The task is to indicate the movement of objects at a great distance with the ability to fine-tune the system to a certain (narrow) direction in space, which needs to be checked for movement. In other words, it is necessary to create a system that, when there is movement in a certain (small) territory located at a great distance from this system, will notify about it. At the same time, the device should be relatively simple to implement and not require large financial costs. Nowadays, there are laser motion sensors, laser and ultrasonic rangefinders that can be reprogrammed and used as a motion indicator. But they have disadvantages. First of all, they cannot be used for long distances. Also, the latter's work on the principle of sending and receiving signals. This means that in the presence of special devices, the source of these signals can be easily calculated which in some situations can be critical. So what is the solution? This paper presents one of the possible options.

What can be achieved using a simple pyroelectric motion sensor that responds to infrared radiation (Fig.1)? The two main characteristics of such sensors are the viewing angle and the range of action (sensitivity). Usually the first parameter for PIR sensors varies from 80 to 120 degrees. In this problem mostly we have to keep track of a certain point in space, and the rest - the movement of trees, flying birds and other objects that we are not interested in movement, we must somehow discard. That is, from all possible values of angles from 0 to 120 degrees, we should use only 1-5 degrees. The second parameter is the range of action, which for the most common (available) sensors is in the range from 8 to 15 meters. For tracking objects that can be 200 meters or more away, using a sensor alone is not a solution. The question is: if it is possible somehow to bring the parameters of such sensors to those required to solve the problem.

As part of the experiment, we took an ordinary satellite dish and glued a mirror surface onto it. In the place where the antenna converter was located, we placed a pyroelectric sensor (Fig.2). Since the location of the converter is initially located at the focal point of the antenna, no additional adjustment is required. The pyroelectric sensor is configured to be as sensitive as possible to wavelengths between 7 and 14 micrometers, which is the wavelength of infrared radiation emitted by humans. Thus, the problem of background motion (trees, birds...) is partially solved. We read data from the digital output of the sensor using the Arduino microcontroller. The geometry of the satellite dish makes it possible to register to a greater extent the radiation that comes mainly from a strictly one (narrow) direction. This allows us to keep track of one specific territory.

Before using the device, it must be calibrated. This process is reduced to finding such an antenna position at which the laser beam reflected from its surface, the source of which is retracted to a large distance, after reflection hits the sensor exactly. In daylight conditions, it is very difficult to accurately determine this position. But even a rough definition of this "ideal" position gives good results. On a two-dimensional image, this process will look something like this - (Fig.3).

Recall that the maximum distance at which a sensor (without a satellite dish) can see movement is only 8-15 meters. As a result of the experiments, we were able to detect movement at a distance of more than 300 meters. And this is not the limit. We used the most budgetary and affordable materials. The total cost of the installation assembled by us does not exceed $40-50. By using better components and with more accurate calibration, the range of action can be increased many times over.

Ease of manufacture and low cost make it beneficial to use such a system for both civilian and military purposes.

What we briefly presented to you is the simplest example, which does not really use all the possibilities of such a system.

Fig.1

Fig.2

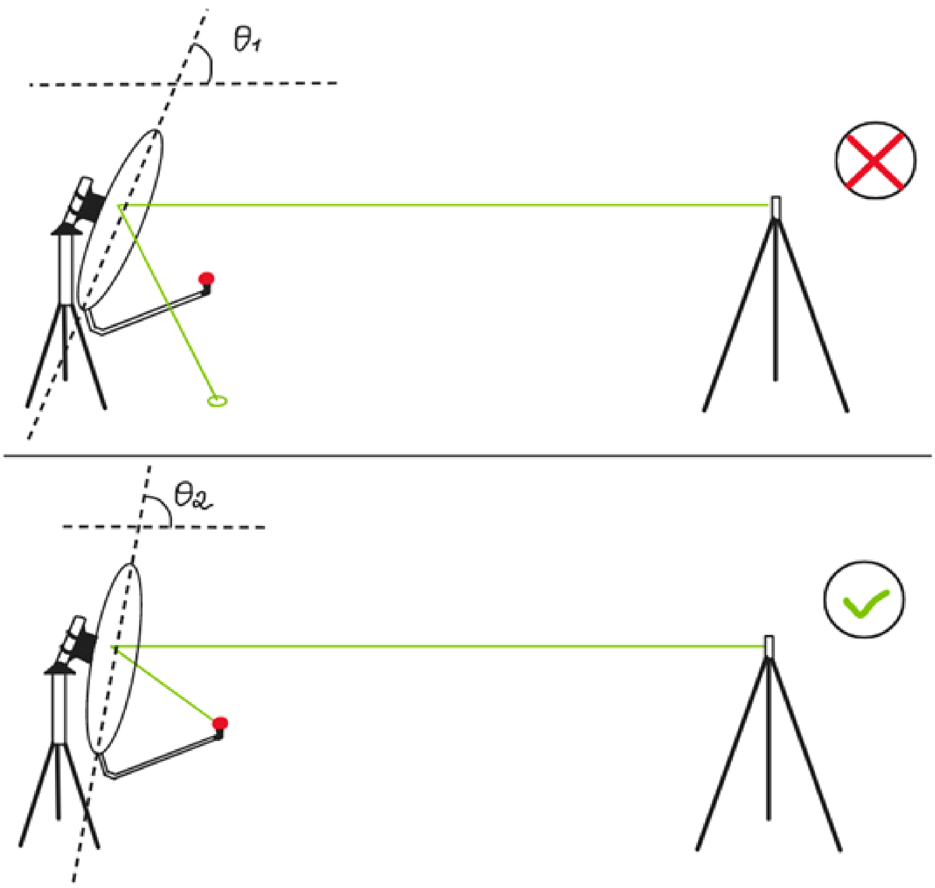

Fig.3