DIGITAL MUTOSCOPE

HISTORY
The original mutoscope offered the 19th century patron a private viewing of remarkably sharp photographs flickering on a mechanical axel to simulate a realistic replay of a historical moment. It cost a nickel. The recreation was achieved by rotating a handcrank to make the action faster or slower, or even stopping to experience a single slice of time. Outdone by Edison's motorized Kinetoscope, which played 35mm film with a more precise intermittent movement, and Lumiere's cinematic projection, the mutoscope, made with rugged steel and brass fittings to withstand the rigors of manual cranking, continued a furtive commercial existence in arcade amusement venues well into the 1960s. (re-work this to include more on history of its invention by Casler and Dickson, and early recordings at 841 Bway)

(In the 1948 *police noir* "Street With No Name," as if to emphasize his down and out condition, the FBI undercover agent lives in a shabby skid row tenement and hangs out at a tacky penny arcade housing peepshows and mutoscopes.)

As a pre-cinema archeologist I bought a mutoscope from the Mike Munves Company, a dealer of jukeboxes and arcade games in New Rochelle, NY, in 1976. It had been stored alongside dozens of other castoffs in a dusty basement, far from the teeming crowds tripping the light fantastic on Broadway and 14th Street at the beginning of the last century.

It had frayed wiring for the miniature light bulb and had been painted with cheesy stenciled patterns to cover up decades of rust and peeling paint. It came with an original untitled reel of a young woman wearing a straw hat festooned with daisies which bounce and quiver realistically as she enthusiastically blows kisses to an unseen admirer. This naïve entertainment was perfectly matched to the solidly mechanical apparatus. There

was no deceit or artifice in the presentation; illuminated innards revealed pages torqued to pop into sequence; the round book flipped in response to the viewer's steady cranking — participatory illusionism.

Until 1903 the sequences were made on the original mutoscope camera which could produce about 800 2"X2" images onto 68mm gauge film; it punched a hole at every frame for registration. Distinct from the sprocketed medium (patented and fiercely protected by Edison and Eastman) which is often credited for facilitating complex narrative grammar through montage, the original mutoscope process seemed best suited for one shot "actualities" like the portrait of the lady in the daisy hat.

TECHNOLOGY AND ANIMATION
For the past 40 years I have built animation stands of varying degrees of complexity to make experimental films and produce commercial work for a living. I have also bought and hired cameras with more bells and whistles, and rubbed shoulders with film technicians at all levels of the production pipeline. This symbiotic marriage to technology, often ignored by designers, was deeply embedded in the routines of animation craft. The specialized tasks of studio animators (sequence drawing, plotting, exposure sheets, timing) were complemented by camera operators with whom they shared a complex notational language: the arcane roadmap for organizing and collating the daunting folders of cels and backgrounds. As independent animators began to rig, light, and shoot their own artwork, often working directly with malleable media, the industrial divisions of labor withered away and more creative/technical possibilities emerged.

(Some methods I explored: hand-cranking instead of using the motor on the 16mm Bolex to shoot footage in a flickery, herky-jerky manner; lighting artwork to accentuate shadows and material dimensionality rather than flattening it into an artificial plane; using longer exposures of individual phases to stress their differences rather than meld them into a smooth stream.)

Free from the constraints of the cinematic apparatus animators can explore simple manual devices like flipbooks, zoetropes (and the many variations of scopes) which allow a direct interaction with the moving image. And when these book-like machines are connected to the storage capacity of a hard drive, rapid computation and high resolution display, the results expand exponentially.

SCRUBBING THE TIMELINE
When producing animation, the ability to instantly play a recently-compiled Quicktime movie is greatly enhanced by the additional feature of scrubbing the timeline: using a digital pointing device to randomly slide through the sequence to diagnose its structure (a more precise method of flipping actual drawings). It allows the animator to intervene frame by frame at the intersection between drawing and final design. In the old days cels could not be flipped; one waited until the camera collated them on film using fairly rigid formulas. Re-shooting to correct an error was expensive and might even degrade the artwork.

This manual intervention uses the computer's graphic interface based on a linear gauge. The film editing equivalent was to turn a wheel on the synchronizer or Moviola to inch one's way frame by frame. Joysticks have long been used in video games to give the user a simulation of control over preset tempos. But still the feeling of tactile control was missing.

So I began to consider the possibility of combining the best of both worlds.

DIGITAL MUTOSCOPE
This term suggests a combination of computer technology with the original hand-cranked device: a devolution to a more directly interactive (and private) display of animation. My first prototype consists of a 15" Dell monitor and entry-level Mac-Mini ($400 on eBay), a handwheel, shaft, collars and bearings ($60), and a Griffin Technology (no relation) USB knob, technically a rotary encoder, called a Powermate. Its control panel allows for some customizing, but not enough for my needs.

The controlling software was created at Harvestworks, the New York City non-profit media resource center, where Tobias Rosenberger, a young German artist, wrote an application with a program called Max/MSP. I outlined my needs and he spent about 2 hours with the object-based program creating a schematic diagram, the plan for the code that actually controls the works. I had imagined that he would customize the Quicktime MoviePlayer by scripting certain specific commands. But instead he built a stand-alone player that is programmed to respond to the rotating knob, yet allows certain variables of scale and format ratio. One complete rotation will play 10 frames. I based this on my subjective experience of the illusion of movement: one could easily turn the crank about once every second, slower if desired, or a bit faster. If the movie were compiled at 10 frames per second it could be viewed at the "real" speed. There is a direct relation between hand-cranking and frame viewing: no "catch-up" time. Unlike a traditional mutoscope it can be cranked forward or in reverse, and can rest on a stopped frame without shutting off.

Like the original mutoscope, the mechanical parts are built to endure years of heavy use. Installed in a sturdy wood casing, attached securely to a wall, the player is permanent and foolproof. It can be programmed to shut down or start up at prescribed intervals so, once installed, it needs little or no attention. The casing was fabricated by the set builder, David Kellough.

VARIATIONS AND IDEAS FOR FURTHER TECH/DESIGN RESEARCH
I made certain choices for the prototype, but am currently considering a range of alternatives and alterations:

1. The casing could be an altered piece of furniture from another era, such as Victorian-Ornamental, Deco, Moderne, Googie, Post-Modern, Functional/Industrial, each with an appropriate hand-crank design. Or there could be a thematic feeling to the design to reflect or parody the contents of the enclosed movie.
2. The mutoscope could be programmed to allow the viewer to choose the program by pushing one of several buttons. The crank could allow an alternative speed by pushing in momentarily.
3. The placement on the wall must be at the proper height for the average viewer, so that the tallest must stoop a bit, and the shortest must use a step-stool. Or

the screen could be removed from its private peepshow window to be viewed on the wall by a small group audience.

4. The program can be of any resolution up to 1042 X 768, native to the 15" monitor, and can be any frame format. If the image is smaller than the monitor view, a margin of any hue or saturation is visible.
5. There is no audio linked to the speed of playing the movie although there could be audio continuously playing at one speed during cranking, or responding to the irregular cranking speed for abstract distortions.
6. The movie can be loaded into RAM to enable a smoother playback.
7. For a large image on a wall or other façade a video projector could replace the monitor and the hand-crank would be housed in a plinth or other free-standing case with the computer.

PEEPSHOW
The devolution from cinema's public spectacle to the private intimacy of the peepshow, flipbook, or parlor toy, suggests a return to the realm of the imagination, unencumbered by the strictures social mores. Whether in a hushed, white cube in a gallery or the privacy of one's own home, the situation contains a subtle suggestion of voyeuristic illicitness. The cranking wheel keeps the hands busy as if enacting the Christian maxim to prevent devilish idleness. The penny arcade was a realm where sinners were immune to punishment. There was just enough time to watch a striptease, then deposit your coin if you wanted more.

The woman in the daisy hat is posing innocently, acting as if she is sad, pouting, then coy, then laughing, pointing, hugging herself, merrily blowing kisses. Then, after a couple of blank frames, the end of the show. Another coin deposit abruptly starts the same sequence. Was she an actress, shop girl, prostitute, student, someone's sister? The viewer can freely identify with her, re-create her into a personal fantasy, particularly given the century of lapsed time which makes the social codes (dress, make-up, expressions, gestures) exotic and harder to interpret.

VIEWMASTER
The idea of creating a digital mutoscope became more intriguing when I was contacted by a curator who wanted to show my 1976 animation, Viewmaster, in a gallery. It is about three minutes long, consisting of 8 drawings of running characters of various design arranged in a circle. The film is a continuous loop, but cuts to a long view at its climax to reveal one of Muybridge's running men. If installed, I reasoned that the figures should be able to run continuously without any externally imposed climax. One of the figures is actually cranking a kind of mutoscope device so it seemed appropriate to devise a similar device for a self-referential installation.

Yes, I could be worried about "re-purposing" a 30-year-old film. But the digital mutoscope will open up more possibilities to make high resolution animations, with unusual frame formats, to be played at cranky tempos by the viewers themselves who seek out the work in an art gallery or encounter it by chance in a public space.

(note to self: prevent handle theft by vandals)