Passive Auto-Tracking Heliostat

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Over the past decade, photovoltaic solar cells have been increasing in popularity exponentially despite their high cost. Photovoltaics are clean, robust, and flexible energy sources that can function in remote areas and are easy to transport and deploy when compared to other renewable energy solutions. Unfortunately, most existing solar panels are static and not optimally aligned with the sun throughout the day. During the first year of experimentation, a panel was created that could passively track the sun using carefully aligned Fresnel lenses, bi-metallic thermal actuators, and a steel axle. This provided nearly constant energy output throughout the day. However, the panel was only capitalizing on sunlight directly hitting its surface and not from reflected light. Instead of the panel tracking the sun for added power, two mirrors were added to both sides of the panel and moved throughout the day to image additional, otherwise wasted light directly onto the solar cell. A Fresnel lens, gears, and counterweights passively drove one mirror, while the other was manually driven. The apparatus was tested on a sunny day, and data was recorded and compared to a stationary panel on a comparable date. Results validated the project hypothesis, and proved that a passive heliostat would increase the power output of a solar cell.

Awards Won:

Third Award of $1,000