

normal-conducting machines there is a trend towards the use of higher frequencies for this purpose [4-6].

Market research has shown that the accelerator technique has great potential in the market and Russia occupies a leading position here.

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### **STABILIZER FOR WEB-CAM**

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We have stated a problem to simulate and create stabilizer for our web-cam, but first it is necessary to determine what stabilizer is. In common, stabilizer is a device that provides stability, permanent position, condition of whatever.

Our aim is creation of device that will hold cam in position of balance to horizon.

A gimbal is a pivoted support that allows the rotation of an object about a single axis. A set of three gimbals, one mounted on the other with orthogonal pivot axes, may be used to allow an object mounted on the innermost gimbal to remain independent of the rotation of its support. The

most important gimbal property is, if hold a rotated body in, that body is going to save direction of rotation axis, independent from orientation of gimbals itself.

The next step of our project is developing project of our stabilizer, in CAD system.

**T-FLEX CAD** is a system of automatic designing, that has all modern instruments for developing projects of any difficulty. T-FLEX unites powerful parametric capabilities of 3D designing with resources of creation and appearance of technical documentation.

**Stabilizer components:**

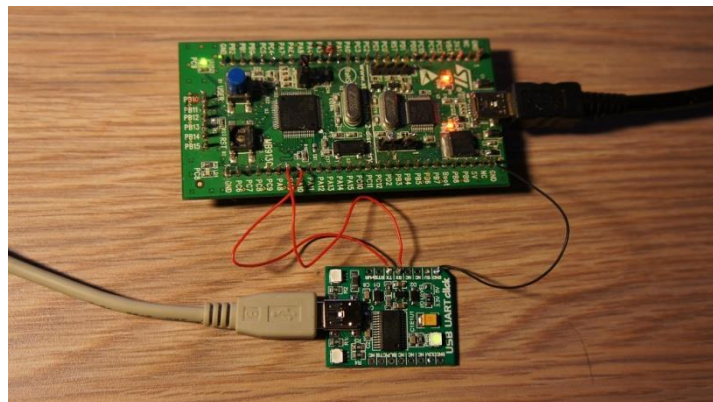
**Microcontroller.**

Controller of STM 32 family was chosen.

**Microcontroller** is a microcircuit, which assigned for controlling electronic devices.

Typical microcontroller combines on crystal functions of a processor and periphery, that is able to do simple tasks.

STM32 is its microcontroller, that built on base of core ARM Cortex-M3.



**Accelerometer.**

This is a device, that measuring projection apparent acceleration (difference between true acceleration of object and gravitational). As the rule, accelerometer is a sensitive weight, which is fixed in elastic suspension. Deflection of weight from its primary position in the presence with apparent acceleration brings information about that acceleration.

Gimbals.

**Servomotor.**

A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is

some signal, either analogue or digital, representing the position commanded for the output shaft.

The motor is paired with some type of encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller. If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the positions approach, the error signal reduces to zero and the motor stops.

The very simplest servomotors use position-only sensing via a potentiometer and bang-bang control of their motor; the motor always rotates at full speed (or is stopped). This type of servomotor is not widely used in industrial motion control, but it forms the basis of the simple and cheap servos used for radio-controlled models.

In a few words, servomotor is “Automatic exact performer” – getting on entrance of controlling parameter (real time), it itself (based on sensor readings) tends to create and support this value and exit of executive element.

### **Operating principle.**

Accelerometer measures acceleration, that appears, when happens translocation considering horizon. That change fixes and transmits to controller, that gives servomotor to controller, which gives command, that moves camera into horizontal position

**Analog-to-digital converter** (ATD) converts voltage, that got from accelerometer, microcontroller and software doing exact operations.

In this work, we have mastered the skills of 3D modeling in CAD system T-flex, the theoretical knowledge about the mechanical and electronic components of the stabilizer, learned the skills of soldering of printed circuit boards and studied the principle of printing on a 3D printer. The main result is a functional prototype of the stabilizer.

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## **WATER TREATMENT PLANT “IMPULSE”**

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One of the most important problems in our days is lack of clean drinking water.

TPU scientists have developed water treatment plant “Impulse”. It is using electro impulse processing of water and filtration with mechanic filters for water purifying. Mechanical filters fit with chip natural materials. Electro impulse processing of water founded on the combined action of the natural oxidants (ozone, radicals, OH, and atomic oxygen etc.). This reproduced the phenomena occurring in nature during a thunderstorm, and preserves the natural properties of water.

The unit discharge of water treatment is a "wet ozonator" placed directly in the aerated water flow. It allows easier purification scheme and leads to reducing the cost of equipment.

Using the all positive factors that accompany discharge (short-active particles, ozone, ultraviolet light, electric field, etc.) made it possible to significantly reduce power consumption and significantly increase the processing efficiency.

The water treatment plant “Impulse” is able to remove metals (Fe, Mg, Pb, Cu, etc.) out of water.

Compared with other water treatment plants, “Impulse” has some significant advantages. Benefits:

- Low power consumption (50 W h / m<sup>3</sup>) at a high efficiency water treatment through the use of the original treatment technologies;
- no chemicals and consumables;
- simplicity and reliability in operation and maintenance;
- environmental safety;
- high quality-price ratio;
- payoff is 0.5-2.5 years;
- the cost of 1 m<sup>3</sup> of water is chip(0.3 \$).