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SOLAR TRACKER SYSTEM USING ARDUINO

Abstract: In this article, the small solar power plant currently being designed is a set of panels mounted in a static position, i.e. fixed axis, usually installed on both sides of the roof at home, which in turn causes the sun to move slowly. due to which sunlight affects the efficiency of the panels on this or that side of the roof, leading to a decrease in the available efficiency. In the first half of the day, the efficiency of the panels on one side of the roof is better, and in the second half, the efficiency of the panels on the other side is better. In practice, this process is inextricably linked to the movement of the sun, so we considered the optimal solution to maintain their current efficiency and efficiency by moving the solar panels. The device is a laboratory-made module that depends on the movement of the sun during the day and is perpendicular to the sun.

A single-axle taker changes its position relative to only one axle. Typically, such a tracker is equipped with a static actuator, which changes the angle of inclination of the device. The actuator, in turn, consists of a motor-reducer and a rod. The rod attaches to the table and moves it up or down. A single-axis tracker changes its angle to the sun several times a year. It is controlled by software that makes 2 to 20 changes per year.

Moving system - such a system is called in English (tracker), ie in Uzbek "monitoring device". Its operation is simple and is designed to monitor the sun as much as possible to increase the efficiency of the device.

Key words: Drive system, solar module, servomotor Arduino UNO, photoresistor.
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Introduction

An important part of the mobile solar module system is the supporting structure for the solar panels. It provides the required strength for the entire system and the right angle of inclination for the solar panel. The combination of the solar panel and the supporting structure must be resistant to various wind speeds and other environmental influences.

This article uses an Arduino-based solar tracking system. Light-dependent resistors (LDR) are used to sense the intensity of sunlight, and the solar module is adjusted to maximize sunlight observation. A servo motor is used to control the solar module. The results show that a moving solar module produces more energy than a static solar module.

Main part.

The following electromechanical and photoelectric devices were required to build a mobile solar module:

➤ Servomotor;
➤ Arduino UNO;
➤ Photoresistor;
➤ Solar panel;
➤ Similar for mounting.

Servomotor. Servo (also known as servomotor) has been used for a long time, the size is very small,

but the role is large, mainly used to control the angle, usually used in aircraft model, smart car, robots, ships, roller movement such as industry, by steering wheel is performed. The servo circuit has a shaft mounted on the engine block and is usually equipped with gears that drive the motor electrically, which determines the amount of movement of the shaft. It is usually advisable to use stepper or servo motors to move the solar panels, and these motors can be connected directly to the Arduio.
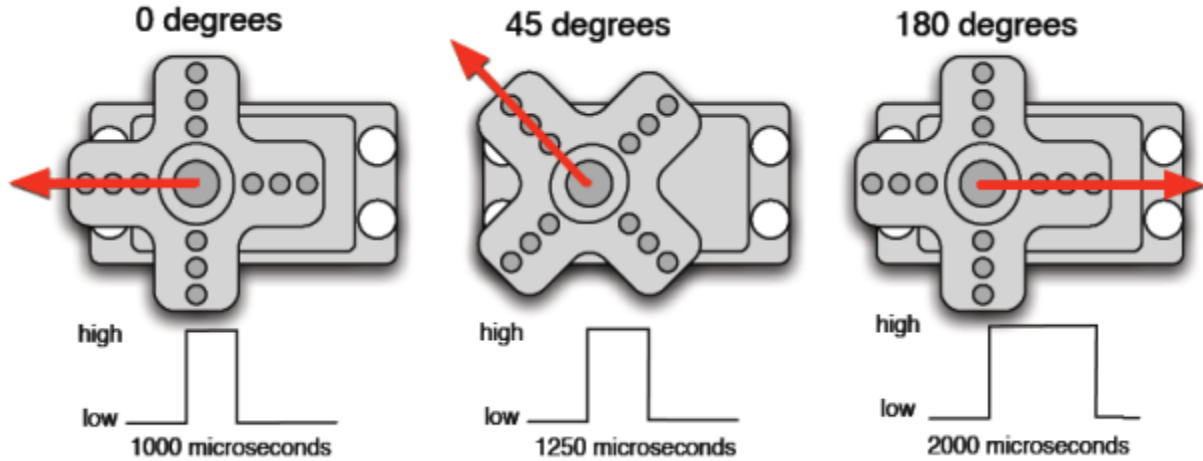

Figure 1. Pulse width and position.

MG996R Servo Motor Features
• Operating voltage is usually + 5V
• Current: 2.5A (6V)
• Stop torque: 9.4 kg / cm (at 4.8V)
• Maximum stopping torque: 11 kg / cm (6V)

• Operating speed 0.17 s / 60 °
• Gear type: metal
• Rotation: 0 ° -180 °
• Engine weight: 55 g
• The set includes gears and screws.

Figure 2. Servo motor structure

Arduino. It is a small board with a processor (microcontroller) and memory.

There are many types of Arduino, such as Arduino Yun, Arduino Uno, Arduino Duemilanove, Arduino Diecimila, Arduino Nano, Arduino Mega, Mega 2560, Mega ADK, Arduino Leonardo, Arduino Micro, etc. An Arduino is a device that combines software and hardware. As mentioned above, there are many types of Arduino, and beginners of Arduino will start using the Uno or Nano type of Arduino. Some robotics technicians, after getting acquainted with the

Arduino Uno and using its capabilities, try to make their own without buying an Arduino Mega. The Arduino Uno differs from other types in that it has more processors, microcontrollers, and more or less digital and analog outputs. The user of Arduino will be able to connect to it various electrical components and modules, for example: LED lights, sensors, relay modules network (Wi-fi, Bluetooth, Ethernet) modules, sensors, motors, magnetic door locks and powered by electricity all things. So you need to create a program! What program do we create? Through

which programming language? Programs for Arduino are written in standard C ++, with simple and straightforward algorithms and programs for controlling I / O (Input-Input, Output-Output) in contacts. There is an Arduino IDE (Arduino program, compiler) running on Windows, Mac OS and Linux to study and write programs, and you can use it absolutely free of charge. Creating algorithms and programs in the Arduino IDE is very easy and easy to work with[6-13].

Arduino Uno specifications:
Microcontrollers: ATmega328;
Operating voltage: 5 V;
Input voltage (recommended): 7-12 V;
Input voltage (maximum): 6-20 V;
Digital input / output: 14 (6 of them can be used as KIM (Shirotno-Impulsnaya Modulation));
Analog input: 6;
Photoresistor. A photoresistor is a semiconductor photoelectric device that uses the phenomenon of photoconductivity, which means that the electrical conductivity of a semiconductor changes under the influence of optical radiation. [11]

Basic sizes:

$$S_i = \frac{I_\phi}{\phi}$$

Darkness resistance $R_{k} = 10^2 - 10^9$ Om with the same value of the resistance of unlit photoresistors;

Operating voltage - the value of the operating voltage depends on the size of the photoresistor, ie the distance between the electrons is selected from 1 to 1000 V.

It should be noted that the size of photoresistors varies with the external environment. Advantages of photoresistors: high sensitivity, can be used in the infrared part of the radiation, small size and can be used in DC and AC circuits.

The sensors use two light-sensitive resistors called LDRs. They change their resistance level depending on how much light falls on them. The more light, the less resistance.

The program works by comparing the resistance of two sensors and moving the servo motors. The sensitivity of the sensors depends on the code written on the Arduino. The codes are set only in a certain area (so as not to disturb the rest of the project) and to move at a set speed. Both aspects of the code can be easily modified.

To prepare and launch a mobile solar module, we will need a number of devices, including:
• Arduino Uno
• Servo motor Servo motor type MG996R
• Photoresistor MLG4416 (90mW; 5-10kGh /1.0MŌ) - 2x
• Metal constructor
• Output resistance 10 kŌ; 0.25 W; 5% - 2x
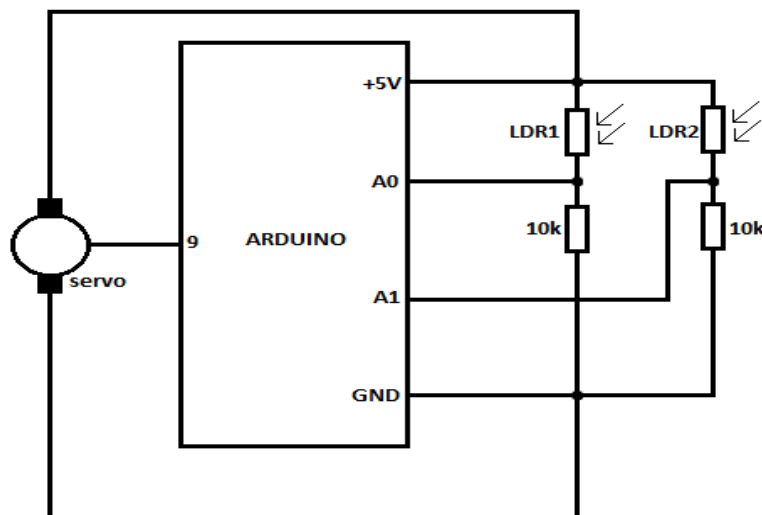• Printing cabinet, box, connection wires

Figure 3. Schematic of the control of a moving solar module using an Arduino.

A solar panel that covers the sun using an Arduino and Servomotor.

There are a variety of trackers available in addition to solar tracking methods.

The pursuer is a horizontal axis that moves from east to west. Once the tracker is installed, you never have to change or adjust anything, because wherever

the sun is, the tracker will follow it. This method is the best result for power generation.

A dead tracker is made along the X and Y axes, which simply moves from left to right from east to west. Typically, these make the X axis (left to right) an observer and then set the panel to 450 on the Y axis.

This system produces more energy than conventional solar modules.

This tracker is a tracker (via Arduino) controlled by a computer program. It uses a sensor to find the brightest source of light. The tracker starts at sunrise in the morning and moves perpendicular to the sunlight until sunset.

The system uses a computer program that changes the angle of the panel depending on the date, time and physical location. Each device on the tracker is much more efficient if it is set up correctly. In this system, the solar module is the most efficient, even on cloudy days, from a mathematical point of view.

In this case, the prototype of the solar tracker based on the Arduino is assembled. Serves are used to rotate the platform on the horizontal and vertical axes, the angle of rotation of which depends on the intensity of the light incident on the photoresistors[5-10].

To start the moving solar module, you need to type the following code on the Arduino Uno.

Solar panel code driven by Arduino

```
#include <Servo.h>

Servo myservo;
int pos = 90;
int sens1=A0;
int sens2=A1;
int tolerance=2;

void setup() {
  myservo.attach(9);
  pinMode(sens1,INPUT);
  pinMode(sens2,INPUT);
  myservo.write(pos);
  delay(1000);
}
```

```
void loop() {
int val1=analogRead(sens1);
int val2=analogRead(sens2);

if((abs(val1-val2)<=tolerance)||(abs(val1-val2)<=tolerance)){
  } else {
  if(val1>val2)
  {
    pos=--pos;
  }
  if(val1<val2)
  {
    pos=++pos;
  }
}
  if(pos>180){pos=180;}
  if(pos<0){pos=0;}
  myservo.write(pos);
  delay(50);
}
```

Once all the necessary elements and equipment have been selected, the design of the projected mobile solar module is ready.

Conclusion

Nowadays, the importance of solar energy is growing day by day. It is also possible to increase the efficiency of solar devices several times, and by installing them on the roofs of houses and next to them, we provide home heating, water heating and household appliances, even if we do not remember the tropics. A moving solar module is 20-25% more efficient than a static solar module. It is better to use such a system[10-15].

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