GPS Sun tracking Solar Panel

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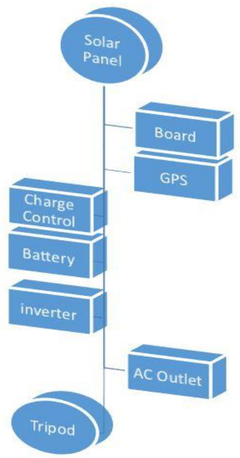
Overview

The concept of our project is based on the Global Positioning System (GPS) controlled Sun Tracking System and the name of our model is GPS CONTROLLED SUN TRACKING SYSTEM. The solar panel will directed towards sun in order to maximize the tracking of solar energy. The tracking of solar energy from the sun will be guided by Global Positioning system. The GPS will regulate the orientation of solar panel to capture the maximum solar energy from the sun. The installed GPS will be equipped with longitude and latitude that correlated with time, therefore in such case the solar panel will actually know where it is and at what angle it should face the sun.

Block Diagram



Azimuth and Altitude are angles used to locate the sun. What is an azimuth? The azimuth is the compass bearing north of a point on the horizon directly beneath an observed object. The horizon is a huge, imaginary circle that is on the centered of the observer and equidistant from the zenith and the nadir. A compass bearings are measured in degrees from north. The Azimuth angles can be ranged from 0 degrees (north) to 90 degrees (east), 180 degrees (south), 270 degrees (west), then finally 360 degrees (north). However, we had the sun as the point of interest, the plane is the surface of the sea and the reference vector points north. The azimuth is the angle between the north vector and the perpendicular projection of the sun down onto the horizon. The Azimuth is measured by the equation $\tan\alpha = \frac{\sin L}{(\cos\phi_1)(\tan\phi_2) - (\sin\phi_1)(\cos L)}$

What is an altitude? It's the vertical angular distant between the celestial body (sun or moon) and your local horizon. The elevation of the sun is the angle between direction of the geometric center of sun's apparent disk and the horizon. The elevation can be calculated by $\alpha = \sin^{-1}[\sin\delta\sin\varphi + \cos\delta\cos\varphi\cos(HRA)]$ **where HRA is the hour angle.**

System Design Tripod

Our tripod was based on two motors that maneuver it and allow it to face the sun. First there's two main components beside the motors and tripod that allows us to get the accurate calculations. The GPS shield finds the location and altitude from sea level. Then there's also the magnetometer sensor where it tell us to find the direction. Once all that done, the Arduino board receives that information and calculates the azimuth and altitude of the sun. The first motor, takes in the angle of the azimuth and rotates it to be facing the sun horizontally. Second motor takes the angle of the altitude of the sun and rotate the solar panel to be facing the angle of the sun.

Features and Specifications

- Solar Panel
- Arduino Mega ADK
- GPS Shield
- Magnetometer sensor
- Battery
- Charge Controller
- Inverter
- 2 standard servo motors