Mirror Reflecting Machine to Increase Solar Power

Gach, Camry (School: Seabury Hall Upper School)

Mirror manufacturing costs less than solar panels, and when a mirror reflects light rays onto a panel, power increases, so utilizing mirrors can develop more efficient and affordable solar energy. A machine was built to motorize a mirror, tracking sunlight movement. Motors were programmed to scale the range of angles on horizontal and vertical axes and return the mirror to the position that illuminated the panel in the most reflected rays. The machine increased solar power under sunny and cloudy conditions, so existing solar systems can be retrofitted with this technology to generate more power at lower costs. The parabolic mirror increased efficiency by 5.8% and the plane mirror by 3.3% when equalizing mirror areas, but even though the plane mirror increased voltage during all daylight hours, the parabolic mirror was only effective at 10am-3pm because the supporting arm inhibited complete mirror downward rotation, a component to reengineer in the future. At 10am, the hour resulting in highest voltages, sun rays shone at the most perpendicular angle to the mirror due to the design geometry. The amount of power the motors consumed overcame the extra voltage the mirrors produced. However, by using astronomical predictions of the sun's orientation in the sky to calculate mirror position, the initial sweep would not occur, which could conserve energy. Positioning the mirror manually produced more voltage than with the mirror machine process, revealing how future prototypes can be explored based on algorithm and physical range improvements to implement the invention more effectively in society.

Awards Won: