



1 – Input / Output

Customer provides images (sequence, preferably uncompressed images such as .dpx 10 bits, 2k, 4k, or more), NEXYAD applies the proper image processing methods – to achieve the visual effects described in the task book - and delivers processed image sequence (a folder of .bmp files). Tests are made on key images in order to validate with the customer that the render is exactly the expected one.

No image size limit.

2 – Kinds of post-processing proposed by NEXYAD

Advanced calibration

- Contrast processing: contrast processing is limited by the SNR (Signal/Noise Ratio). Once we increase the contrast on some ranges of luminance, it is likely to result in noise that was present but did not see in the rush take (noise/grain for a chemical film, electronic noise for a digital camera). The digital processing algorithms that remove noise (available into existing professional products) tend to blur the contours and / or produce halos (ghost images). We deal with it and enhance the SNR before processing the contrast.

- Colour selection and colour contrast processing: the previous comment about signal to noise ratio also applies to the case of contrasting colours. Another phenomenon is the colour adds: Our perception of colour depends on the neighbourhood pixels, and an area may appear "red", for example, when few pixels are actually in the red template. Furthermore, in a mathematical point of view, the colour is encoded into a circular variable banning simple interpolations: this leads to side effects during the colour enhancement (dribbling contours, or shapes that are cropped, flat areas show moire, ...). We implement chromatic enhancements effects (eg saturate or desaturate a colour only), which produce fewer artefacts than the current tools on the edges of objects and large solid areas

- Modification of a group of colours (eg all the "red" and "raspberry" changed to "green") : The usual method of "select and replace", even using options to smooth apodization Borders do not achieve to build a continuum of colours. This typically generates noise textures on the area whose colour has been changed, and it clips or otherwise exaggerates edges of objects. We can generate a continuous function of colour change that respects the degraded initial saturation and luminance, and that minimizes those artefacts.

Surface smoothing

From light smoothing effect to cartoon render, we smooth the flat areas of the image without blurring the edges. Several potential uses: to shine metal surfaces (car body type), increase the readability of reflection (in a window, ...), erase wrinkles, ...

Tracking

The tracking tools are quite sensitive to deformation (quite inevitable when a 3D object is filmed in 2D and moves), to lighting variations, and temporary masking. NEXYAD developed tracking for military applications that keep objects continued beyond what is



permitted by the-shelf tools. Several possible applications: extracting a camera movement (to include the calculated 3D), process an area with a special effect (eg the eyes) ...

2D and 3D effect incrustation

Supervision during the shooting (installation, blue or green keying backgrounds, location of targets, ...) to the integration of 3D effects.

The advanced colour selection tools of NEXYAD, in particular, allow to deal with the complex shooting where constraints make impossible a complete separation of the stage and background lightings, generating poor colour key backgrounds.

Similarly, we integrate 2D objects: example: sky (moon, stars, ...) on American nights with moving camera and moving objects on the foreground.

Conception and render of 3D objects

Reality inside a 3D room

3D objects in a real room (example : candle lights)

3D objects on real objects (example : vampires teeth)

3 – Why would NEXYAD algorithms be efficient ?

NEXYAD team is involved since 1995 in high level research programs in image processing for French Defense and for Road Safety Applications. We developed unique algorithms that are not available on the market. Most algorithms that we use apply up to date theories :

- Artificial Neural Networks,
- Fuzzy Logic,
- Genetic Algorithms,
- Non Linear Observers,
- Fractal geometry,
- Bayesian Networks,
- Particle Filters,
- ...

Most of our algorithms are not real time and need big computers ... but you don't care if we do it for you ... do you?

That is why we don't sell software. We sell the service.

4 – Examples

Electronic Noise Reduction

Especially needed for low lightning shootings with HD digital cameras (see for instance, the night shots of the American movie MIAMI VICE: you will notice that the Signal/Noise ratio is poor). Poor Signal/Noise ratio may give a desired LoFi effect to your film. In such a case, of course, there is no need to remove the noise. But in most cases, the movie maker doesn't want to see flickers, and electronic snow running among the film.

We can remove it



See the electronic noise (in the white background for instance).

Camera Panasonic HVX200 lens 35 Zeiss – numeric zoom on the image 200%

NB: removing the electronic snow (electronic noise) is also welcome if you want to enhance colour and luminance contrasts ... because contrast enhancement (and colour saturation) also means “noise enhancement”. Then even a low noise that wouldn’t be detectable in your rough sequences may become really annoying if you saturate the colours and enhance contrast.

This noise (even hidden in the rough shootings) is always a limitation to your movie render quality.

Surface smoothing

Example: poor vigilance about the make up during the take : raking light emphasizes the many skin imperfection on the actress (zoom into the left side of the image on her face, or at the collarbone, and you'll see). We have removed by smoothing the skin surface, without blurring the eyes, hair, ... The effect is driven strong (as made "cartoon") at the request of the director (vampires are rendered "unreal" to take a distance from the blood story).



Surface smoothing (+ a slice of contrast enhancement + red enhancement, see the lips + objects integration : fire on the candles) : compare the skin smoothness ... and notice that we do not lose the details such as eye contour, background spiders webs. The processing is pushed to the limit to get a "cartoon" effect (Director's task book: vampires must be unreal not to scare).

Camera: Canon HD 5D MarkII, lens 50

Chromatic calibration

Example: selection of red with no side effect (no red drool), without selecting the isolated red pixels in the skin (that are present, and that would generate noise) ... You can select the colour or colours that you want to saturate, desaturate or change its contrast range

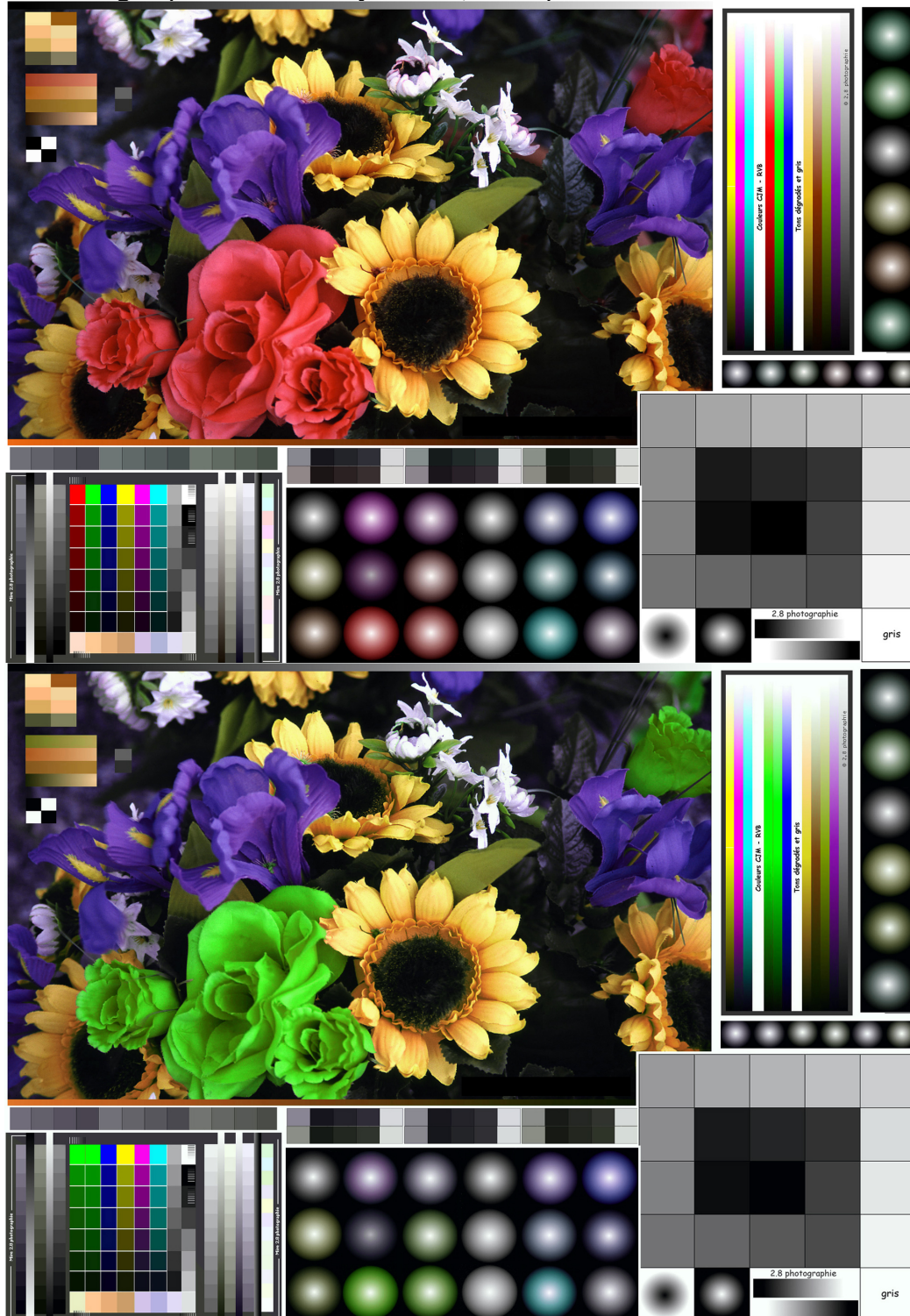


Enhancement of the RED – you will notice that the skin colour doesn't change, the green light in the background remains the same, And there is no electronic noise on the skin.

Camera : Canon HD 5D MarkII, lens 50

Chromatic calibration: changing colours

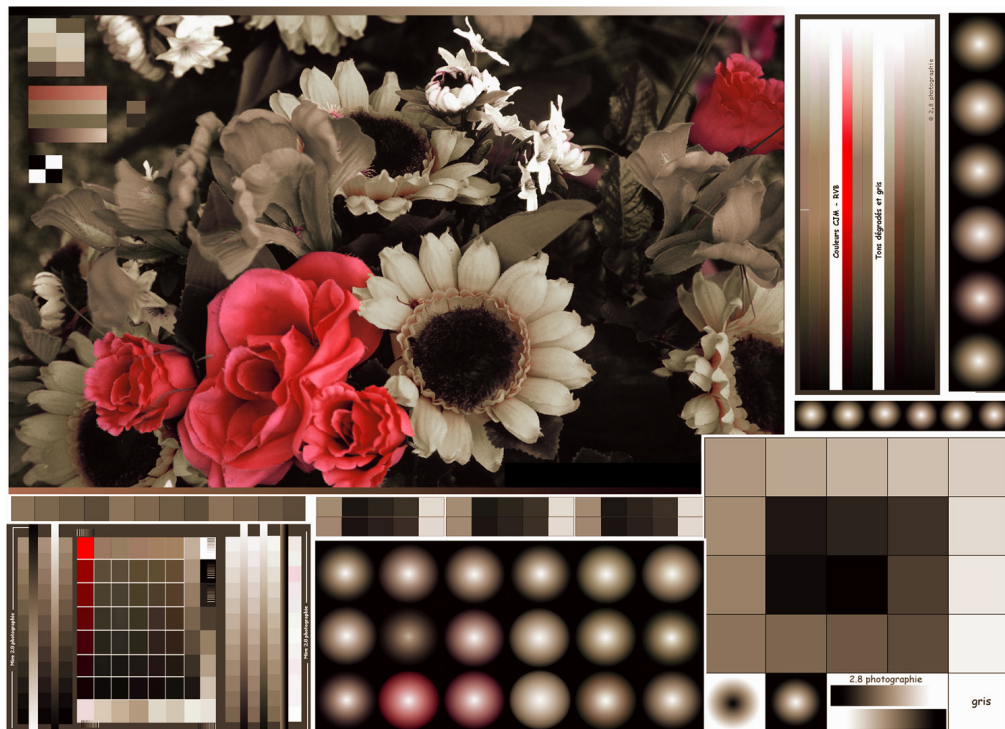
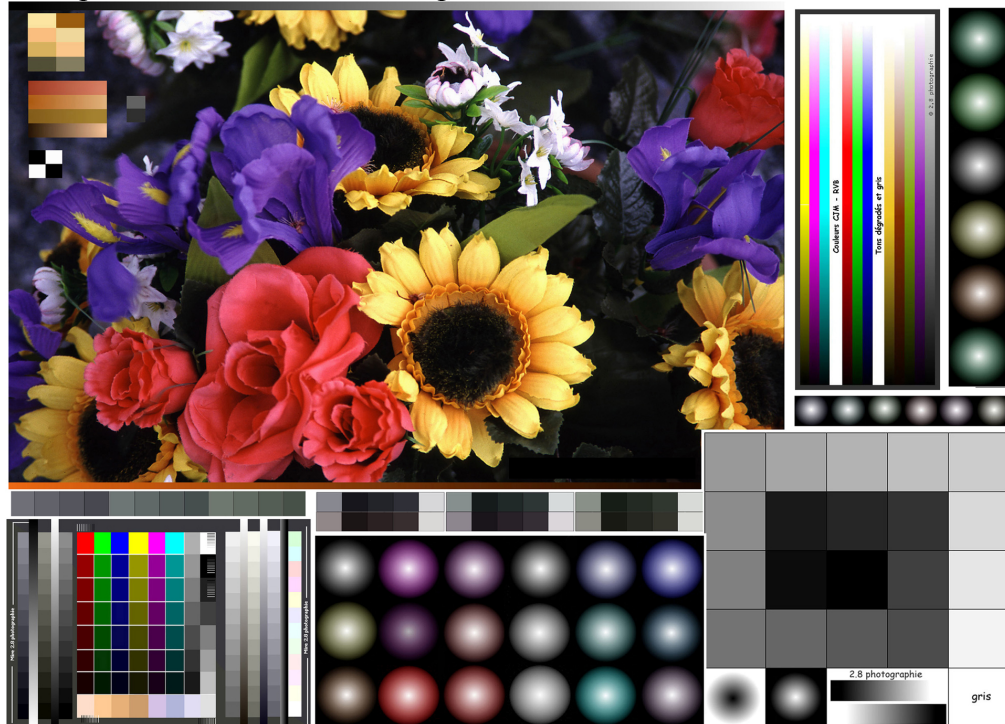
Example: Selection of red and raspberries changed to green, minimizing artefacts. You can select the group or colours that you want, and replace them with another colour.



Changing colours : the raspberry and red colours are changed to green. Let's notice that textures and gradients are preserved. A slice desaturation of some "orange" occurs, but it can be fixed easily – we paste here the raw output of our colour change module.

Chromatic calibration: changing colours

Example: Selection of red and raspberries and all the other colours are turned Sepia.



Roses keep their colour while all the other colours are turned sepia (monochromatic brown levels)..



Complex American nights



BEFORE



AFTER

American night – NB : onboard camera : many movements so the moon, and the clouds must be animated with the proper movement ... Camera : Canon HD 5D MarkII, lens 50



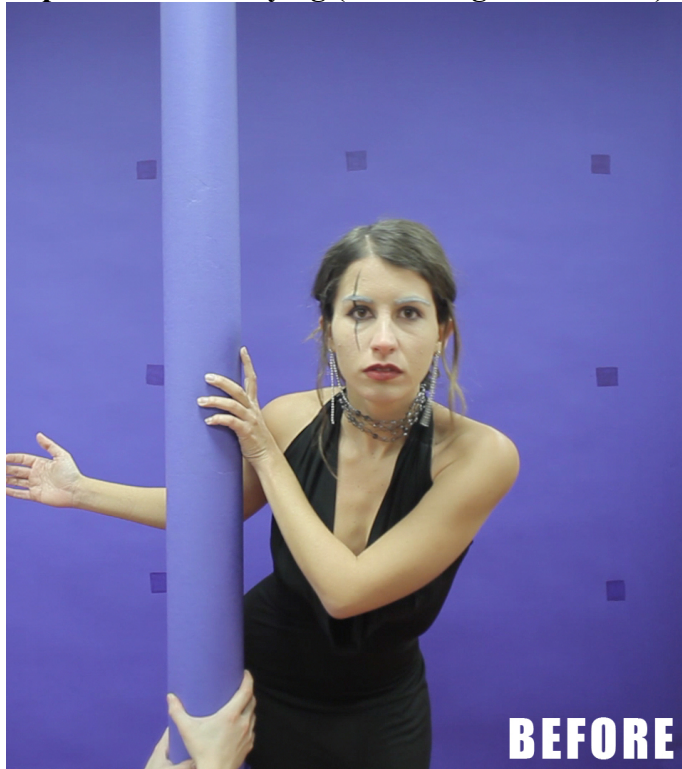
BEFORE



AFTER

American night – NB : camera on shoulder in order to follow the characters ... the background sky (moon, stars, ...) must be animated with the proper movement. And the branches are moving in the wind ... Camera : Canon HD 5D MarkII, lens 50

Supervision and keying (blue and green screens)



Enhancement of the RED (mouth) and contrast, smoothing of the skin, integration of the character in a 3D room.

Camera : Canon HD 5D MarkII, lens 50



Enhancement of the contrast, and of the bass guitar colour, smoothing of the skin, integration of a 3D background. Camera : Canon HD 5D MarkII, lens 50



Something else?

You have a target render in mind? Never assume it's impossible! Just ask!

Complex renders



Camera : Canon HD 5D MarkII Lens 50

See the red colour, the smooth of the skin, the enhanced contrasts with no noise, ...

You can describe your desired render with words (more “yellow”, ...), with an image (a handmade processing on ONE image that we’ll use as a reference), with a famous movie that you like the render of, ...



Camera : Canon HD 5D MarkII Lens 50

See the red colour, the smooth of the cars that makes them shine, the enhanced contrast with no noise, ...



Camera: Canon HD 5D MarkII Lens 50

See the red colour, the smooth of the skin (look between the eyes), the enhanced contrast with no noise, the 3D vampires teeth added, the blue eyes



Camera : Canon HD 5D MarkII Lens 50

See the red colour, the smooth of the skin (look at the arms), the enhanced contrast with no noise, the blue eyes (we can track eyes with a devil precision in most videos ... security applications know-how inheritance :-) ...), the surface smoothing also give a more shinny effect to the leather.

11 – Confidentiality - Secret

We were taught by working on Defense and Industrial applications.

Secret is our second name.

We apply all the secret and confidentiality procedures.

12 – How to work with us

Simply contact us.

Free processings of 10 or 20 seconds for the new customers that wish to verify our skills : just to let them see how render can be.

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