t-SVD) technique were assessed utilizing the Peak Signal to Noise Ratio (PSNR), Structural Similarity (SSIM), Naturalness Image Quality Evaluator (NIQE), and Perceptual Image Quality Evaluator (PIQE). When compared to state-of-the-art approaches, the low rank assumption condition with the lifting transform consideration gave good data recovery for every missing ratio. **Novelty:** The missing data is calculated by lifting polyphase structures by utilizing the available data. The polyphase structures are splitting the value into equivalent multiple triangular matrices, these are processed with the t-SVD to have the better approximation tensor rank.

Keywords: Tensor Completion; Transformbased Optimization; 5/3 Lifting Wavelet Transform; Lowrank tensor completion; tSVD

1 Introduction

Estimating the missing tensor observations from the limited uncorrupted tensor observations is very difficult [(1)]. To recover missing observations, repeated patterns present in the image may be used [(2)]. It is providing the solutions to wide range of problems in machine learning, computer vision, appearance acquisition, video coding, scan completion, subspace clustering, and compressed sensing applications [(3–6)]. The two-dimensional data completion difficulties are addressed with the nuclear norm approach; it replaces the rank function [(7)] and it is termed as Low Rank Minimization.