Chapter 13
Solar Panel Tilting System in IoT Using Maximum Power Point Tracking

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ABSTRACT

The optimization goal is to increase the amount of generated energy with the help of photovoltaic system considering the tracking system's consumption. Determination of the tilt angle and azimuth angle trajectories is described as a nonlinear and bounded optimization problem. For collection of solar energy we have used sensors (LDR) for tracking of sun's path to make sure that the panel should be placed in MPPTto observe more efficiency and make sure that the panel should be placed in MPPT point.This is definitely a more cost effective solution than purchasing additional solar panels. The maximum power point tracking (MPPT) method is used to track the maximum amount of solar energy generated by the sun. In the world to avoid the dependency on non - renewable resources, solar energy is rapidly gaining the focus. This system will rotate according to the position of the sun. The operation of the experimental model of the device is based on a servo motor which is intelligently controlled by an Arduino UNO board that moves a mini PV panel according to the rotation of the sun.

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INTRODUCTION

In remote areas the sun is a cheap source of electricity because it uses solar cells to produce electricity. The output of solar cells depends on the intensity of sunlight to get the maximum efficiency. The solar panel remains according to the position of the sun during the whole day. But due to rotation of earth those panels can't maintain their position always in front of sun. This problem results in decrease of efficiency. In order to get a constant output, an automated system is required which should be able to rotate the solar panel according to sun's position. Automatic solar tracker is made as a prototype to solve the problem that mentioned above. Automatic solar tracker is a prototype which rotates according to the position of the sun. The unique feature of this prototype is that, it takes position of the sun as a guiding source instead of earth's rotation. The solar power is used interchangeably with solar energy but refers more specifically to the conversion of sunlight into electricity by photovoltaic cells. It has become a popular investment for companies as well as for residential users. This demand has stimulated the research for increasing the overall output power of photovoltaic

(PV) system causing people all over the globe to work hard on making the technology more efficient as well as cost effective. Solar panels are photovoltaic cells which gives voltage directly if you place them in sunlight. "Energy is non been created or not been destroyed". This is a universal law said by newton which has been proved by science. this is applicable for all things in energy sector the various forms of energy is converted into electrical energy in the process of transformation of various energy into electrical energy nonrenewable resources, after some time these resources are run out or replenished in human life we need to focused on renewable energy which are given by nature and don't make harm to the same nature so many energy have been identified from that solar energy is one of best energy from renewable energy this energy is not replenished until the sun existed.

1.1 Types of Solar Panels and Solar Tracking Techniques

Modern solar tracking methods can be classified into the following types.

1.1.1 Single Axis Solar Panel

Solar tracking systems can be classified by the mode of their motion. These tracking systems have the PV surface that can be rotated/tilted around axes to derive a proper angle that can help them get the maximum sunlight. When movement or adjustment of the PV surface happens by rotating around one axis, it is called single-axis tracking. When the movement of the PV surface happens around two axes simultaneously, it is called dual-axis tracking. Single axis solar tracker is a device that positions the panel in the direction of the sunlight to draw the maximum energy possible. As the name suggests, the tracker helps the solar panels to flex on the axis and change their angle with the Sun's direction. Simply put, the single axis solar tracking system allows the panels to move from east to west and improve energy production. It is much more efficient than fixed solar panel systems because compared to the latter, the single axis trackers generate up to 25-35% more electricity.