



## Solar Panel Power Optimization

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Due to dust and other deposits, solar panels produce less electric energy than what they are if they were clean. Based on the camera images of the panels, we developed mathematical theories that use as input the probability functions of the (R, G, B) channels and predict the power loss due to the dust and other deposits on the solar panels. The dust and deposits the solar panels collect every day is a random variable, this dust accumulates until measurable amount of rain falls at which time the panels are cleaned or partially cleaned and the energy produced is increased. We developed a formula that takes into consideration the cost of cleaning and the cost of electric energy lost, and find the optimal time for the panels to be cleaned. In addition to that we cleaned panels we considerable amount of deposits, using vacuum and also using water, and we found no significant difference. Our conclusions were that in order to maximize the power output we have to minimize the cost of cleaning. This is the reason we designed a robot with four cameras to detect the deposits on the panels, and to vacuum the panels if needed. This research is part of what we proposed to do, thus is aligned with the goals and objectives of the Nexus project. Our theories are based on image data obtained by our camera facing the five solar panels which are part of Dr. Boehms lab, the measurements of the voltage and current generated by the panels, the cross correlation between the solar panel image data and voltage-current solar output, and the weather data obtained by NOAA.



This material is based upon work supported by the National Science Foundation under Grant No. IIA-1301726. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.