

Title:

Optical Flow for Intermediate Frame Interpolation of Multispectral Geostationary Satellite Data

Authors:

Vandal, Thomas

Bay Area Environmental Research Institute

[thomas.vandal@nasa.gov](mailto:thomas.vandal@nasa.gov)

Nemani, Ramakrishna R.

[rama.nemani@nasa.gov](mailto:rama.nemani@nasa.gov)

NASA Ames Research Center

Moffett Field, CA

Abstract:

Applications in areas such as weather tracking and modeling, ecosystem monitoring, wildfire detection, and land-cover change are heavily dependent on spatial and temporal resolutions of satellite observations. However, there are typically trade-offs between spatial and temporal resolutions in dataset selection. For instance, geostationary weather tracking satellites are designed to take snapshots many times throughout the day but sensor hardware limits data collection. In this work we tackle this limitation, developing a method for temporal upsampling of multi-spectral satellite imagery using optical flow video interpolation deep convolutional neural networks. The presented model, extends Super SloMo (SSM) from single optical flow estimates to multichannel where flows are computed per band. We apply this technique on 8 multi-spectral bands of NOAA/NASA's GOES-16 mesoscale dataset to temporally enhance full disk hemispheric snapshots from 15 minutes to 1 minute. Through extensive experimentation, we show SSM vastly outperforms the linear interpolation baseline and that multichannel optical flows improves performance on GOES-16. A visual analysis of optical flow vectors clearly identifies hurricanes and large-scale atmospheric dynamics. Furthermore, we discuss challenges and open questions related to optical flow and temporal interpolation of multispectral geostationary satellite imagery.

Key Words:

Geostationary Satellites, Optical Flow, Video interpolation, Deep Learning