Photovoltaic System Condition Monitoring Utilizing Computer Vision from Unique Video Sensors

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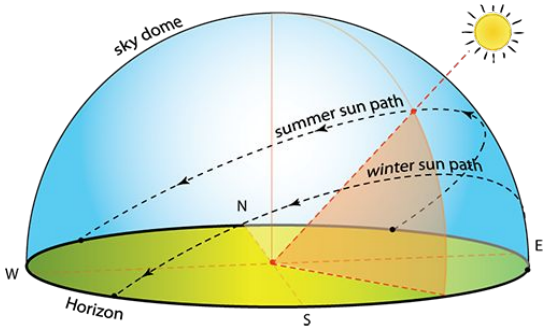
Problem Statement

- Solar power is an important renewable energy source
- Utility-sized solar arrays require unique management
- Solar panels **degrade** over time and need replacement
- Material **faults** can be a serious safety concern
- **Shading** can cause an exponential loss in power
- Transient **clouds** greatly affects entire power grid
- Predicting faults and forecasting environmental conditions can i**mprove the reliability of solar power**

Proposed Solution

- **Computer vision** has utility for solar monitoring
- **Thermal/infrared** camera for PV fault diagnosis
- **Cloud tracking** can forecast power generation
- **Irradiance forecasting** important for utility-grid
- 3D environment modeling using stationary camera
- Solar path to predict shading geometry



Solar research facility at ASU Research Park used for experiments and data collection.

Thermal/infrared camera can capture PV semiconductor defects and faults not visible to the human eye.

360-camera useful for collecting wide field of view at low hardware cost. 3D-model of physical environment can estimate geometric shading pattern.

D.F. Ramirez, S. Jayasuriya, A. Spanias, "Towards Live 3D Reconstruction from Wearable Video: An Evaluation of V-SLAM, NeRF, and Videogrammetry Techniques." I/ITSEC, 2022.