OMSI Solar Café Table

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 ran 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 photoreisist switches to activate lights within home.
- 2 LCD displays showing power generation/consumption.
- Electrical system controlled by a micro-controller.

Table Power

Solar Cells
The 3D 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.

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 OLED displays.

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

Conclusion

The design 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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