

# Computers Optic Microscopy for Education Electronics

Silviya Letskovska<sup>1</sup>, Pavlik Rahnev<sup>1</sup>

**Abstract** – In this paper the combination between optical microscope and modern digital devices (computer) is described. The system of the image analyze is intended for training students and scientific work.

**Keywords** – optical microscope, image analyze, student training.

## I. INTRODUCTION

In the advanced microscopy technique more frequently is the necessity of using monitor visualization of registration and computer analyses of the images (electronics, criminology, material science, biology, medicine, etc.), everything connected with small objects.

The modern computer system (image analysers) can be used in laboratory works, science investigation and education. They consist soft – hardware complexes built for receiving, converting, processing the image and saving the received information.

The complex of the equipment depends on the tasks to be solved. They are not simply connected separate elements, but unified in common system.

The transfer of optical microscopy to computer can be done in two ways:

- Leader Companies producing microscopes (Zeiss [1], Nikon [2], Leica [3]) supplied their microscopes with special video adapters, video cameras and software for micro objects image analysing;
- The presence in the market of not expensive digital photo and video devices gives the possibility of easy connection microscope – video – computer.

In other words there is interesting possibility to upgrade and to connect in complex old microscopes, modern photo technique, computer (PC), software and printer - Fig. 1.

The goal of this work is to describe such combinations for laboratory and educational purposes.

## II. REQUIREMENTS FOR IMAGE ANALYZER

The microscope could ensure the choice of monitoring field in different magnifications and light conditions. It forms the image and transfer it to the photo/video device.

The camera must accept the image from the microscope and transfer to the computer. It could be black/white or colour with high resolution and possibility to control and manipulate same of the image parameters [4,5].

The required resolution of the video camera is determined by the sizes of the object and microscope used magnification (M).

If the size is 2mm, M=100, the resolution could be 50 pixels/mm (for recognizing of the object on to it must have no less then 5 pixels).

As result CCD camera 510x510 will allow to work with images with real size is approximately 10x10mm.

The base requirements for the computer are:

- Working with images which size is several MB and more;
- Speed and reliability (quick processor and memory 256 MB and more);
- Compatibility with peripherals with could be the part of the complex analyser and to be command by the computer.

The monitor is also peripheral of the PC. The main parameters are:

- Size – usually 17" minimum for 1:1 scale of viewing and editing of the image;
- When the digital cameras with matrix over 1milione pixels the size of the screens could be 19" or 21";
- Special monitor for corner correction and deformations of the image.

The software requirements depends on the specific equipment and purposes – Fig.2.

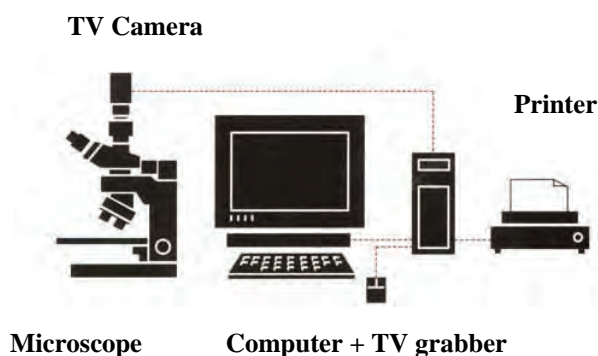


Fig. 1.

<sup>1</sup>Silviya Letskovska is with of Burgas Free University, San Stefano 62, 8000 Burgas, Bulgaria, silvia@bfu.bg

<sup>1</sup>Pavlik Rahnev is with of Burgas Free University, San Stefano 62, 8000 Burgas, Bulgaria, rahnev@bfu.bg

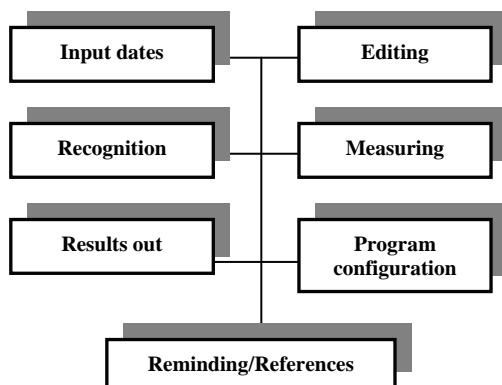


Fig. 2. Block diagram of software requirements.

### III. BUILDING THE SYSTEM FOR IMAGE ANALYZING

The composition of the system is next:

- Optical microscope MBS -10 (Microscope Binocular Stereo, Russia) with standard light source - Fig. 3;

The process of student education in many courses need



Fig 3. Microscope MBS -10.

- Black/White camera with CCD matrix (B/W /3" CCD) mounted onto the microscope with TV adapter (TV – A) - Russia, Fig. 4. The technical parameters are in Table I.
- TV adapter is intended to transmit the optical image from the microscope to TV camera with next input in the computer (Fig. 4). For this purpose TV tuner is installed model PV – BT878P+W/FM (PixelView, play TV pro) [6, 7].
- Computer and printer. The computer has processor 1,3 GHz and moor, Windows XP Professional, 17" monitor, video card 32MB, memory RAM 512 MB and more. The printer is Black/White, HP Laser Jet 1020;
- Special software Video tesT – Metall, for managing and analyzing of images.

TABLE I

Overall dimensions, mm	170x130x130				
Weight, no more, than kg	0,7				
Increase in optical system of the TV-adapter together with a head part of a microscope depending on the established position of handles of change of increase:					
Index on the handle	0,6	1	2	4	7
Increase in a plane of the CCD-matrix	0,15	0,27	0,55	1,1	1,92



Fig. 4. TV adapter (TV – A).

So completed system can fulfill next functions:

- Choice of part of the object and viewing the image in the type "life" picture on the screen in real time;
- Filtering (colouring), changing the scale of the image, illumination;
- Estimation the sizes of the objects;
- Viewing the image on the screen and printing (hard copy).

It could be mentioned that using different additional devices can extend usefulness of the system. For example using UV light (ultra violet), Infrared camera (Thermo camera) Laser beams etc [8].

### IV. THE SYSTEM AND STUDENT EDUCATION

The process of student education in many courses need visualization of micro images. The use of the optical image analyzer (OIA) shows good results in material science, criminology, medical courses, etc.

As examples of using OIA (optical image analyzer) in education process could be shown next:

- Demonstration of micro images from educational sample collection;

- Demonstration of micro images with additional education for use the computer analyzer;
- Using OIA for creating educational materials (disk, movies etc.).

## V. CONCLUSION

As result the student have better acceptance of new materials, increasing their computer skills, increasing the possibility to use microscopes. In the same time the students create better vision for micro objects.

## REFERENCES

- [1] <http://www.zeiss.ru>
- [2] <http://www.icon.com>
- [3] <http://www.leica.com>
- [4] Panteleev V.G., Egorova O.V., Klykova E.I., Computer microscopy M, (2005)
- [5] <http://www.infectology.ru/microscopy>
- [6] <http://www.specteh.com.ua>
- [7] <http://www.mwrn.com>
- [8] <http://directindustry.com>