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Elastic Effects – New Optical Wrinkle

by Paul Mandell

Remember the Renault television spot several years back? A bright red car came around the bend. As it proceeded down the road in an S-shaped path, it streaked and stretched, assuming the proportions of a maxi-limousine. The "plastic car" was one of those unusual visual effects that, in the barnstorming days of computer-generated imagery, one simply took for granted as being of that ilk.

Savvy viewers may have scratched their heads. Was it a computer image? Or perhaps a slit-scan streak effect of the car, matted over a background scene? None of the above. It was an optical trick consisting of 1,200 split screens per frame of motion picture film. Believe it or not.

The elastic effect, as it is called, was conceived and developed by Eugene Mamut, an optical printer expert at R/Greenberg Associates in New York, who rightly states that "its commercial possibilities are endless." Using this technique, any moving object on regular production footage can appear to stretch, twist, shape-shift, or otherwise transform into an image that would have delighted the surrealist painters of the Forties. What's more, by applying this technique to a zoom-in or zoom-out on a stationary object, such as a magazine page or a title logo, the artwork itself can distort into soft swirling patterns – or disperse into hundreds of random segments and assemble itself magically, in the best tradition of an ADO effect. Except here, the illusion is composed directly on film resolutions, making it applicable not only to TV commercials but to feature films as well.

The idea of the elastic effect evolved in 1979, when Mamut first came to America. Slit-scan technique was something new to him; he had just seen *2001* for the first time, and streaked television logos were in their hey-day. When Jeff Kleiser, an effects layout man, showed him how to create slit-scan images on an optical printer, the wheels began to turn.

"In slit-scan," Mamut explains, "the slit moves continuously, resulting in a continuous streaked image. I realized that if the slit *stopped* during exposure, the *shape* of the slit could be altered from frame to frame, resulting in a final image composed of a series of *discrete* frames. Hundreds of different-shaped 'elastic mattes' could be introduced in the printer consecutively. So I thought, there are many possibilities that have not been explored."

Creating an elastic effect is an intricate procedure. Unlike slit-scan, nothing

The Renault "S" turn: 1200 split screens.

Right turn: blur stretches via 400 vertical split screens. (Frame blowups from 35mm film)

is scanned. It's the age-old split screen process used in an unprecedented way. Call it "slit screen."

200 to 1,200 hairline slits are generated on a computer, depending on the effect desired. The slits are then transferred to hi-con film stock, resulting in what is essentially a clear-core matte roll. The clear sections are nothing more than tiny hairline slits on black emulsion, one slit per frame, which change in position (and in shape, if need be), very much like an animated cartoon.

Normally in split screen shots, the matte roll is step-printed from head to tail with the original scene, awaiting a countermatte and another print run for a composite. An elastic effect is done differently – there is no need for a countermatte. The matte roll may consist of 1,200 slits. Like a cartoon, each slit is on a separate frame of the roll, in advancing continuity.

Frame One of the original scene is held in place on the printer, the *matte roll* is advanced frame by frame, and an exposure is made. So in reprinting the scene, each frame of the composite is exposed in 1,200 segments.

One printer head houses the hi-con; another accommodates a print of, say, an object moving normally against a stationary background. In the case of the Renault spot, it's the car curving down the road.

As the car makes an "S," the shape of the hairline slits are changed from vertical lines to arcs, angles, and back to verticals. Exposures are made through the slits. At a pre-determined point, however, selected frames of the car's blur are *repeated* through a specific number of slits.

In other words, *every frame* of this scene (from the start to the end of the shot) is exposed through 1,200 hairline divisions onto new negative. But at a certain point, the printing is done out of "real time" – blurs on the car are "borrowed" from different parts of the footage and rephotographed through the slits in a stuttered arrangement.

Here's the trick: Because the road, the background, and the foreground objects are stationary, they are unaffected by the split-screens. If 400 of the 1,200 exposures are stuttered, the unchartered road, trees and sky will look static and seamless, because there is no motion in them. Only the *moving object* is affected, because the *blurred frames* become distended. Hence, the car becomes "elastic."

The Renault spot – a very complex example of this effect – was still a future event. During the initial research and development, Mamut envisioned another whole series of circular, clear-core slit-mattes. By selecting frames of the zoom action, taking them out of "real time," and printing them through the concentrics, the static image could be transformed into a rippling whirlpool.

Experiments began in 1979. Mamut used an ABC-TV logo, strictly as a test. The artwork was shot on an animation stand. As a favor, Judson Rosebush of Digital Effects generated the first set of "slit-mattes" (10 sets, 200 mattes in each set) on his equipment free of charge for the test.

Mamut did an optical zoom on the logo, and went one step further. Through a matte roll consisting of 200 horizontal clear-core slits (one slit per frame on the roll), the logo was printed onto raw negative. In other words, 200 horizontal exposures were made on each frame of raw negative. This altered image was printed *again* using *another* set of mattes *vertically* for an added distortional effect. The zoom action was disassociated simultaneously, using the 'frame-select' procedure. The final composite showed an ABC logo that stretched and swelled in kaleidoscopic configurations.

"The test was done to demonstrate the possibilities of the elastic effect, what clients could expect, by using an entire series of mattes to change the shape of the original image.

"The interesting thing about this process," he adds, "is that you never know what the effect will ultimately look like. You have an idea, but it's always a surprise. Usually it is very beautiful."

The first experiments were contact-printed, using a machine with only one printer head. Eventually, on effects director Joel Hynek's suggestion, Robert Greenberg invested a lot of time and money in installing the CompuQuad printer – a 4-head Oxberry unit supported by a software program that could handle the most intricate compositing jobs.

The new optical bench, interestingly enough, was designed specifically for the production of elastic effects at R/Greenberg Associates. Extensive technology went into the creation of the software and hardware, enabling the facility to develop new industrial applications for this technique. Once the CompuQuad became an in-house item, myriads of clear-core slit-mattes could be handled with ease. For Eugene Mamut, it was a fantastic new tool.

Joshua Pines, a programmer in R/Greenberg's CGI department, began producing large sets of slit-mattes on a computer, far exceeding what had been done earlier, and had them transferred to hi-con film stock. He perfected a way of generating 1000 + super-clean mattes for a final image containing no perceptible split-screen lines.

In 1981, an ambitious title test was done for the film *Flash Gordon*. On the printer, Mamut used a computer-controlled "spin-lens" attachment, which rotated the image of the artwork per frame. The image was then reprinted through a film roll of concentric, octagon-shaped slit-mattes. This transformed the artwork into a geometric wave. At the same time, a zoom lens moved in and out during each concentric exposure. This, in addition to the rotational device, resulted in a "spin" and "swell" on the final composite.

Mamut recalled that "on the test, 200 octagonal mattes were used. On the actual job, however, 400 to 1,200 were used. That meant 1,200 octagonal exposures per frame. The divisions were completely invisible. At that point, I knew we really had something."

The Renault "plastic car" campaign for Grey Advertising was contracted to R/Greenberg Associates in 1983. In the particular scene already described, the car was shot traversing the road in an "S" formation. Mamut made a decision list as to what frames would be selected to "extend" the car, programmed the printer with that information, and reprinted the entire scene through 1,200 slit-mattes. The result: an image in which blurred frames, microseconds apart, were suspended at a given point, creating the "stretch."

Obviously, an elastic effect in this situation can only work if the scene is filmed with a locked-down camera. Everything except the car must be totally static. Even a falling leaf would "time-expand" in the reprinting.

That problem actually cropped up during the shoot. Trees on the left side of the road were blowing in the wind. The solution was to film the tree section separately and recompose the scene on the printer, using a simple area matte. The elastic effect was then introduced on the doctored footage.

In 1985, the R/Greenberg team came up with another variation of the effect. An AT&T commercial called for the cover of *Time* magazine, headlined by the Chernobyl Meltdown, to disperse into hundreds of linear fragments and reassemble itself. The idea was to suggest an electrical impulse. Eugene Mamut credits optical director Stuart Robertson with the idea of "random mattes."

An optical zoom was done on the *Time* cover and reprinted through a hi-con roll of horizontal slits. As in other elastic effects, the zoom movement provided the basis for a disassociation of the image. Only this time, each of the 200 + divisions were recombined *randomly.* It was nothing short of an ADO video effect. The beauty of it, of course, was that it was done on film, not tape.

A more spectacular example of "random reconfiguration" was done for a Citrus Hill orange juice spot. A girl was filmed spinning in place in front of a blue screen. Through a series of horizontal slits, the girl's body was reprinted completely out of sequence. The uncanny result was that of a twisted, coiling female form. [The idea was to have a "liquid" girl pour out of a juice carton into a glass. But the image proved too overpowering and an alternative was used. A zoom was done on a static girl. Like the *Time* cover, she is disassociated into random linear fragments and "comes together" in the juice glass.]

Mamut stresses that hundreds of different-shaped slit-mattes can be used for an elastic effect. They can be linear, circular, multiple squares, humanoid, or whatever. The mattes can run forward, in reverse, at random, or in "frame select" (the Renault spot). Moreover, each slit-matte progression can be used with 4 different axes of movement: east-west, north-south, zoom, and spin. By using these printer movements and myriads of different matte shapes consecutively, on different passes, the alteration of the original production shot can be mind-boggling. He likens the elastic effect to critical mass in an atomic bomb.

"You build quantity to some point. Quantity mutates and a new kind of quality is created. Chain reactions occur. The elastic effect is really an application of this same natural law. You start increasing the quantity of split-screens. After some 'critical point,' a new image is created, a new look. A new effect."

Recently, director Ron Howard hired R/Greenberg Associates to come up with a logo for his new film company, Imagine Entertainment. For this, Eugene Mamut did a slow optical zoom on a background plate of dark clouds. Soft concentric slit-mattes, generated by the CGI department and transferred to hi-con film, were introduced on the printer. By printing the zoom through the slits, and disassociating the zoom's time continuum, the clouds were transformed into a soft, mesmerizing ripple, as if a stone had been dropped in a pool of water.

In 1986, a variation of the elastic effect was ready for a feature film. The opportunity came with *Predator,* the title character being an extraterrestrial monster capable of blending perfectly with a jungle environment.

This illusion (dubbed "the camouflage effect") was created with a series of concentric mattes that conformed to the Predator's traveling shape. The mattes were devised by supervisor Joel Hynek and created by Mamut, using a painstaking, multi-directional positioning process for the production of those mattes directly on the CompuQuad printer. Once they were done, various takes of the Predator's jungle environment were shot at different focal lengths and inserted into the character's shape, concentrically. The creature resembled a moving Fresnel lens – something that had never been seen before theatrically.

"At first," says Mamut, "we thought that a smooth Predator image would require 100 concentric moving mattes for each frame of film. This would've required tons of hi-con rolls, which was impractical.

"Joel Hynek decided to go with only 12 concentric mattes. This created a distinctively contoured look and added more visually to the Predator's image."

Not surprisingly, *Predator* was nominated by the Academy of Motion Picture Arts & Sciences for this year's Visual Effects Award.

Eugene Mamut sees a bright future for the elastic effect in commercials and motion pictures. The most complicated ones are difficult to produce on computers, he notes, because there is not enough memory in them at the present time.

That notwithstanding, he reports that the CGI department of R/Greenberg Associates has created the first tests of an elastic effect using computers, *without* going to hi-con mattes. The live action image was digitized. From this information, a new elastic effect frame was assembled. Joshua Pines made the program.

Mamut points out that it takes two to four minutes on an optical printer to create one frame of an elastic effect. "It takes longer to do on a computer. But as the computer accumulates more memory, the effect will be done faster, and with better quality. I think we can look forward to an abundance of new and exciting images." △