Levenhuk MED 12M Microscope Digital Camera with 9.7" LCD Screen

User manual

levenhuk
Zoom&Joy

General information

Levenhuk MED Digital Camera is a professional accessory for trinocular microscopes. Its 9.7" color LCD touch screen and 12Mpx digital camera allow you to conduct high-precision research in real time, and save images and video for further use.

The kit includes

Digital camera with an LCD display, C-mount, AC adapter, USB cable, user manual, and warranty slip.

Parts of digital camera

1. Microphone
2. USB port
3. USB mouse port
4. Headphone jack
5. AC adapter socket
6. MicroSD (TF card) slot
7. HDMI out
8. Power on/off
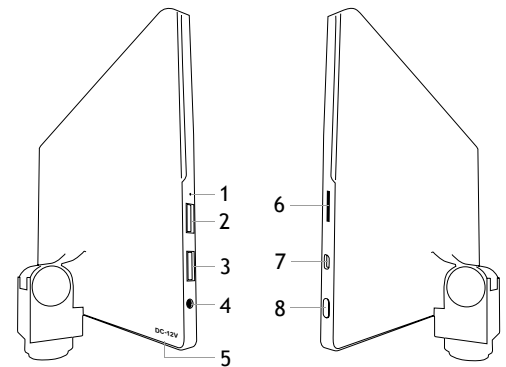
Caution! Please remember that mains voltage in most European countries is 220—240V. If you want to use your device in a country with a different mains voltage standard, remember that use of a converter is absolutely necessary.

Installing a digital camera

LCD screen digital camera is installed on the third vertical tube of trinocular microscopes. Assemble and set up your microscope. Insert the digital camera into the C-mount, then insert the C-mount into the trinocular tube and tighten the locking screw. Connect the supplied AC adapter to the camera and to the AC network. Press the power button and the camera will be ready to work. Use the supplied USB cable to connect the camera to your PC.
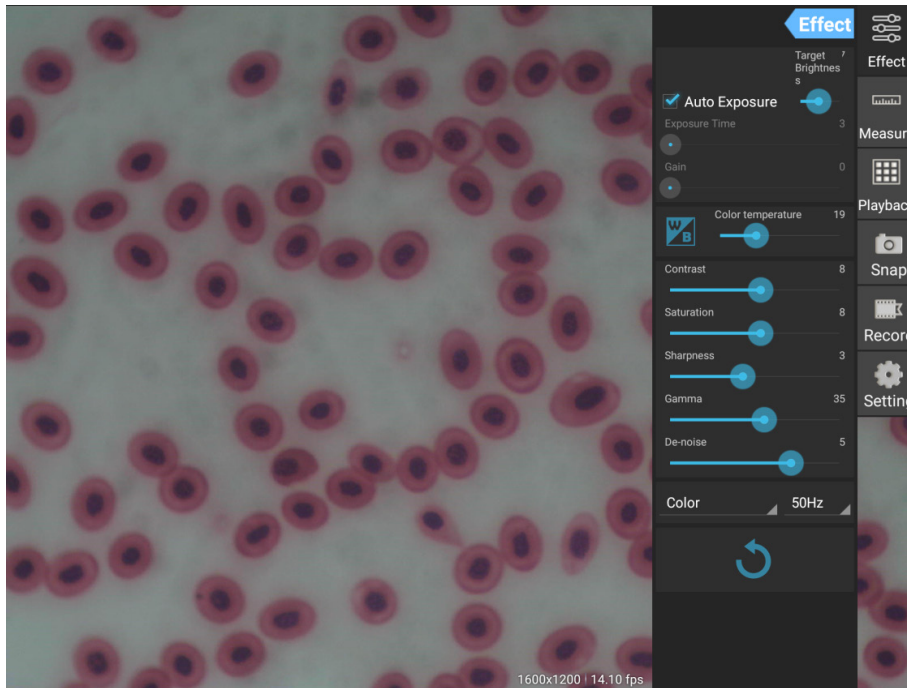
Embedded software

The embedded application is designed for using Android digital cameras with microscopes. With this application, you can change image parameters, measure objects and save images for further use. In addition, you can perform particle analysis with its image processing feature. Like all Android applications, this application features a user-friendly multilanguage interface.
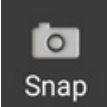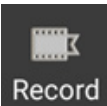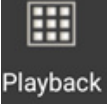
Camera display interface

The screen is divided into two parts:

1. The left part is the **Preview Image**. It displays the current image provided by the camera.

2. The right part is the **Tool Panel**. It contains a number of tools for image capturing, changing parameters, measuring, etc. Use the right side of the screen to perform the following actions:

- Effect: Settings of the camera parameters
- Measure: Measuring tool
- Playback: Images and video playback
- Snap: Image capturing
- Record: Video recording
- Setting: Setting and changing parameters

Capturing and playback tools

Snap	Press the **Snap** button to take a photo. Select the image size in the Settings section.
Record	Press the **Record** button to start video recording. To stop recording, press the same button once again. If the original size of the video is smaller than 1080p, then the size of the recorded video will be the same as the original. If the original size is bigger than 1080p, the recorded video size will be reduced to a size smaller than 1080p.
Playback	Press the **Playback** button to open the last image captured or to play the last video recorded. The image will be opened in the **Image Analysis** window.

Capturing and playback tools

The **Effect** panel allows you to edit the captured image, if necessary.

Exposure
Auto Exposure: The brightness of the image will be automatically adjusted.
Manual mode: You can set the exposure time and gain.

Color temperature (White balance):
Press this icon to set the white balance automatically. For manual settings, use the slider tool on the right.

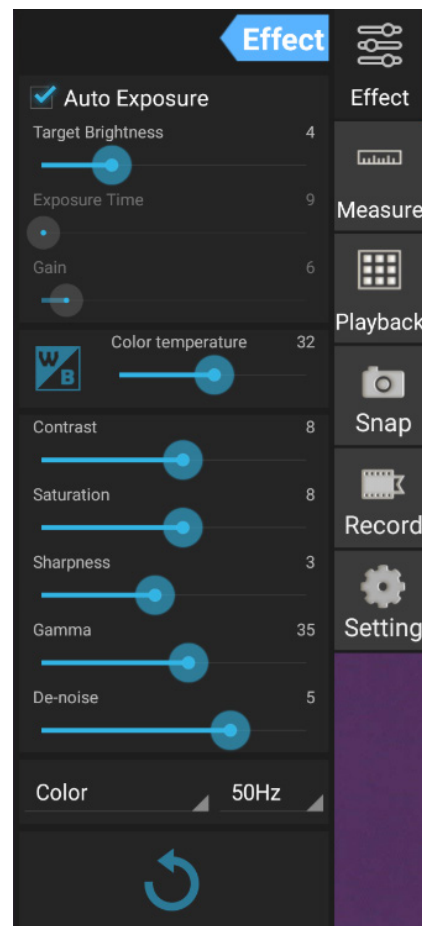**Contrast**: Use the slider tool to adjust the contrast.

Saturation: Use the slider tool to adjust the saturation.

Sharpness: Use the slider tool to adjust the sharpness.

Gamma: Use the slider tool for the gamma correction.

De-noise: Use the slider tool to adjust the noise level.

Press this icon to reset all the settings to the default parameters.

Measurements

On the **Measure** panel, you can select a tool to conduct a measurement.

Before you start, you need to calibrate the ruler. You also need to calibrate it after changing the microscope objective and/or camera resolution.

1. Calibrations
Go to the Measure panel, and press **Add** button to start a new calibration process. Press **Edit** button to make changes in precious calibrations.
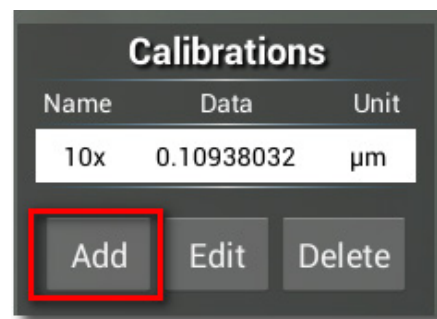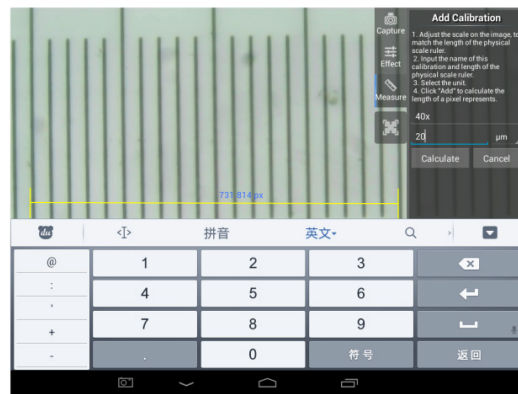
Open calibration menu:
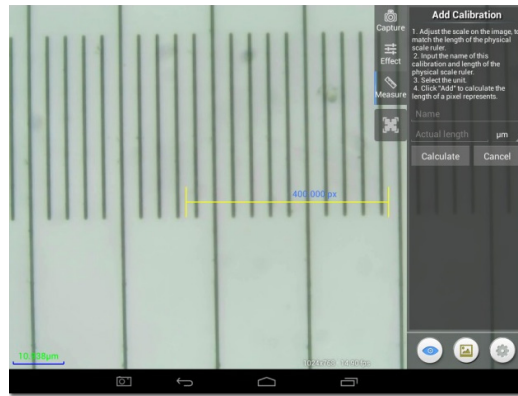
Follow the instructions:

Adjust the yellow ruler to where its ends are on the physical ruler's scales. The ruler on the screenshot has 0.01mm scales, and each big grid equals 10µm, so two big grids equal 20µm.

Enter the name for the calibration and actual length of the ruler. In the example, the name of the calibration is "40x", which corresponds to the magnification value of the chosen eyepiece, and "20µm" is the actual length of the chosen ruler.

Press **Calculate** to get the calibration value for the current eyepiece and image size. Press **Add** to save the calibration.
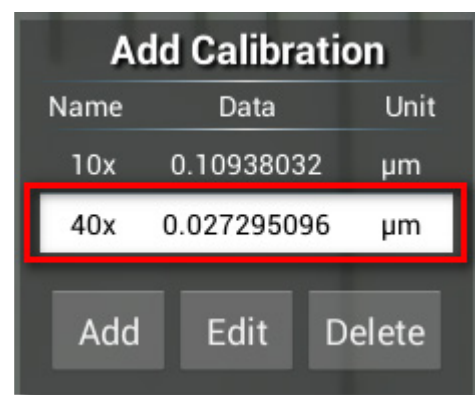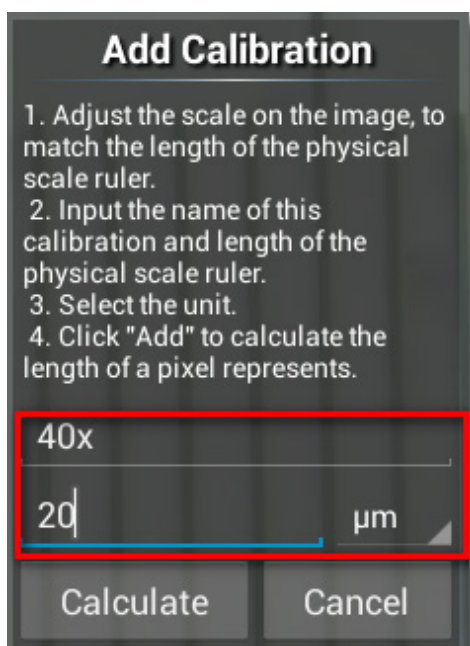
2. Measuring tools

You can use a wide range of measure tools (rulers).

| Icon	Measure tool	Action
	Point counting	Set the starting point of measuring on the photo
	Line	Measure the distance between two points
	Rectangle	Measure the width, length, and area of the rectangle
	Circle	Measure the area of a circle
	Cros	Measure the cross hair
	Angle	Measure the angle
	Two Circles	Measure the distance between the centers of two circles
	Perpendicular	Measure the length of a perpendicular line
	Concentric	Measure the radius of two concentric circles
	Text Annotation	Add a comment to an image
	Option	Change the width or the color of the ruler's scale, and the size or the color of the text
	Export	Export the image with measure marking
	Delete	Delete the chosen ruler
	Delete	Delete all

3. Use of the measuring ruler

Choose a calibration (the chosen option will be displayed as a black print on the white background).
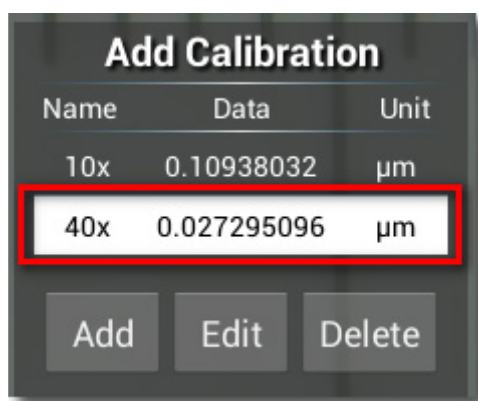
Choose a ruler from the side menu, and it will appear in the image.
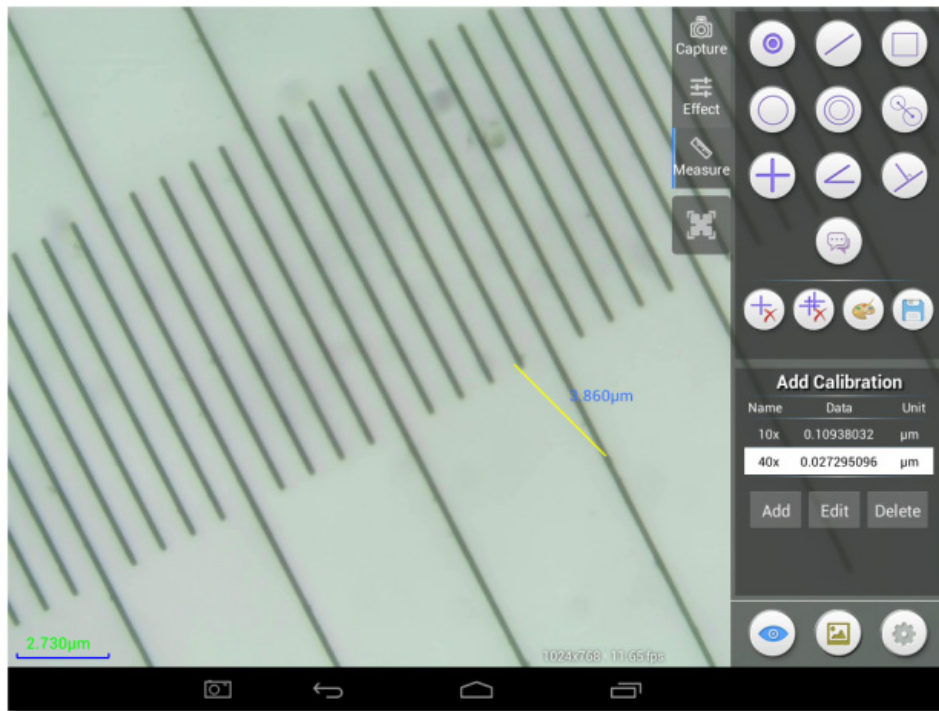
Use the measuring ruler to measure the physical ruler.

In this example, 1.5 large grids were measured: the measuring ruler shows 14.910µm, which confirms the correctness of the measurements.
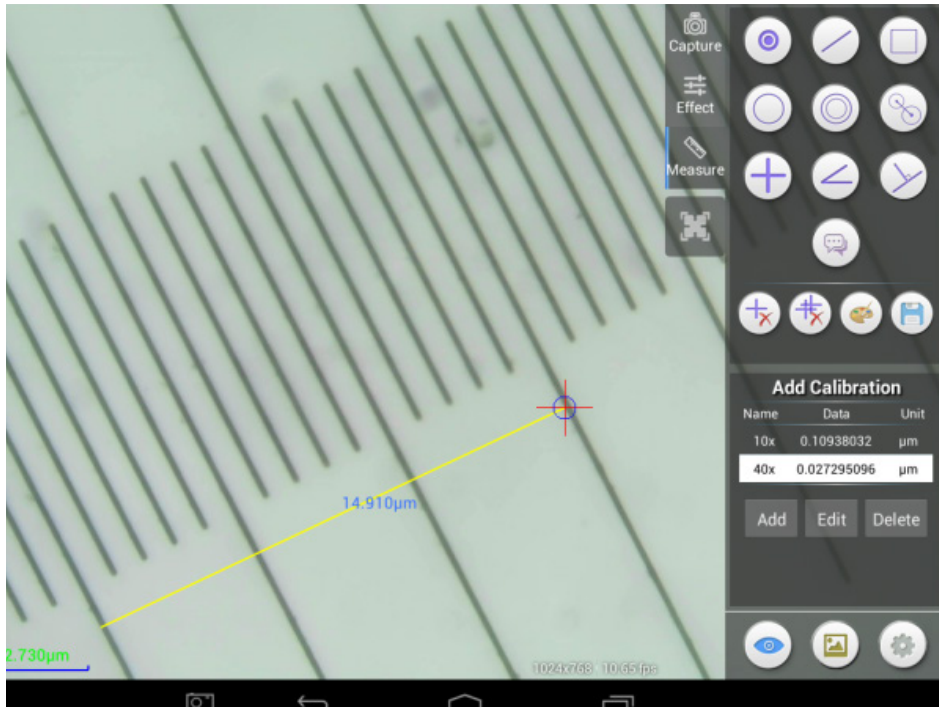
Image analysis

The images are analyzed with the Android application YWImage, which uses OpenCV (Open Source Computer Vision Library). The application version 1.0 supports such functions as gray scale, contrast, binarization, and particle analysis.

Let us consider an example of particle analysis.

Image uploading. Click the camera icon in the upper right corner of the screen. You can select an existing image or take a picture with the camera.
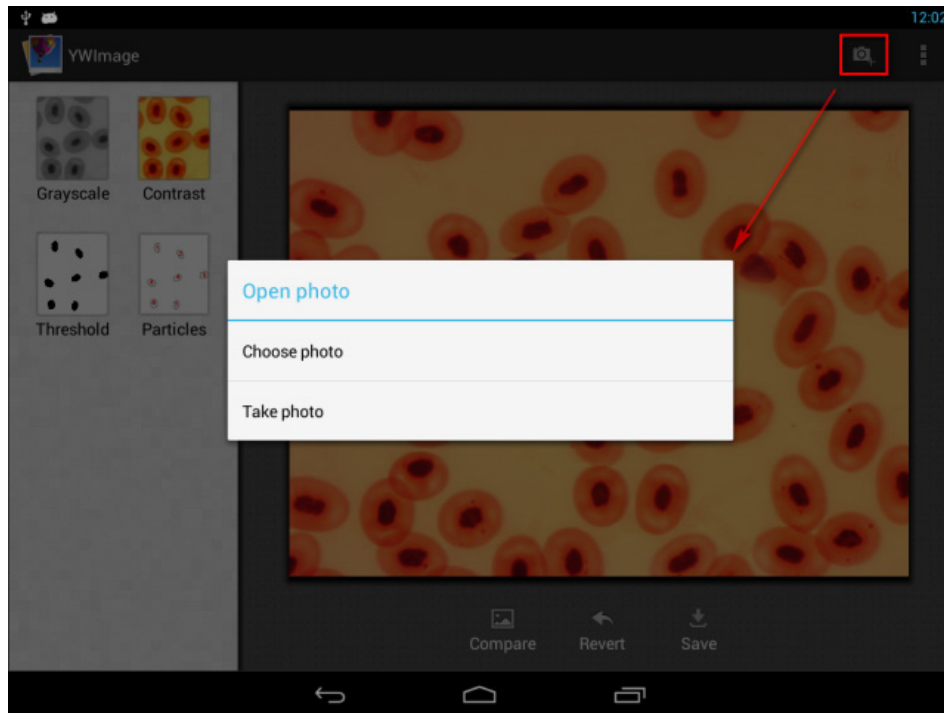
Convert a color photo to Grayscale mode. Choose **Grayscale** from the left menu and press **Apply** to confirm converting.
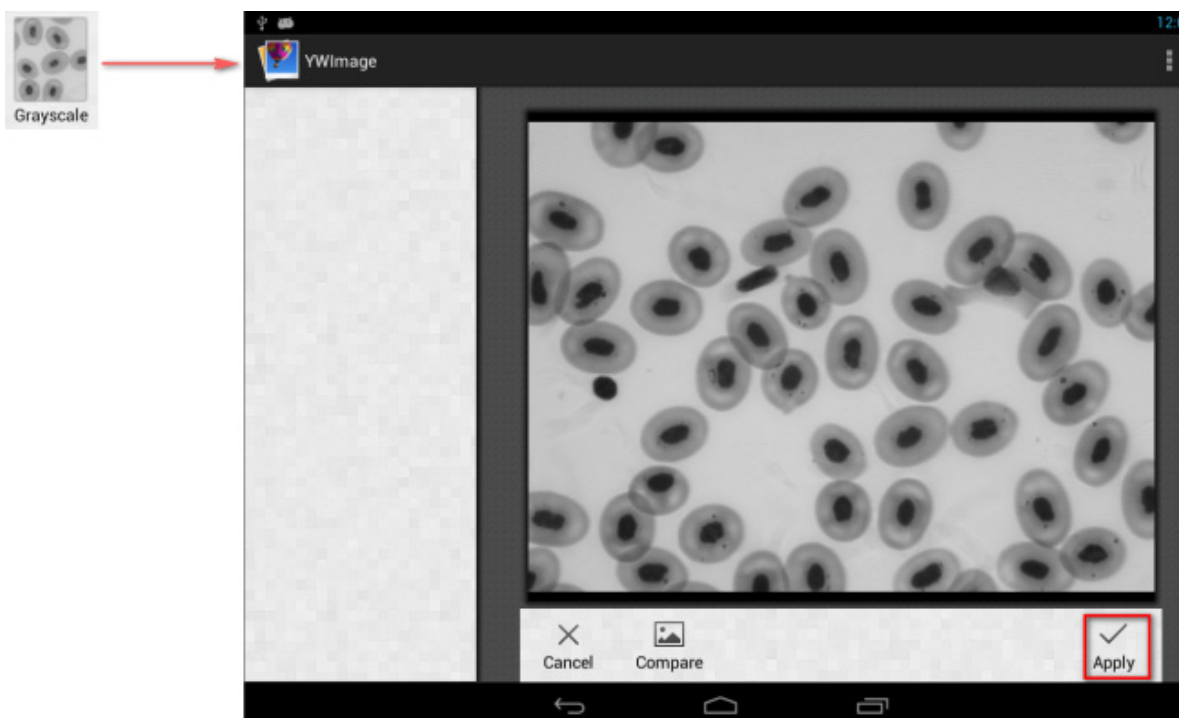
Contrast and brightness adjustment. Adjust the contrast and brightness of the black and white image, increasing the difference between objects and the background.
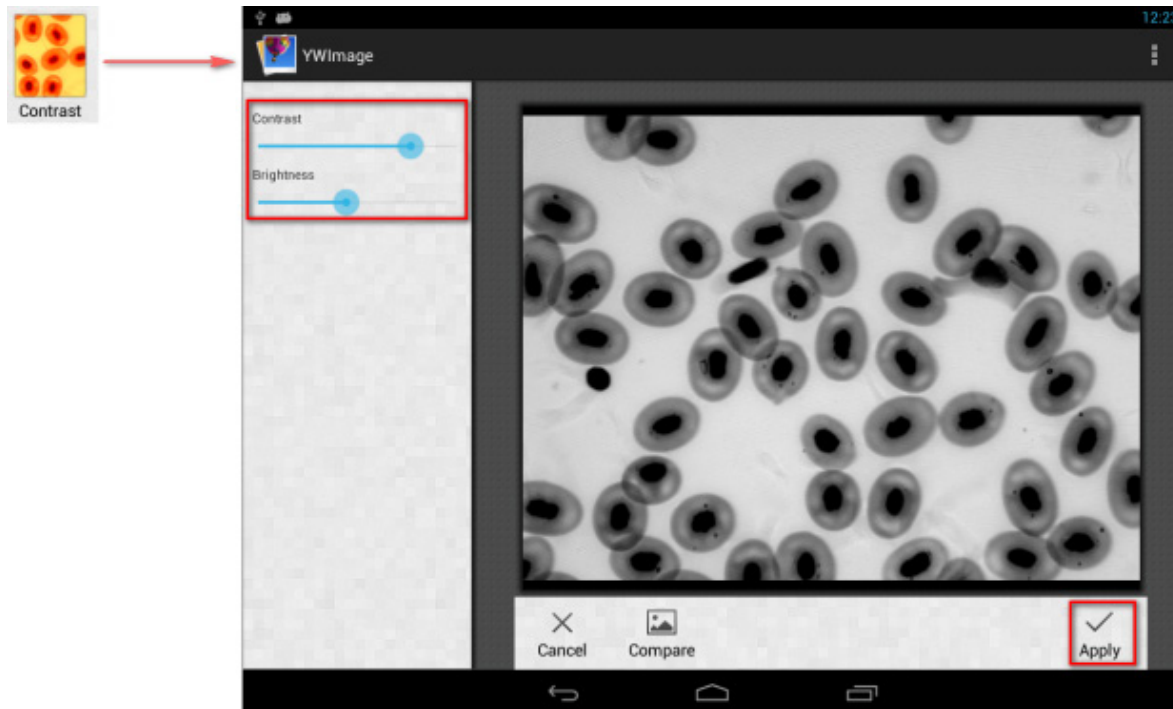
Binarization. Using the binarization function, you can convert a color image or an image in grayscale to two-color (black and white) by setting the minimum and maximum thresholds with which the brightness of each pixel will be compared.

All pixels within the threshold range will be highlighted in red. After executing the binarization, the RGB-value of the red areas will be set to (0, 0, 0), the RGB-value of the other sections will be (255, 255, 255).

Note: Red areas should not overlap.

Particle analysis. After executing the binarization, open the particle analysis tool.
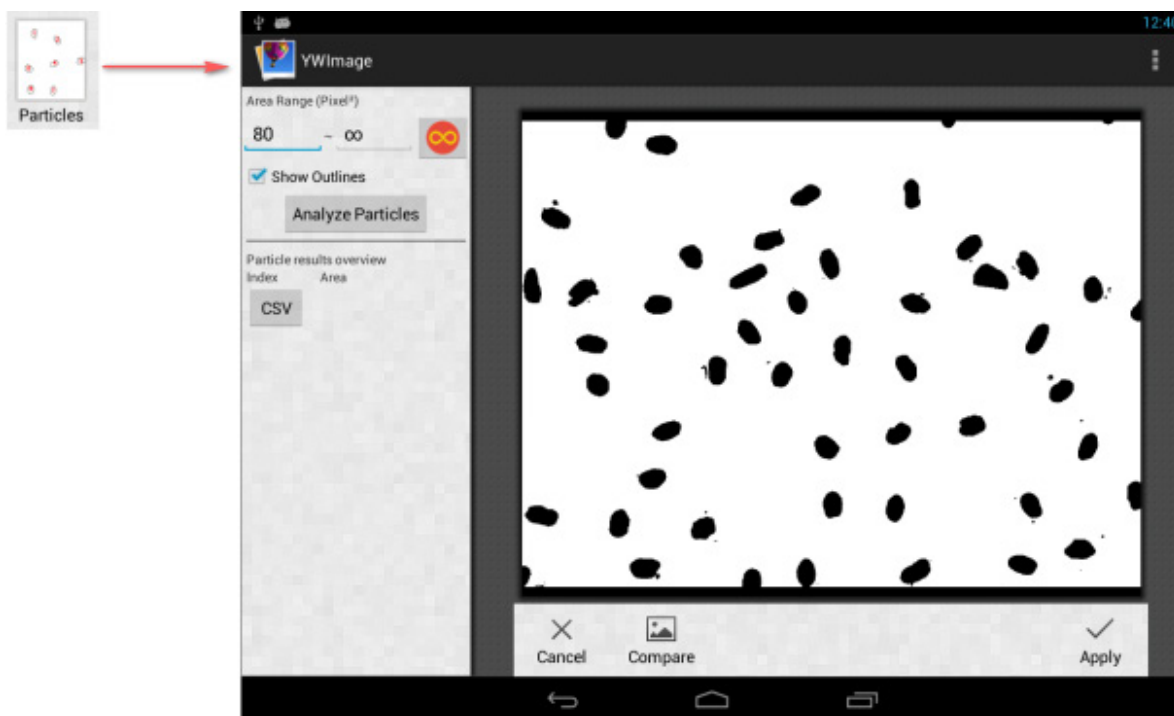
First of all, if some noises were not deleted during binarization, you need to specify a particle size range. The designation of the particle size range will make the result more accurate.

Press the button ∞ to set the maximum value to infinity. Select the **Show Outlines** check box to show the boundaries and number of particles after the analysis. Click **Analyze Particles** to begin the analysis. The result will be shown below.
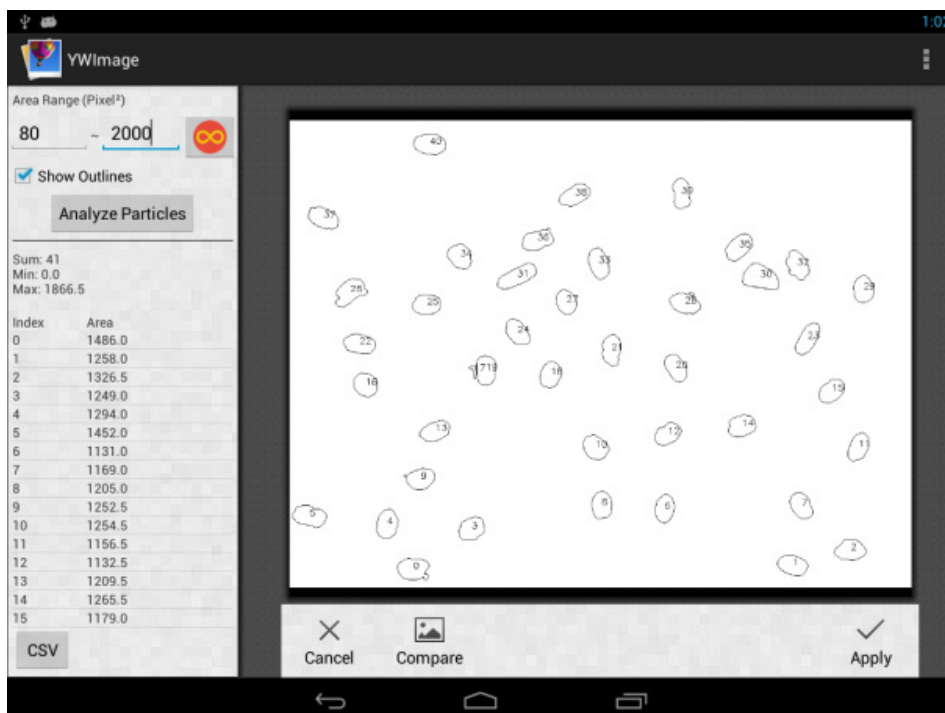
Click the **CSV** button to export the data to the report file, which will be saved here by default: /mnt/sdcard/Image/ Reports.

Specifications

LCD display	9.7" color touch screen
Mounting location	third eyepiece tube of 23.2mm diameter; C-mount
Megapixels	12
Maximum resolution (for still images)	2048x1536px
Pixel size	2.2x2.2µm
Frame rate	30fps
Image format	*.mjpg
Video format	*.mp4
Sensitivity	18.8v/lux.sec@550nm
Exposure time	50—1000ms
Spectral range	390—770nm
Ability to connect additional equipment (not included in the kit)	support of microSD cards with capacity up to 32Gb; PC mouse with USB plug; screen/TV with HDMI out; headphones
Built-in modules	OC Android 5.1, Wi-Fi, Bluetooth
White balance	auto/manual
Exposure control	auto/manual
Software features	measuring, brightness, exposure time, etc.
Power supply	12V DC-in / 2A; via AC adapter or USB 2.0 cable

Levenhuk reserves the right to modify or discontinue any product without prior notice.

Care and maintenance

- **Never look at the sources of bright light or lasers through the camera or the microscope: it will cause PERMANENT DAMAGE TO YOUR EYES!**
- Do not disassemble the camera on your own.
- Keep the camera away from moisture; do not use it in rainy weather.
- Keep the camera away from shock or excessive pressure.
- Do not overtighten the locking screws.
- Keep the camera away from hazardous environment, home and car heaters, incandescent lamps or open fire.
- When cleaning the lenses, first blow any dust or debris off the surface or wipe them off with a soft brush. Then wipe the lens with a soft cleaning cloth slightly damp with spirits or ether.
- **Seek medical advice immediately if a small part or a battery is swallowed.**

Levenhuk International Lifetime Warranty

All Levenhuk telescopes, microscopes, binoculars and other optical products, except for accessories, carry a **lifetime warranty** against defects in materials and workmanship. Lifetime warranty is a guarantee on the lifetime of the product on the market. All Levenhuk accessories are warranted to be free of defects in materials and workmanship for **six months** from date of retail purchase. The warranty entitles you to free repair or replacement of the Levenhuk product in any country where a Levenhuk office is located if all warranty conditions are met. For further details please visit our web site: www.levenhuk.com/warranty.
If warranty problems arise, or if you need assistance in using your product, contact the local Levenhuk branch.

Levenhuk prepared slides sets

The Levenhuk slides sets include thoroughly prepared specimens of various biomaterials as well as blank slides and cover glasses for you to make your own specimens. Prepared slides, blank slides and cover slips can be used with any microscope model.