Development of a UAS-Driven Universal Field Assessment, Correction, Enhancement Tool Adopting Non-Intrusive Optics

Julius Yellowhair
jeyello@sandia.gov
Sandia National Labs
CPS #: 34249

Guangdong Zhu
guangdong.zhu@nrel.gov
NREL
CPS #: 34242

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PROJECT OVERVIEW

- PI: Julius Yellowhair, Sandia National Labs
- Co-PI: Guangdong Zhu, NREL
- Partners: University of Colorado at Boulder, Tietronix, SolarReserve
- DOE Funding: $3,500,000 (3 years)

SUMMARY STATEMENT

- No tool currently exists that will assess multiple optical errors efficiently and accurately in commercial heliostat fields.
- Sandia and NREL are developing a UAS-based imaging system to asses optical errors in large commercial heliostat fields using near- and far-field target structures.
- System will measure slope errors in facets, canting and tracking errors, and provide feedback for making canting error corrections.

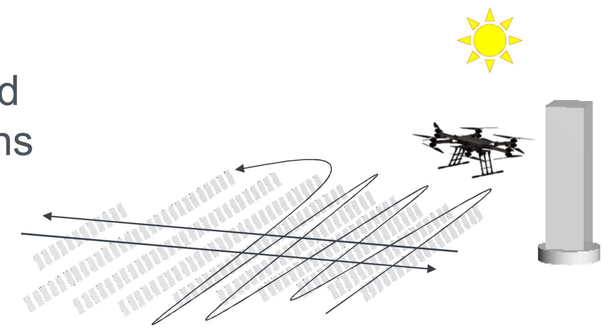
KEY ACTIVITIES

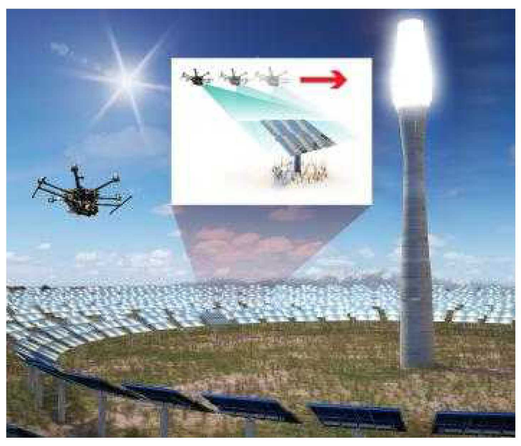
- Develop methods to assess and quantify heliostat field optical errors such as slope, tracking, and canting errors.
- Develop an unmanned aerial system (UAS) platform for image collections with predefined, optimized flight paths for fast assessments.
  - Use open hardware/software options to provide ability to scale to swarms and open-architecture for integration.
  - Use advances in high-speed embedded computing which is driving sensor-based autonomy for on-board supercomputing.
- Demonstrate methods at NSTTF and commercial heliostat fields.

KEY OUTCOMES AND IMPACT

- Assessments of heliostat fields for optical errors, identification low performing heliostats, and making corrections to those heliostats to ensure consistently high performance from the heliostat field.
- Frequent monitoring of heliostat fields to quickly identify issues and measure temporal effects on optical performance.
- Deliver an open-architecture, high-accuracy UAS imaging platform with the ability to integrate new features and functionalities.
- Reduce plant O&M cost by efficiently and accurately assessing large heliostat fields using UAS technology.

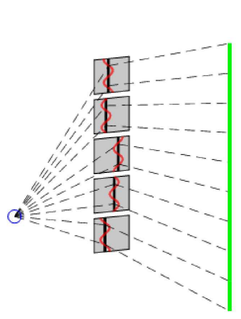
1 Optimized flight paths

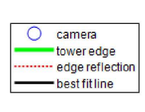


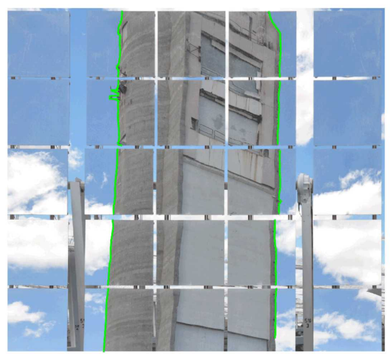


2 Image collection on far-field targets using NIO

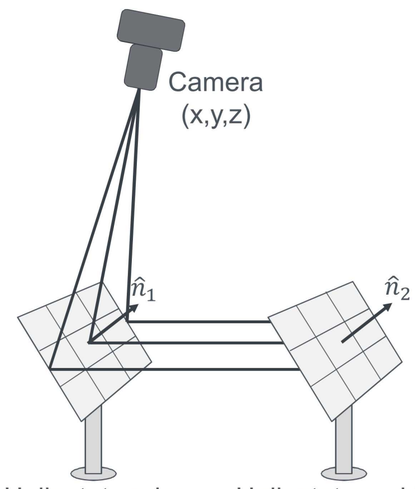
3 Image processing for optical error calculations

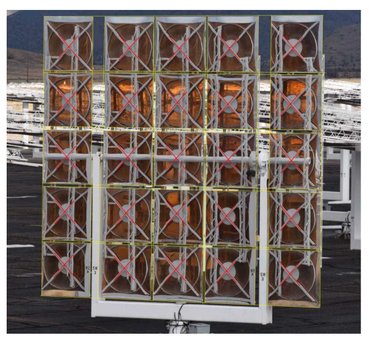






4 Apply canting error corrections using UFACET for feedback





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