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SWIVEL MECHANISM FOR ANTENNA WITH GPS SENSOR AND LAN CONTROL

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This article discusses the method of developing a rotary device with a GPS sensor and the ability to control the position of the antenna remotely from the workplace using a LAN connection.

Introduction. All that is needed for the development of the device is a reduction in the size of the case, a decrease in the weight of the device itself, and a higher antenna rotation speed. To compensate for the resulting deficiencies the device should be built-in and programmed to support network connections.

Task formulation. As a rule, to develop a device, we need to determine our technical characteristics, on the basis of which the elemental base of the developed device will be largely determined, and the operating conditions of this device must also be determined.

Technical details:

- The executive part of the motor has a power of 500W ± 10%;
- Connector for wired LAN;
- The presence of a GPS module;
- The device has several types of antenna rotation;
- The BRIGHTNESS adjustment knob allows you to adjust the brightness of the display;
- Using the VERTICAL knob, azimuth control is provided from 0 to 360º;
- Using the HORIZONTAL knob, you can control the elevation from 0 to 90º.

Operating conditions for use:

- Range of operating temperatures from minus 20 to plus 60 ° C;
- Atmospheric pressure 84 - 106 kPa;
- Relative humidity of 80% at a temperature of no more than 50 ° C.
- The overall dimensions of the device should not exceed 190x110x95mm, the mass should be no more than 3kg.

The device must be powered from a 24 V DC network.

Methods of research. The following basic elements were selected for the rotary device:

- Encoder-OCD-EIB1B-10V-IXARC;
- Microcontroller-ATmega328p-32KB Flash 2.5V / 3.3V / 5V-Vercial;
- Display-WH1602A-5V-WINSTAP;
- Motor-ZY1016-350W 24V2750 RPM-Funsport;
- GPS module - Beitan BN-880;

The principle of operation of the device is based on the processing of signals transmitted from control devices to the controller, followed by rotation of the device. The device consists of a control part, a controller and an actuator.

The actuator consists of several parts. The necessary signal received by the controller is processed and then transmitted to the motors of the device.

This rotary device is designed to rotate and accurately position even the largest television antennas to ensure the best signal reception. The rotation of the motor is synchronized with the position of the rotary switch on the control unit. This is achieved through the use of high-precision synchronous motors. The connecting cables between the controller and the motor are under safe voltage. After the end of the operating cycle, the device automatically turns off and does not consume current until you turn it on again by turning the switch on the control unit.

Based on the structural diagram, you can determine the principle of operation of the device

– The signal from the encoder is fed to the programmed microcontroller.

– From the microcontroller, the processed signal is sent to the display on which the angle of rotation of the antenna will be displayed.

– The microcontroller also receives a signal to the actuator that will rotate the antenna horizontally and vertically.

After a thorough analysis of the available data, the structural diagram, you can begin to develop a functional diagram on which there will be more components of the device, as well as the device itself will be divided into separate blocks for convenience in drawing up the electrical circuit.

The GPS sensor in this device is required for:

- Accurate location of the antenna;
- Accurate determination of the direction of the antenna;
- The exact azimuthal position (if the antenna was moved by a person to another place).

In the device under development, an absolute encoder was used. In the absolute encoder, the entire rotation circle is divided into a certain number of sectors, most often the same size. These sectors are numbered. The encoder at work gives the number of the sector in which it is currently located. Therefore, it is called absolute.

With this type of encoder, you can always determine by what angle relative to the zero sector the encoder is turned at a particular moment, that is, when turning it, it gives the values of the sector numbers to the maximum value. Then it goes back to zero. If the encoder shaft is turned in the other direction, then it will start to produce opposite values. [2]

Microcontroller ATMega328 is an 8-bit low-power CMOS microcontroller based on advanced AVR RISC architecture.

ATmega328 / P - the microcontroller of the AVR family, like all the others, has an 8-bit processor and allows you to execute most commands in a single clock cycle.

The reprogrammable read-only memory (EPROM) stores the microcontroller's program of work, as well as the values of the coefficients and constants necessary to calculate the value of the rotation value from the signals received from the sensor.

The random access memory stores intermediate values of variables necessary for calculating the measured temperature values.

I / O ports provide information exchange between the microcontroller and peripheral devices relative to it. These ports vary in purpose and functionality.

Atmega328p is used to receive the supplied signal, process it and transmit it to the actuator. ATmega328 / P - the microcontroller of the AVR family, like all the others, has an 8-bit processor and allows you to execute most commands in a single clock cycle.[1]

This microcontroller uses 5V power.

A display is an electronic device designed to visually display information. The display in most cases can be called the part of the finished device used to display digital, alphanumeric or graphic information electronically.

It is necessary to distinguish between the concepts of "display", as part of the device, and a monitor, which can have different types of displays - CRT, LCD, plasma, and so on. For example, a mobile phone has a display for displaying information, but it can also have a remote (plug-in) monitor.

Some displays serve as indicators. But you should distinguish between the concepts of "display" and "indicator". An indicator is a device (device, element) that reflects any process, the state of the observed object. Indicators can be, for example, raster, segment, arrow, acoustic, tactile and so on [3]. For example, the TV display is not an indicator, and the audio indicator is not a display.

Previously, in technology, only raster devices were called displays, and only segment devices were called indicators, but now modern multifunction indicators are also called displays.

Conclusion. As a result of the article on the topic "Swivel mechanism with GPS sensor and LAN control", the following results were obtained:

- The requirements for the developed device were formulated.
- The development of a structural diagram of the device.
- The development of a functional diagram of the device.

After the implementation of the above points, the economic justification of the thesis project was carried out, the total cost of the product was calculated. Information about analogues showed that the developed device is more competitive in price, and is not inferior to them in characteristics. Therefore, the production of this device can be considered economically and technically feasible.

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