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Electrowetting-Controlled Dual Liquid Prism for Adaptive Beam Steering JIANGTAO CHENG, University of North Texas — The use of concentrating photovoltaic (CPV) technology has been the most promising method of harvesting solar radiation. These CPV systems often require motor-driven tracking devices to steer the sun's beams onto solar cells. The cost of maintaining these tracking systems is the primary inhibitor for widespread application. We aim to overcome the need for mechanical trackers through the use of an electrowetting-driven solar tracking (EWST) system. The electrowetting-driven solar tracking system consists of an array of novel electrowetting-controlled dual liquid prisms, which are filled with immiscible fluids that have large differences in refractive indices. The naturally formed meniscus between the fluids can function as a dynamic optical prism. Via the full-range modulation of the liquid prisms, incident sunlight can be adaptively tracked, steered, and focused onto CPV cells through a fixed optical condenser. Furthermore, unlike the conventional and cumbersome motor-driven tracking systems used today, the liquid prism system would be suitable for rooftop applications. The results of this project reveal that the EWST system has the potential to generate $\sim 70\%$ more green energy at 50% of the conventional capital cost.

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