



3Activ

Cinema Camera & Production Process

3Activ is a 3D rig with silent follow focus, and a live 3D viewer with convergence & active horizontal image translation



3Activ is an ultra-light 3D mirror rig designed to carry 2 C-Series Canons or any small digital cinema camera and has 4K DSLR compatibility giving ultra-shallow depth of field and advanced on-camera optical control. It has silent follow-focus, active convergence, active optics and a miniature 3D live-view monitor¹. Its aim is to deliver *full depth 3D* and no eyestrain using conventional 2D camera controls and 2D production grammar. It is simple to use, ultra-light and compatible with a range of super-wide tele primes, zooms or wide aperture lenses 3Activ does not require extensive new skills, long set-up times or expensive post-production error correction. Its aim is provide fully corrected in-camera 3D that is satisfying to 2D directors and DoPs while delivering outstanding 3D imagery. **It is currently being re-designed to take vertically mounted stills cameras to shoot stereoscopic portraits and to vertical formant stereoscopic video.**

'A brief history of 3D movies'

In the 1950s Hollywood produced over 50 3D feature films. But the first 3D film revolution ended abruptly when 2D fought back through developments such as Cinemascope and Technicolor. 3D suffered from poor reliability, projector misalignments and eyestrain problems. Once the novelty ended, people avoided 3D film and it survived only in theme parks and short films because audiences firmly rejected the discomfort and poor production values of full length 3D movies. 3D remained unused for over 25 years, in part because the eyewear was erroneously identified as the cause of the problems. 3D is currently mainstream again, but many fundamental problems have not been resolved, even though considerable resources have been deployed to address them. These solutions only correct for artefacts of the root causes, problems the 3Activ design actively resolves.

Background to the 3Activ process

In 2006, a series of ITC *Immersive TV* ² experiments into the oft-reported fattening effect of photography were completed. People were photographed in 3D using a prototype version of the 3Activ, and side-by-side projection showed that its polarized 3D images offered undistorted size reproduction. But the 2D images were all significantly fatter. The 3D could be viewed indefinitely with no eyestrain. The images were also easy to view without eyewear and looked like shallow DoF 2D photography. The ITC then commissioned a world-first demonstration of orthostereoscopic video, using DVCAM cameras and active optics. The life-size polarized 3D video reproduced the previous naturalness and zero eyestrain for all viewers, regardless of age or stereovisual impairment. 3Activ also demonstrated HD-like resolution in 3D and *comfortable 2D compatible 3D images without glasses*.

Advantages of the 3Activ process over existing 3D systems

3Activ improves on existing 3D systems in the following important aspects:

Silent follow-focus	Simplicity	Light weight	Set-up times
Active convergence	Full depth reproduction	Image quality	Ease-of-use
Wide range of lenses	Live 3D location monitor	Costs	Zero Ghosting
Low light performance	Ease of correction in post.	Keystoning	Eyestrain

¹ The miniature 3D mirror rig monitor and the latest version of the rig is not shown in these views of the first prototype.

² The Independent Television Commission was a UK Government regulator and TV industry funded R&D organisation.

The 3Activ process offers 2D-like comfort and viewing times because its images are actively rendered to stimulate the correct disparity detecting neurons and smooth pursuit processes of the human visual system. These processes allow viewers to perceive a stable and natural image that is often disrupted in conventional 3D motion pictures. *3Activ* allows high brightness displays to be used without side effects to produce images free of many common artefacts found in movies and television. *This is essential because up to 20% of the population have impaired stereoscopic vision and can find 3D uncomfortable for extended periods.* For some, 3D can be a painful 2D experience because their visual system will suppress anomalous depth to avoid fusing unnatural vergences from dark images. Removing the glasses however can make the 3D double-image equally unwatchable. By convention (or for artistic reasons), many stereographers avoid natural disparities and use lens alignments derived from look-up tables that simply delay the onset of eyestrain, ghosting and other major causes of viewer fatigue. *3Activ* actively suppresses eyestrain, ghosting and motion artefacts using active optics, delivered by a unique in-camera process that is unmatched by existing 3D systems.

Freedom of Expression

3Activ is a "2D + 3D process" designed to avoid incorrect 3D. The left camera is used in any 2D mode (super-wide to telephoto, shallow DOF etc). The right camera is slaved via an active convergence/follow-focus mechanism and can be shoulder, tripod or steady-cam mounted. Most importantly, a wide variety of specialist lenses can be used to create in-camera visual effects that can be seen on location playback, but are often challenging to produce conventionally. The rig outputs a corrected 3D image on camera and uniquely, operators can use camera movements that are avoided in 3D movies because they can cause image judder. *3Activ* does not interfere with HVS smooth-pursuit vergences, is HFR compatible and cannot cause image judder. The *3Activ* process also allows for fast editing and viewers will not see unpleasant motion artefacts. Conventional 3D edits can take up to 300 milliseconds to re-fuse a new scene, and during this time, the viewer can be acutely aware that what they are seeing is unnatural. *3Activ* allows 2D-like editing, so re-acquiring a target after a fast cut takes the same time as normal 2D editing. Also, 2D footage can be used in fast 3D cutting and the audience will be unaware of that mixed 2D/3D content is being displayed. 3D artefacts such as ghosting, card-boarding, curvilinear distortion, retinal rivalry, gigantism and dwarfism are eradicated and seen only if required.

Summary

3Activ is superior to existing 3D systems because it does not rely on false assumptions about human vision and uses the latest research on how we see depth, resolution, colour, true size, shape and motion. Conventional 3D can never be free from the artefacts that make its images look distorted, even when produced to current industry standards. Such systems can create imagery evoking strong criticism of 3D, yet these objections can be easily resolved by the *3Activ* process. The *3Activ* rig can also be used for stills photography, and is currently being redesigned to take vertically mounted DSLR cameras. It also has a unique live-view passive-polarized 3D monitor to allow real-time focusing on-camera alignments without a separate stand-alone 3D monitor.

Most 3D technology requires optical corrections that are expensive and perceptually unnecessary, especially for live broadcasts. *3Activ* reduces complexity, distortions, mediation cues and eradicates eyestrain. It features fast 2D-like operation with shallow DoF (even with super wide-angle lenses), new camera moves & scene changes, zooms, edits, enhanced motion, improved colour, film-look reproduction, conventional editing (without breaking immersion), and zero eyestrain. *3Activ* is a patentable process design to deliver undistorted 3D for movies, TV, documentaries and in-camera VFX. Its fast set-up times, 3D monitoring and active optics will allow DPs to work quickly and use active stereoscopic alignments that could be kept unmodified in the final edit. By retaining 2D shooting techniques but adding full depth, high brightness and natural motion, *3Activ* could become a standard method of digital media production.

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