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AUTOMATION OF SOLAR INSTALLATIONS THROUGH TRACKERS

Today, much attention in the world is paid to alternative energy sources. Problems related to the environment and the depletion of natural resources are gradually bringing humanity closer to the transition to renewable and ecological methods of generating electricity. The most promising representatives of alternative energy sources: solar and wind energy. Both of these types of energy production are a good way to get electricity from natural resources without polluting the environment. However, there may simply be no wind, and the sun, although covered with clouds, will still shine from 7 to 15 hours, depending on the time of year and the position of the coordinates on the earth's surface.

The main problem of alternative energy sources, in comparison with traditional ones, is low efficiency and high cost. Often, solar panels are installed in a stationary state, and they do simply not capture most of the sunlight. To solve this problem, I usually install solar panels in the direction of the south, but the problem of incomplete consumption of sunlight does not go away. You can solve this problem by installing solar trackers on a solar panel [1]. Typically, the solar tracker or heliostat shown in Figure 1 consists of several LED sensors and an electric drive that turns the solar installation towards the sun. This method of targeting has its drawbacks. First, the behavior of the tracker, when the sky is covered with clouds, is very difficult to predict. Second, poor response to interference, that is, response to moonlight and clouds. The presence of these reasons suggests the use of a more advanced system of tracking the sun.

Consider a model of a stationary solar panel and a solar panel with a tracker. The tracker will be assembled on a PIC16F876A microcontroller and two A5 MG996R servos [1]. The circuit will be charged from a solar battery from the TP4056 module.

To determine the current time, we use the DS3231 clock. The maximum voltage does not exceed 4 V on the battery to power two servos. The board will have a voltage divider, which will reduce the consumption in sleep mode.

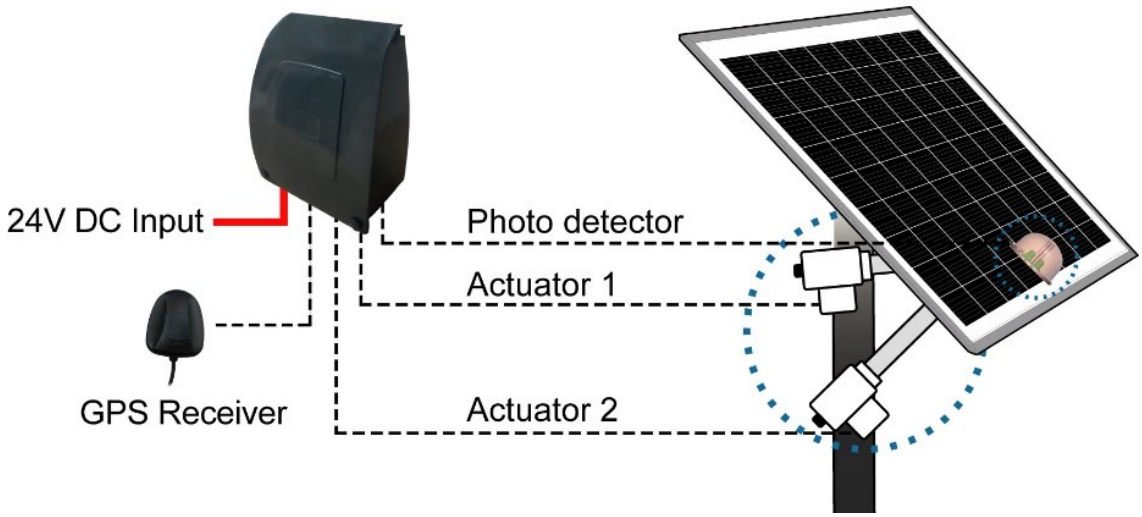

Figure 1 – Example of solar tracker operation on photo sensors

To detect an error in the tracker's communication with the clock, an LED was connected, which lights up if there is no response from the clock. The assembly is carried out with the installation in the middle position of the servos, with subsequent adjustment of their extreme positions. After the build, you must specify the coordinates and time to set the program parameters. The program performs for each day the positions of the sun from sunrise to sunset. After sunset, the program takes the tracker to sleep mode and exits it before sunrise. When using a solar panel using a tracker, the time of direct illumination is up to 90 % [2]. Figure 2 shows a schematic diagram of a solar tracker.

A solar power plant, automated according to such a system, will increase the efficiency of sunlight consumption. The program will adjust the panel regardless of cloud cover and other factors. However, it is worth noting the important disadvantages of this approach. First, it is the complication of the design with two electric drives for the orientation of the installation in space, equipping the structure with digital equipment. Secondly, maintenance of electric motors and possible incorrect operation of equipment in frosty weather. Third, because of the additional equipment, there will

be an increase in the cost of an already expensive installation. However, you can compensate for the cost if you use the tracker modification not for a single solar panel, but for a set of panels connected together on a single mast.

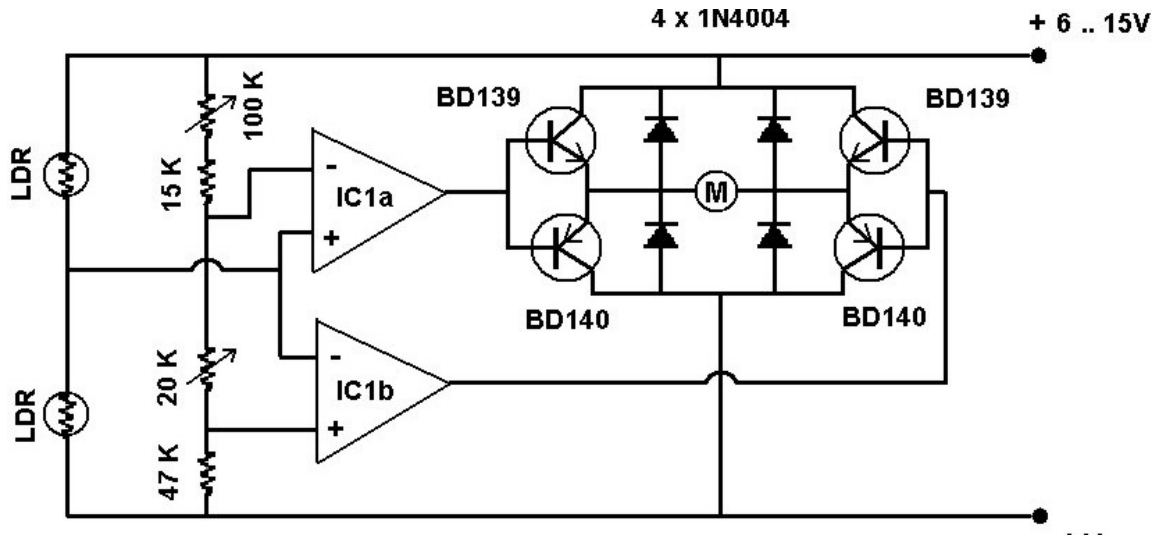

Figure 2 – Electrical circuit diagram of the solar tracker

In our time, it is more important than ever to find a compromise between traditional and alternative energy sources, the obvious advantages of alternative energy sources are their waste-free operation, but, in turn, traditional energy sources can offer many times more energy [4].

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