Super-resolution reconstruction (SRR) generally relies on the assumption that estimation of sub-pixel motion in the scene is accurate. However, when there is an inaccurate estimation of motion within one of the existing SRR algorithms, it often produces undesirable results with disturbing artifacts.

The goal of our project is to implement, improve and compare SRR algorithms without explicit sub-pixel motion estimation.

Related Work

Glasner et. al [3] proposed a framework that combines Classical SRR and Example-based SRR.

Low/high-resolution patch correspondences learned from recurrence across multiple image scales.

In [4], Zhang et. al proposed a MAP SRR framework that incorporates NLM and SKR prior terms.

Danielyan et. al. [5] proposed a framework using an algorithm BM3D to compensate lack of motion information.

Simulation Results

- **Super Resolution Reconstruction With Probabilistic Motion Estimation**

  - **Fusion Step:** \( \epsilon_{\text{Fusion}}^2(z) = \frac{1}{2} \sum_{t=1}^T \| D_{t} z - y_{t} \|_{2} \)
  
  \[
  z_{t, \lambda} = \sum_{t=1}^T \sum_{\lambda} \sum_{l=1}^{L} W_{m, \lambda, l} \cdot [z_{t,l}]_{\lambda} [k,j] \]
  
  \[
  W_{m, \lambda, l} = \exp \left( - \frac{1}{2\sigma^2} \| D_{t} z_{t,l} - y_{t,l} \|_{2} \right)
  \]
  
  - **Deblurring Step with ADMM:** \( \epsilon_{\text{ADMM}}^2(x) = \| H x - z \|_{2} + \lambda \cdot TV(x) \)

- **Super Resolution Reconstruction With Steering Kernel Regression**

Future Work

- Try and compare different f functions in SRR with probability motion estimation to get better results
- Apply color TV in ADMM deblurring so that it can be used in RGB images
- Develop a SRR framework that combines probability motion estimation and steering kernel regression

Reference