Meeting Announcement

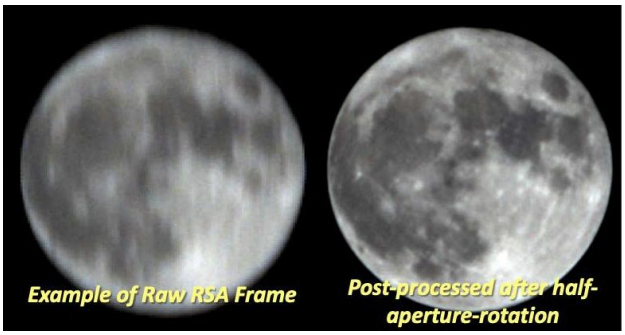
November 10th, 2021

Rotating Synthetic Aperture Imaging by

Dr. Joseph J. Green, Principal Optical Engineer, JPL

Abstract: The culmination of our best technologies and engineering practices will soon yield the James Webb Space Telescope. But underlying JWST, Spitzer, Hubble, and virtually all telescopes is the unspoken principle that all angular directions on the sky must be measured simultaneously. That each observation has made results in a conventional image, even if the ultimate science products require many images that are carefully dithered and stacked together through post-processing. This principle drove the design of JWST to approximate a circular aperture with its 18-segment primary mirror. But if we are to make transformational leaps in future space-based astrophysics systems we must consider putting aside this constraint to realize more fully optimized concepts.

The rotating synthetic aperture (RSA) architecture is an expression of this optimization. Its strip-aperture primary mirror seeks to directionally maximize the instantaneous angular resolution on the sky for any given amount of collecting area that can be afforded.



To cover the full-frequency spectrum of the science targets, measurements are collected as the system rotates. Upon a half-rotation the entire frequency content of the scene is measured out to the diffraction limit of the long-axis of the aperture but now in all directions. The aperture synthesis in RSA concepts is achieved through the post-processing of this measurement ensemble into conventional science image products.

In our discussion, we will present the theory and practice of RSA imaging along with recent results from our field demo station camera. In pursuing future developments at larger scales, we hope to enable entirely new high-resolution observation approaches to astronomers, synthesizing far larger apertures than can be fit within a launch vehicle today.

About our speaker: For the past 21 years, Dr. Green has advanced the state of the art in wavefront sensing and control, active optics, high-contrast imaging and image processing on many projects including JWST, TPF, SIM and Spitzer. In 2007 he was part of the team that won the NASA Software of the Year Award for the Adaptive MGS Wavefront Sensing software. He has also won top JPL awards for Technical Excellence (2008) and Technical Leadership (2017) related to efforts supporting Non-NASA Government efforts.

Optical Society of Southern California

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Wednesday, November 10th, 2021

Reception: 6:00; Dinner: 7:00; Talk: 8:00
Online Session Open: 7:30
(Zoom link provided on day of meeting)
Dinner: $35 for members registered by November 7 ($40 non-members), $40 after for members ($45 non-members)
(OSSC Student Members $10 by November 7, $20 after)
In-Person Location:
Sierra Madre Methodist Church, Fellowship Hall
695 W Sierra Madre Blvd, Sierra Madre, CA 91024