



CV.SC SHOT CALCULATOR

CV.SC.QS EN Shot Calculator Quick Start

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1. Hygiene of perception for 3D movies - the challenge of production.

Registration of stereoscopic images is based on saving scene separately for each eye. To do it there are used two identical cameras on exploded optical paths.

During playback, the image of the left camera goes to the left eye and the image of right camera to the right eye.

The brain combines the two flat images giving a sense of depth.

The eyes are spaced apart by about 6.5 cm. This is the reason that they see the same area from a slightly different perspective and from different angle.

Excessive horizontal spacing of image - more than the standard 6.5 cm - causes the viewer's eyes will set up divergently.

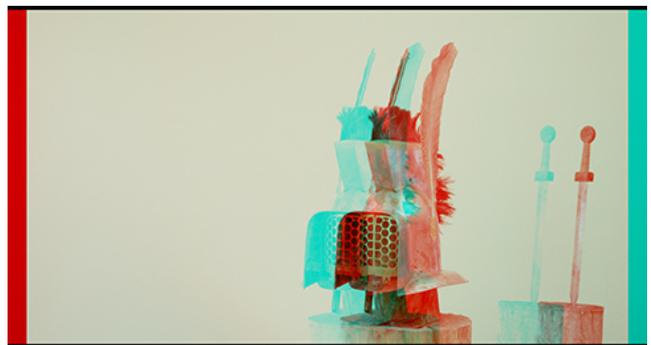
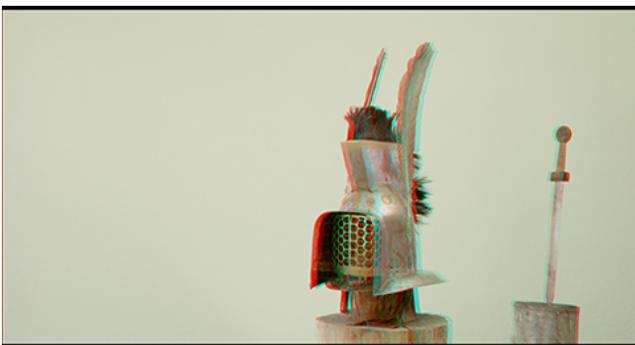
This significantly reduces the comfort of receiving stereoscopic image and this is the obvious technical error of 3D content.

To achieve proper convergence of the eyes during 3D projection you should give sufficient parallax budget on shooting and appropriate division between negative (close) and positive (long) parallax in Post-Production.

During shooting on the movie plan there is a need to adjust the settings of cameras and spacing between them all the time . They must correspond to currently established scene geometry.

Made-to-date changes of settings (eg. stereoscopic base, convergence, aperture, focus) should interact with each other and meet the appropriate correlation.

Unsuitable setting of stereoscopic base in relation to the shooting scene may result in improper shift of left and right image during 3D projection.

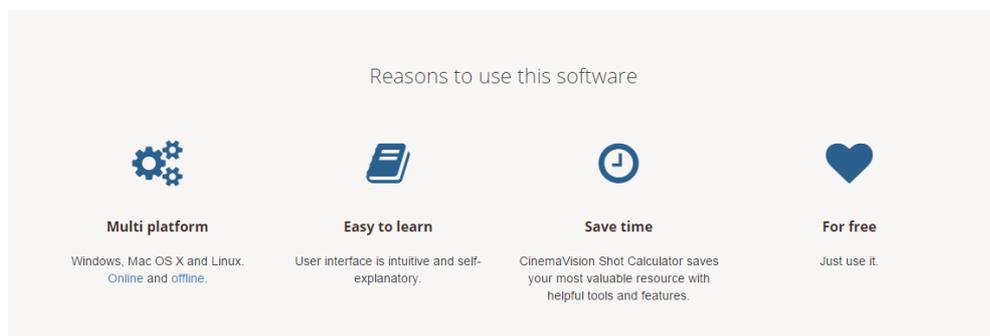
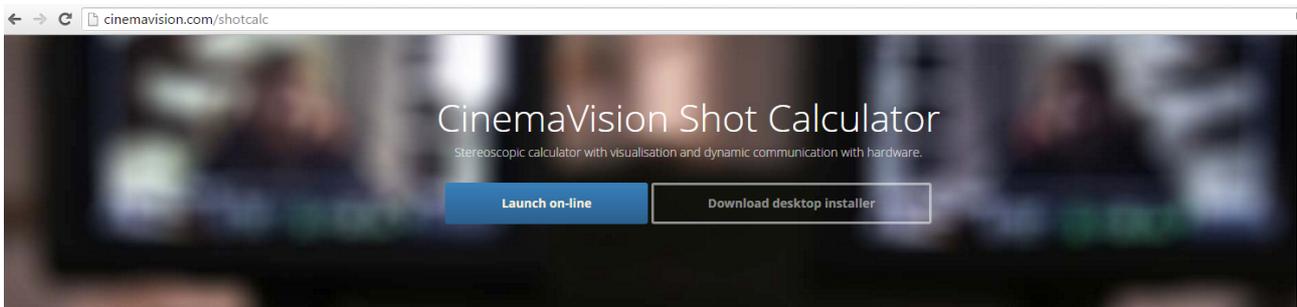


Correctly calculated budget of depth

Exceeded budget of depth

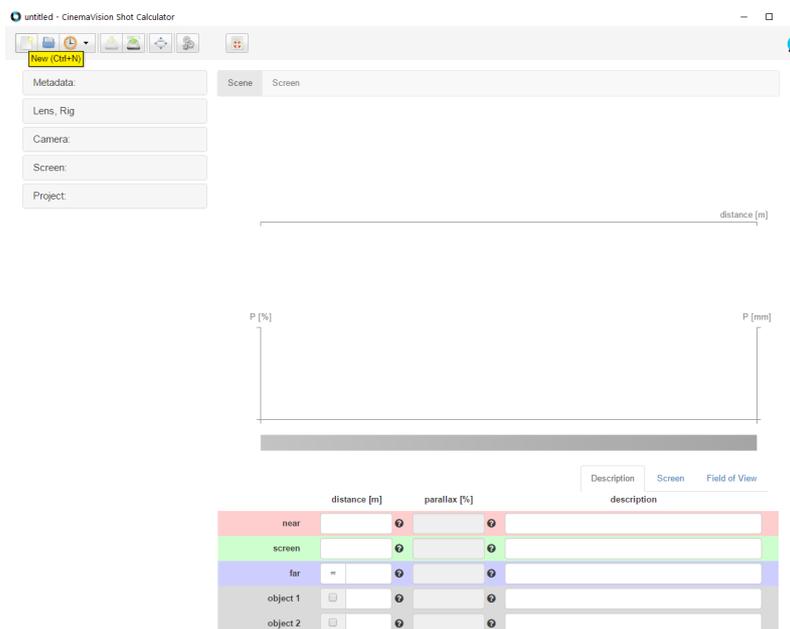
2. CinemaVision Shot Calculator.

The tool CinemaVision Shot Calculator is created to control the budget of parallax for exact scenes and shots.



The program helps to plan and carry out technically correct 3D shot in several aspects:

- Selection, hardware and optical configuration camera set prepared for shooting the scene.
- Modeling location of plans: short, central and long on the basis of a conceptual draft.
- Assessment of the parallax budget.
- Checking the perception of plans and objects by the audience on the assumed target display screen.



3. Getting Started.

Getting started is setting up a project details and camera set features on the basis of available hardware resources. Target Screen is to be set up, too.

Those settings are global for many potential shot calculations.

Setting up is done with drop-down list of settings specific to subject. The basic choice of particular model of equipment completes its fixed parameters. Adjustable parameters shall be stated in the relevant field.

The definition of each parameter is displayed after pressing the icon "?". To be true, this hint is available for any feature.

Project: The Dream 24fps	Camera: 4K (×1.62)	Screen: 9m width
Production name: The Dream ?	Camera type: RED Mysterium-> ?	Screen type: 9m width ?
Director: John Smith ?	Sensor width [px]: 5120 ?	Screen width [m]: 9.00 ?
DoP: Frank Newman ?	Sensor width [mm]: 27.7 ?	Screen height [m]: 4.50 ?
Camera operator: Joane Brighton ?	Sensor height [px]: 2700 ?	Spectator distance as multiple of screen width: 1.00 ?
Project framerate: 24 ?	Sensor height [mm]: 14.6 ?	Spectator distance from screen [m]: 9.00 ?
	Frame format: 4K ?	Spectator FoV horizontal [deg]: 53.13 ?
	Frame width [px]: 4096 ?	Interpupillary dist. [mm]: 65 ?
	Frame width [mm]: 22.2 ?	
	Frame height [px]: 2160 ?	
	Frame height [mm]: 11.7 ?	
	Frame horizontal crop: 1.62 ?	
	Frame vertical crop: 2.05 ?	
	Frame diagonal crop: 1.85 ?	
	Circle of confusion [px]: 2.0 ?	
	Circle of confusion [µm]: 10.81 ?	

The choice of camera model complements the fixed parameters related to. If any parameter is adjustable a list of possibilities is dropping down.

Filling features to Camera produces a finished traceable camera set, which assigns a unique name in the Camera ID.

Setting up the Screen Tab (Destination Screen) is crucial for the proper stereoscopic base selection later. In this Tab the target screen for recorded footage is defined.

Image displayed on the cinema screen is many times greater than on TV set. Shift of the images for the left and right eye is larger, too.

This offset (comfortable on the TV screen) can be completely unacceptable on the big cinema screen and can disqualify the shot.

Target Screen configuration allows you to visualize the perception of the calculated 3D scene for a potential audience. It is to do at the screen view.

4. Optics of camera set and metadata.

Tabs: Lens and Metadata are essential for carrying out and storing calculation.

Metadata information identifies the shot. Key identifiers make up a suggested name construction for saving the calculation file.

On Pre-Production calculation there are no values for Reel ID and Clip ID yet. They are marked only and are to be updated at real shooting time.

The update is automatic if you use CinemaVision Rig Controller to support camera set.

Stored and assigned to a shot calculation generates parallax budget documentation, that can be very useful in Post-Production later.

The image shows two side-by-side panels from a software interface. The left panel is titled 'Metadata: 16 2B A009_005' and contains several input fields: Scene (16), Shot (2B), Camera ID (A), Reel ID (009), Clip ID (005), and Location (London). The right panel is titled 'Lens: 25mm/T5.6, Rig: B=50mm' and contains several input fields: Focal length [mm] (25), Aperture (f/N 5.6, 0), Focus dist. [m] (∞, 5.20), DoF near [m] (3.71), DoF far [m] (8.71), DoF total [m] (5.01), Baseline [mm] (50), Convergence [deg] (0.55), Convergence [px] (47), FoV horizontal [deg] (47.81), FoV vertical [deg] (26.30), and FoV diagonal [deg] (53.22). Red boxes highlight the title bars of both panels. A green box highlights the Camera ID field in the Metadata panel and the Baseline field in the Lens panel. A purple box highlights the Focus dist., DoF near, and DoF far fields in the Lens panel.

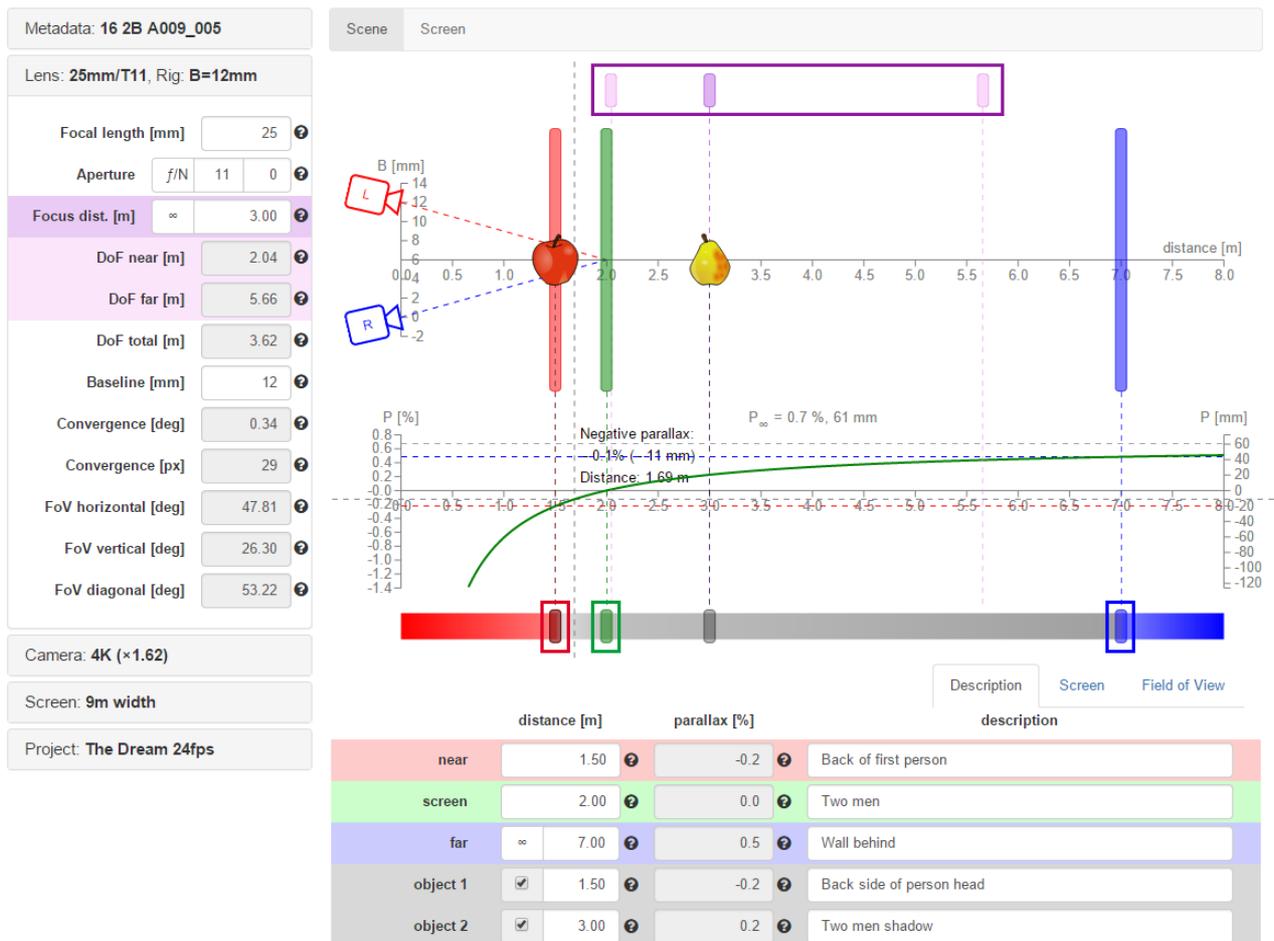
Lens Tab contains a collection of fixed and adjustable parameters related to the optics of camera set. Handling focus and aperture you can manipulate the depth of field according to the requirements of the scene.

The key control parameter during the calculation of parallax budget is value of rig baseline (ie, the spacing between the cameras). Field to enter rig baseline is located in Lens section and convergence of camera tracks is associated to this value.

5. Creation the model of shot.



Concept of the shot.



Calculation of the parallax for the shot above.

The main calculation window, in the interactive mode, allows you to set and modify position of the plans on the basis of shot concept.

There are created (and constantly updated) dimensional axes for model.

Rig configuration is visualized by left and right camera symbols as the convergence track of their optical axes, too.

Colors of bars and sliders correspond to the plans:

- a close (red),
- main (green),
- and far off (blue).

Moving bars or sliders you can simulate position of plans regards to camera set.

Distances can also be enter as numbers at the Description Tab in the table below the model of shot.

On the model you can check in and modify additional sliders:

- focus (purple) – interactive,
- range of depth of field (light purple) – their position depends on the aperture value.

You can turn on the visibility of the two additional auxiliary objects (symbols of apple and pear) to more accurately describe the reality of a particular scene. They can be freely positioning on the model.

In the Description Tab you can name the individual component of the model adequately to its equivalent at the storyboard.

	distance [m]	parallax [%]	description
near	1.50	-0.2	Back of first person
screen	2.00	0.0	Two men
far	∞ 7.00	0.5	Wall behind
object 1	<input checked="" type="checkbox"/> 1.50	-0.2	Back side of person head
object 2	<input checked="" type="checkbox"/> 3.00	0.2	Two men shadow

Handling calculation is mainly based on the positioning the elements of the model and changing the settings of camera optical system.

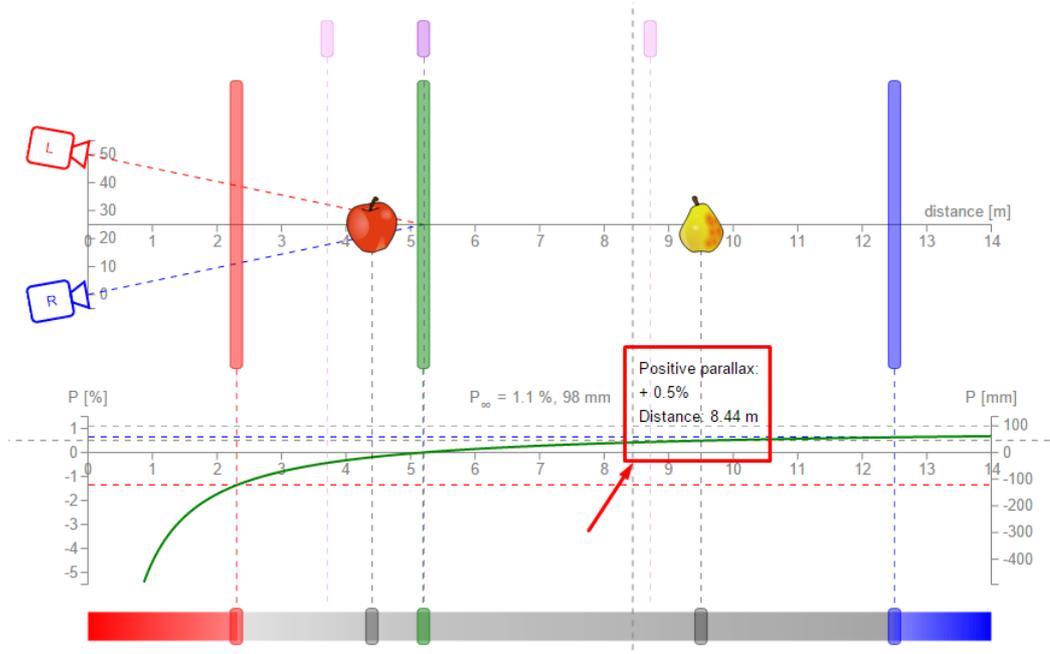
The aim is to optimize the budget of parallax for 3D shot.

6. Parallax calculation.

Shot Calculator computes on fly, for actual adjustment of camera set, the value of parallax at any distance on the shot model.

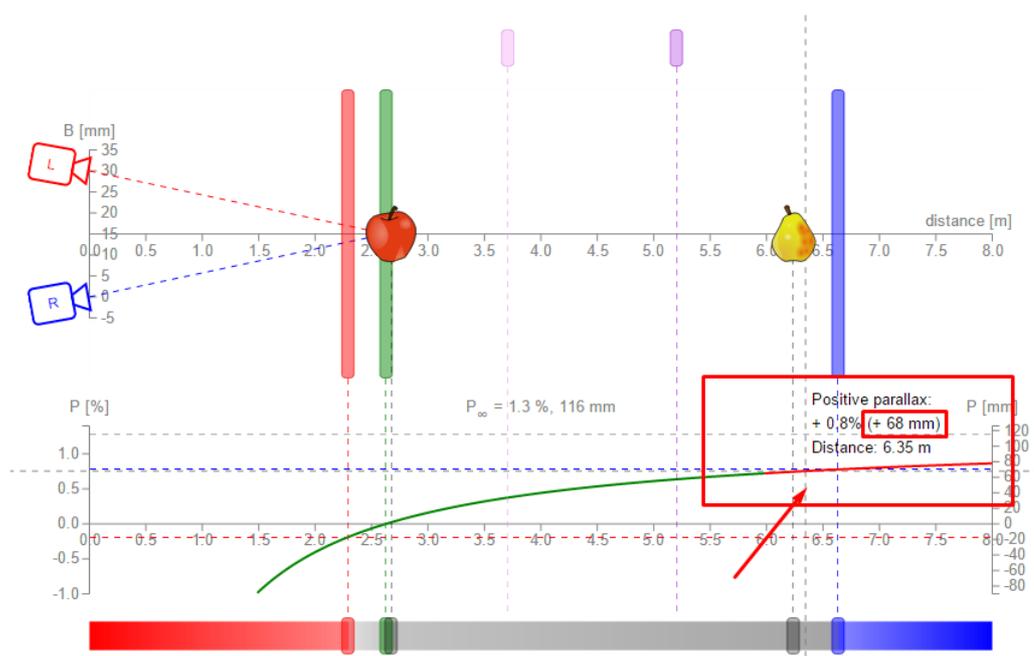
The course of parallax changes is visualized in the chart.

You can view the metric and the percentage rate of parallax at any distance on the axis of the scene.



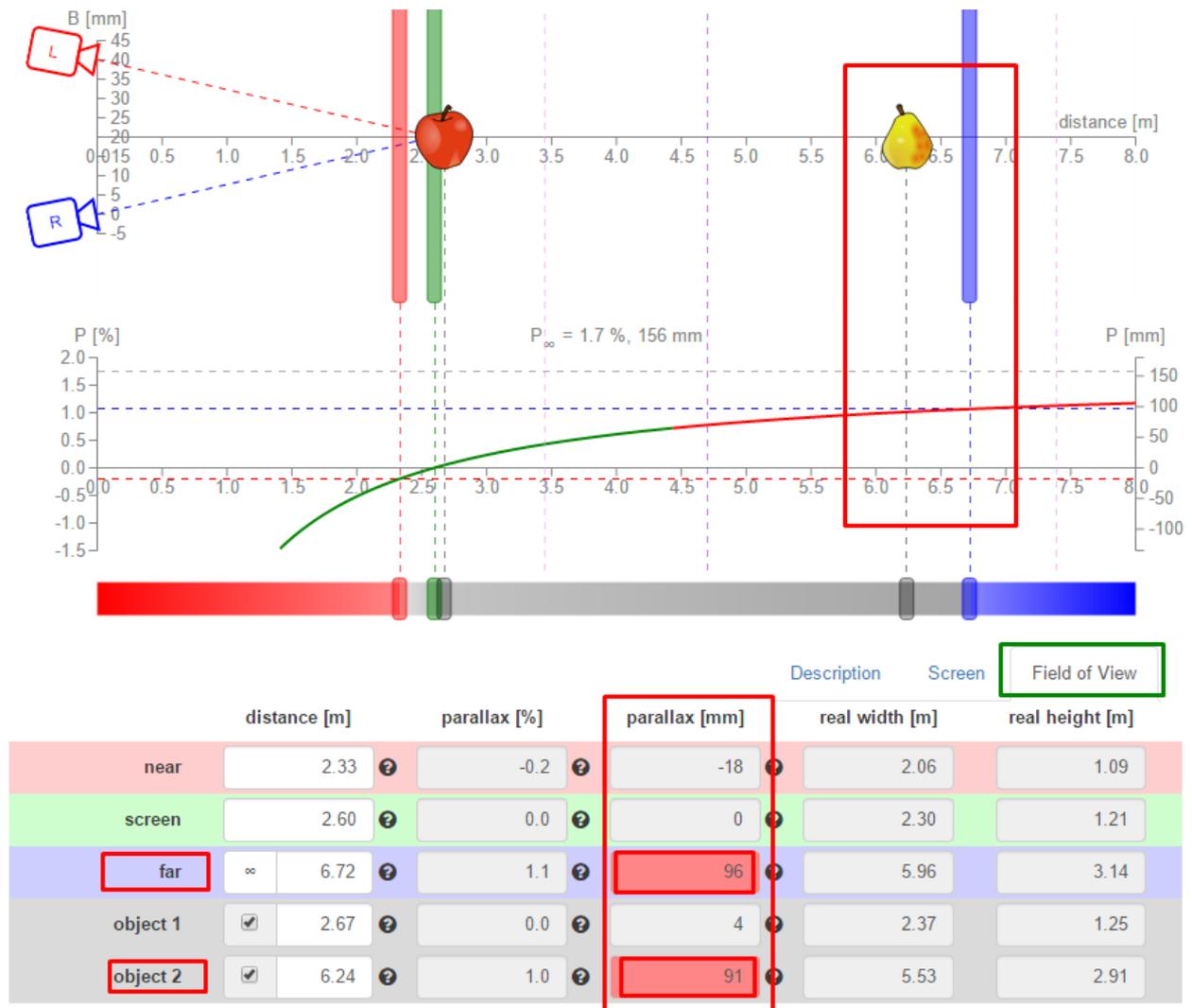
The values and the course of chart are updated:

- after any change of plans location for the shot model
- or after adjustment camera set parameters (eg. when you change the baseline of rig).



The software indicates graphically exceeding the permissible value of parallax. Color of the chart course changes from green to red.

The corresponding entries in the Description and Field of View Tabs indicate the limit values exceeding.



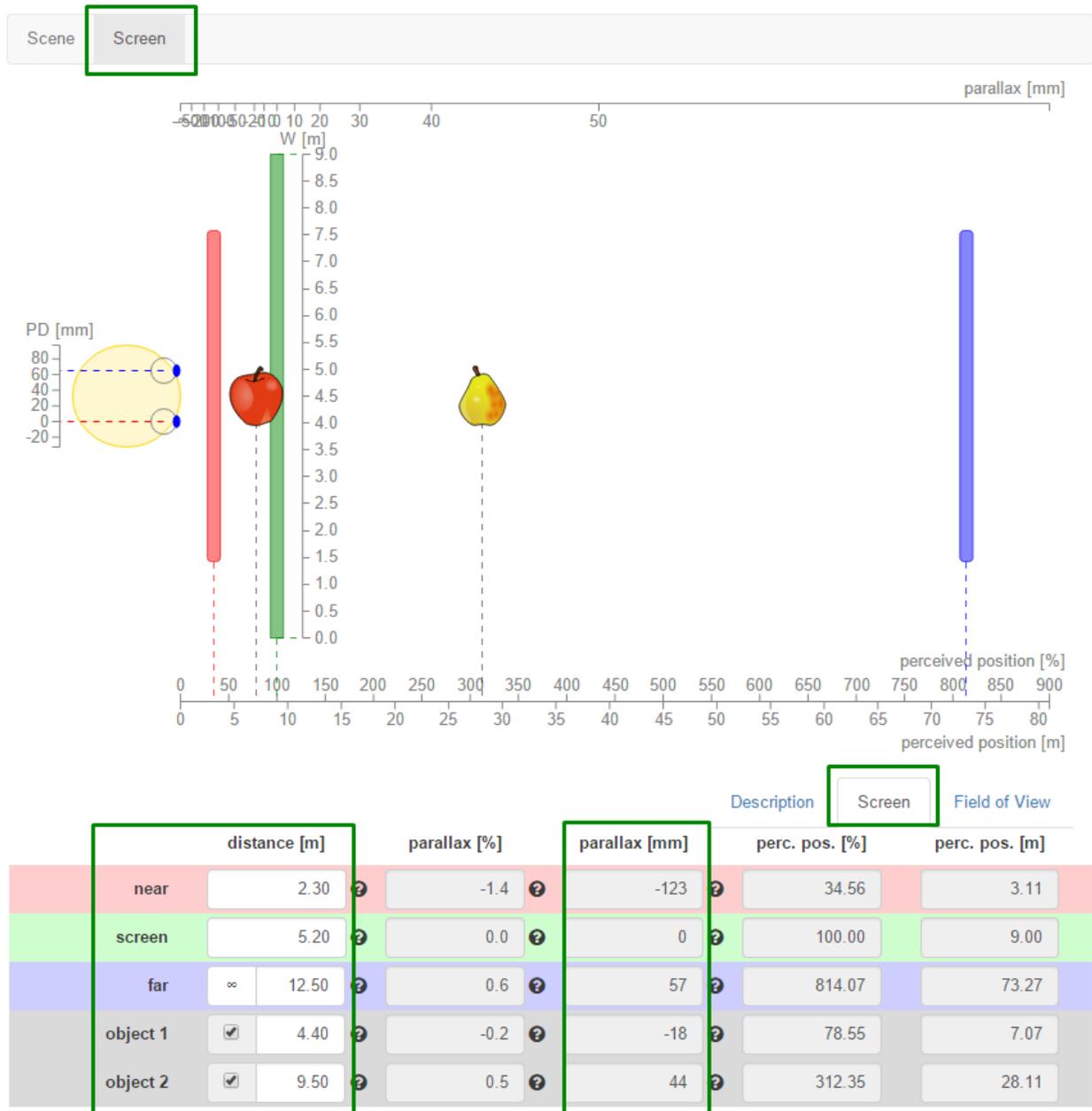
By changing the position of plan sliders and manipulating with camera settings you can simulate the entire process of shooting and be aware of the distribution of the parallax budget on the footage.

If the settings of rig baseline is insufficient to achieve a secure budget of parallax they are possible other simulation activities:

- remodeling the scene (changing the position of camera set, switching the actors and scenery),
- changing lenses and lens settings.

7. Stereoscopy verification from consumer point of view.

Switching the model of the calculation from the Scene to Screen view you can estimate how the audience will perceive the 3D scene on the assumed target screen.

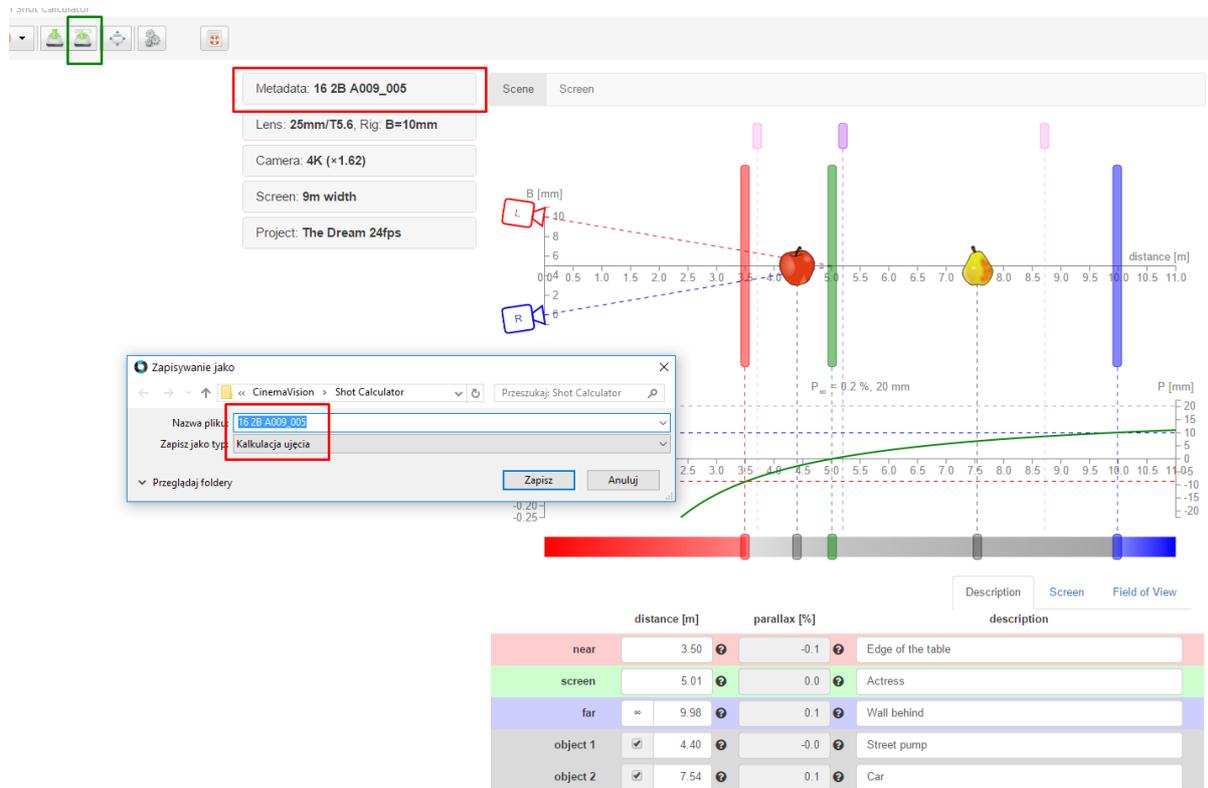


The relative position of the plans and the distance from the viewer allow you to estimate apparent of the plans size on the screen.

You can rate viewing comfort and quality of stereoscopic effects, too.

8. Saving the calculation, shooting.

Calculation approach, structured and stored on pre-production, is the basis for stereographer to verify parameters on a film set.



The final acceptance of the shot model and the rig baseline is to be decided just before start of shooting, often as a result of director improvements.

Veritable metadata for shot – Reel ID and Clip ID are updated.

If the camera set comes with CinemaVision Rig Controller it takes automatic synchronization between the approved calculation and parameters of cameras, lenses and rig.

After the shooting, set of calculation data is uniquely assigned to the scene.

Pairing calculation and shot is a great benefit for the next steps of Post-Production activities.

9. Calculation and Post-Production.

Ability to check the calculation of the parallax budget for the filmed shots is important for applying the proper techniques of image correction. It is useful to create special effects or improve stereoscopy depth in the target issue.

Knowledge of parallax budget makes it easy to select the best one shot from several versions of the 3D scene for further processing.

It optimizes the selection of a particular clip by the possibility to obtain the expected results.

We also invite you to watch the movie: **CinemaVision Shot Calculator Quick Start (CV.SC.VT1 EN)**.

THE END