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## Project Overview: The Solar Tree

The planet is facing the ever-growing dangers of climate change and limited resources of fossil fuels. This pushes the need and demand for renewable energy. Kennesaw State University aims to answer this demand by planning for the use of a solar powered sign and outside outlet. Due to the aesthetic limitations of solar panels, many designs have been drafted to mimic an everyday tree while preserving a high efficiency.

### Problem Statement

As the mechanical half of this project, the problem is an aesthetic, efficient design of a solar array, whose image must imitate that of a tree. Mechanically, the solar tree will consist of 3 parts: the trunk, the branches, and the solar array housing. The total budget for the mechanical portion of the project is \$2000. The tree will be built using the design of a concrete base commonly used for light posts. From there, the trunk of the solar tree must house the battery while also providing support to the other sections. The trunk must be designed in a method that will allow easy access to any internals as well as for easy battery replacement. The branches must be designed to in an array to account for different tilt angles while also being structurally strong enough to support the solar housing. Preferably, the branches will be hollow to allow the wires from the solar array to be protected in their path to the battery. The solar array housing will consist of the solar array from the electrical engineering department housed in a plexiglass casing. The casing must be replaceable, and account for angles with reference to the sun's path that are important in being as efficient as possible. The solar tree must be able to run continuously for 10 years, excluding the parts to be replaceable.

### Impacts

The project will, on a societal level, provide information displayed through the sign, a leisure spot to charge one's electronics, and demonstrate an innovative use of futuristic technology. On a global level, the solar tree design will help advance the field of renewable energy and its applications. Economical The solar tree design will utilize renewable energy to power many info graphs and electronic devices. Kennesaw State University will save money on the energy produced for only an initial investment and maintenance. The project has been given an initial investment budget of \$3000, \$2000 of which is for the mechanical portion of the project.

### Environmental Sustainability

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The solar tree, on a fundamental level, is a project based off environmental sustainability. This tree, along with representing the Year of Morocco, is being designed with longevity in mind going well past the initial year of its use. The design will also set an example for other college campuses and even for current students at the university that the move towards clean energy alternatives needs to be of paramount importance in the coming years.

## Contemporary Issues

Energy consumption has been rising at a quick pace because of the increase in energy demand. A solution for this is a renewable energy source. The United Nations has released a climate change report in 2018 stating that the world has as little as 12 years to reduce global net human-caused emissions of carbon dioxide by in order to reach net zero by 2050. Energy needs must be met with renewable energy sources that do not harm the environment. Therefore, nonconventional energy sources such as sea tides, geothermal, sunlight and wind are a good choice. Together with these energy resources, we can meet the energy demand in the coming future. In urban areas using with large populations, the problem of energy source gets even more challenging. A renewable energy source can solve such energy problems. Solar power offers solutions to these urban areas. A solar tree can be a good way to show society the benefits of solar energy. The stigma against proclinate endeavors can be swayed by providing people with locations where they can use complimentary wireless internet, free charging stations, and digital maps or directories.

## Constraints

The constraints for the solar tree which will be outside for many years are listed below:

- Minimum power
- maximum load (based electronic components)
- max height (8 ft)
- max wind shear
- minimum plexiglass life
- lifetime of entire tree
- thermal operating conditions
- \$2000 budget.

## Design Criteria

- Safety

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The tree can be very dangerous if it falls. Therefore, safety is a number one priority.

- Environmentally conscious

The tree represents sustainability, so it must show that.

- Public acceptance

The tree should be aesthetically pleasing and multipurposed.

- Reliable

The tree will be outside for many years. It must be able to stand up to multiple weather conditions.

- Minimum Maintenance and ease of maintenance

The tree should have access to inner electronics and be easy to repair in case there is damage.

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