



CALIFORNIA STATE SCIENCE FAIR 2012 PROJECT SUMMARY

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Project Title eHarvesTree: An Energy Harvesting Robotic Tree with Analysis	
Objectives/Goals Currently in the United States less than 10% of our power is being produced by renewable sources. This is not only because research is still being done to increase their efficiency but also some of these systems are visually obtrusive. Not many people have solar panels or wind turbines around their house because it may not be aesthetically pleasing. But what if you could combine different forms of energy harvesting into an artificial tree? I decided to tackle this problem of visual appeal and functionality. My engineering goal was to create an aesthetically pleasing robotics tree (eHarvesTree) that looks life-like but is a fully functional showcase of renewable energy sources.	
Abstract My eHarvesTree would be able to mimic the movements of a real tree to generate energy. I looked at various leaf structures and built two functional trees with different configurations. I experimented with multiple flexible solar panels and piezo-electric materials to build this tree. We can see the feasibility of a small scale design for everyday application. My methods include: 1. Observe tree movement to determine the mobility of the robotic tree 2. Test the amount of energy produced by one piezo-electric plate and one solar cell 3. Test out different ways in which the flexible solar panels and piezo electric generators can be arranged 4. Construct an artificial tree to demonstrate the concepts	
Methods/Materials I have constructed two different eHarvesTrees based on different leaf structure and power generated. I used flexible solar panels as the primary energy harvesters and piezoelectric generators as the secondary energy harvester. I have provisions to use small hydroelectric generators and microbial fuel cells in this tree. Both of the trees can be used in a variety of applications including charging laptops, mobile phones, MP3 players and any 12-volt battery.	
Results Inspired by nature, and enhanced by technology, the eHarvesTree is a system for showcasing newer technology for energy harvesting or scavenging. In the current version, I have used both flexible solar panels and piezoelectric generators. I have made provisions to include both small hydroelectric generators and microbial fuel cells. I see applications for such trees in the parks, homes, streets and almost everywhere. In the future I hope to continue my research and experiment with other energy harvesting techniques.	
Conclusions/Discussion My creation, the eHarvesTree is an aesthetically pleasing robotics tree that not only looks life-like but is also a fully functional showcase of several renewable energy sources.	
Summary Statement I thank Sacramento Municipal Utility District (SMUD) for their support. I thank my teachers, Mrs. Baker and Mr. Lewin for their patience and guidance. I thank my parents for their support.	
Help Received	