

This paper presents the design and implementation of an automatic solar tracking system for optimal energy extraction. A prototype system based on two mechanisms was designed and built. The first sub-system is the search mechanism (PILOT) which locates the position of the sun while the second mechanism (Intelligent PANELS or optimal energy extraction mechanism) aligns itself with the PILOT only if maximum energy possible could be extracted. The unique feature of this designed system is that instead of taking the earth as its reference, it takes the sun as a guiding source with an innovative alignment procedure for accurate and precise alignment between PILOT and PANEL so that maximum energy is extracted. For synchronization purpose between the PILOT and PANEL, two active sensors; LDR (light dependent resistor) constantly detects the sun rise and ultrasonic sensors detects the east position while the servo motors rotate the panel towards the direction where the intensity of sunlight is maximized. The two systems are driven by a microcontroller ATMEGA 328P programmed in C-language. At maximum, the solar tracker was perpendicular to the light source by 10 degrees. The built system achieved 25% improved output power at 10:00am compared to the conventional practice where solar panels are fixed mid-way between the geographical east and west with approximately 30 degrees towards the south as this optimal tilt was based on the season, and geographical location index of Minna, Niger State, Nigeria on the following coordinates; 9.5836° N, 6.5463° E.

Keywords: Solar Tracking System, Pilot, Panel, Automatic, ATMEGA 328P