

DEVELOPMENT OF A CONFOCAL LASER SCANNING MICROSCOPE

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A special light microscope that uses a focused laser beam to scan a sample and then reconstruct three-dimensional structures from sets of images taken at different depths. Laser scanning along the sample is carried out by moving the laser in the x and y directions. The image is composed by combining the measured light points. The resolution of such a microscope is determined by the number of possible measurements made in the x direction and the number of lines in the y direction. The maximum resolution is limited by the numerical aperture of the objective lens of the system and the wavelength of the laser, just as in conventional optical microscopes. Since the resolution of the DVD-reader must be high enough to read the information on the disc [4], it can be concluded that the head with the lens unit and its servo drives can be used to build the CLSM. The prototype installation uses two heads. One emits a laser and scans in the x direction. The second gripper head carries the sample and moves in the y direction. The signal is captured by a simple photodiode. The servos that move the heads, as well as the current supplied to the laser, are controlled by an Arduino Micro with an electronic drive on the printed circuit board, and the images are reproduced in the Processing program [5]. Processing sends 81 settings to the microscope, and in return receives line-by-line readout data. You can set the following parameters: type of laser (infrared, ultraviolet, red, etc.); laser power; launching site; scanning resolution; color scheme and brightness [3].

The usefulness of the development of CLSM using DVD drives is justified, which will allow scientists or students with a small budget to build a microscope capable of receiving digital images with a fairly high resolution. A structural diagram of the KLSM prototype based on DVD drives has been developed. The perspective of the work is the further improvement of the drive control program code and the development of a suitable vacuum chamber to improve the image acquisition conditions.

Reference:

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