OMSI Solar Café Table

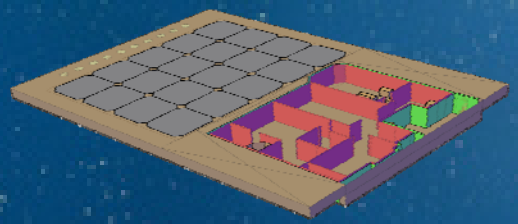
A Model Home Completely Powered by Solar Energy

Abstract

Portland State teamed up with OMSI to design an interactive café table powered by solar energy. The team 's goal for this project was to create awareness of solar technology and to provide a hands on learning experience. The team came across some challenges along the way. These include size constraints, switch implementation, and solar cell soldering.

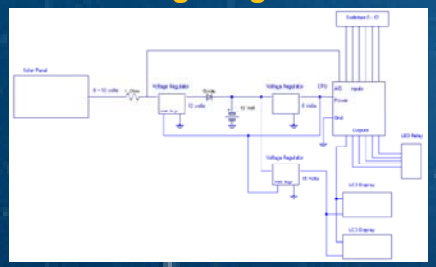
The Design

- A small-scale model home powered by solar energy.
- Batteries to store power during low light conditions.
- Table dimension: 29.5" X 42.5" X 1.5".
- Recessed section of table to 3.8" to accommodate model home.
- 10 photoresist switches to activate lights within home.
- 2 LCD displays showing power generation/consumption.
- Electrical system controlled by a micro-controller.



Initial conceptual design of Solar Café table.

Wiring Diagram



The solar array is connected to the Li-Ion battery thru a resistor, diode and voltage regulator. The diode protects the battery from discharging into the solar array. The battery is connected to the micro-controller. The micro - controller is connected to all 10 switches, the solar array, all LEDs in the house, and LCD displays.

Table Power

Solar Cells

The 20 solar cells used were generously donated by SolarWorld and were configured into an array. The soldering of these cells proved to be very difficult, due to their delicacy. The solar cells provide the following benefits:

- High efficiency monocrystalline cells.
- Array can generate up to 40 watts.
- Used to charge batteries.

Batteries

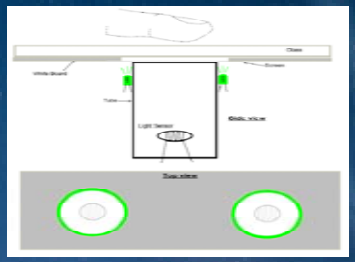
The model home runs off a 12 volt Li-Ion battery which is charged by the solar cells during the day. The battery has the following characteristics:

- 11.1 V 4400mAh Li-Ion battery.
- No memory effect and rechargeable.
- Built-in IC chip prevents over charge/discharge.

Actual Solar Café table.

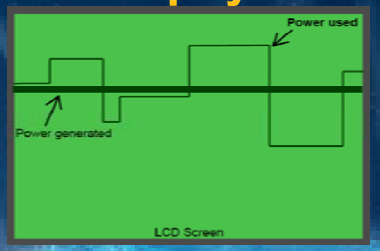
Interaction

Touch Switches



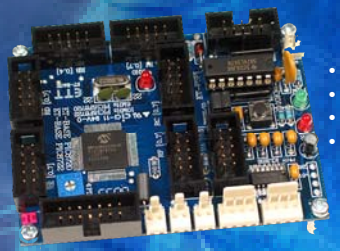
Typical switches such as inductive, capacitive and infrared couldn't be used due to certain design constraints. Photoresist switches were implemented to overcome these difficulties. The switches turn on the LED's in the home when covered.

Displays



- Graphically describes the solar array's power generation.
- Graphically describes the power usage of the model home.

Micro-Controller



- Runs @ 10 MHz with 68I/O pins.
- Controls switch activity.
- Collects data on power generation & usage.
- Controls LCD display screens.

Conclusion

The designing and building of the OMSI solar table was a great learning experience for all team members. Though many challenges arose, our team created a solar café table that will help OMSI visitors learn about solar technology in an interactive fashion.

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