Automated camera station

Maxim Matvei

Zamolxe 18, 2049 Chişinău, Moldova
mmatvei@gmail.com

An automated camera station is described.

1 Introduction

The automated camera station consists of an automated chassis controlled via a wireless antenna. The chassis can be moved forward, backward, left, and right.

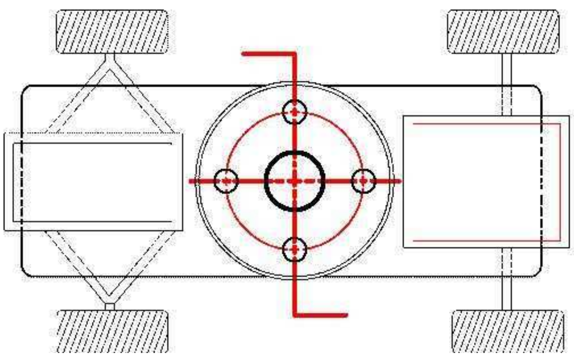

Figure 1 – The camera mount.

On the chassis there is a platform that allows a circular movement (left, right), independent from the main chassis. On top of it is an equatorial mount. One, four, or six wide-angle cameras can be mounted, so, as a result, photographs spanning $360° \times 90°$ are obtained. (With a more sophisticated lens, this can actually be realized by a single camera.)

The advantage of the wireless control of the station is that it allows to photograph meteors at any location on Earth, because the station can be manipulated using a computer.

2 Chassis

We first explain the construction of the chassis. It is a 30-cm wide crawler. For now, it has only the gear unit, and the engines with measuring devices. For each gearbox, I installed speed sensors on a support. They consist of an infrared LED and a photodiode. Each gear has a hole in it, through which the light emitted by the LED can fall on the photodiode. It has been applied for two reasons:

1. to measure the covered time lapse. The crawler does not slide a lot, leaving the opportunity to measure the relative movement; and
2. to adjust the speed. If the engines work irregularly, the chassis will become skewed. The control is needed to fix that. The controller will measure each 10 rotations, and, if an engine moves slower, it will speed it up. The differences in speed can occur due to various reasons, such as friction or different parameters.

The photodiodes can be bought. I got mine from an old 5-inch disk drive. It can be connected to the controler using a cathode. For finding the cathode on the photodiode, you will need a tester tuned in diode mode. Connected to the sensor, the device will show a reaction to light. In the dark, the resistance of the photodiode is infinity, in bright light 100 Ω. The cathode goes on the controler and the anode on the ground. The output port is configured for the appropriate buttons. The LED is connected through a resistance of 510 Ω, +5 V. Volts. You can check with a digital camera that its matrix is sensitive to infrared light. Why did we choose a LED? In principle, it could be a red or white diode, but all the photodiodes I used worked best with the infrared light. For example the showed no reaction for green, a weak reaction for white, a better reaction for red, and the best reaction were for infrared light.

3 The engines

I am very delighted to use Maxon engines, made in Switzerland, which are 20 mA when idle on 12 V—less than a photodiode! The current when active on 12 Volts is 600 mA, but the spin is so furious that I cannot stop them with a finger.

Connected together, the rotation of one engine will lead to the rotation of the other one—they are like a synchronous motor: one works as a generator, the other as an engine.

I am afraid to even think about their efficiency: 99.99%; madness, made in Switzerland!

I got them from the disk drive of an old Robotron—they were spinning the spindle of the diskettes. It can be also found at flea markets where it costs about 20 USD.

A little bit less efficient are the engines of Mabuchi Motors. They can be found in Chinese recorders, or in radio stores. The only thing you must do is removing the stabilization chip. The current when idle on 12 Volts is 80–100 mA. The current when active on 12 Volts is less than 1 A. It is adequate for feeding using a L293D bridge.

4 Speed reducer for disk camera support

Figure 2 shows the electronic diagram of the speed reducer for disk camera support.

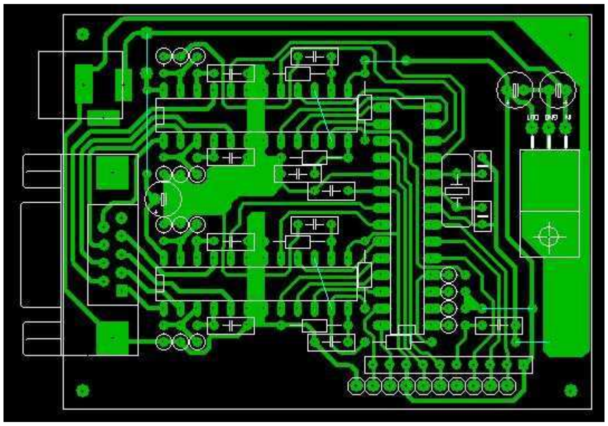

Figure 2 – Electrical diagram.