STEPHEN C. BECK - DIRECT VIDEO SYNTHESIZER (ZERO and ONE)

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As a student at University of Illinois in 1968-1969 Stephen Beck performed experiments on a Zenith color television set to generate "color sound", which would translate music into a television picture. Later he moved to the San Francisco/Bay area and from 1970-1971 built prototype video synthesizers at the National Center for Experiments in Television (NCET), at KQED in San Francisco. These synthesizers generated pictures with visual elements which Beck identifies as "geometry, motion, texture and color". These hardware efforts were guided by a goal : to replace the television camera model, with primal images, formed and directed by electronic circuits. These circuits could empower the video artist accessing an "electronic means of evoking images ... within the television system".

The first video synthesizer was later called Direct Video Zero. Direct Video #0 (DV #0) was an expansion of Beck's Illinois experiments, and consisted of a modified color television set, driving the color CRT's red, green and blue electron guns, with modulation sources. Colors were formed from oscillators and audio signals combined with external analog mixers The modulation sources were pulled from a Buchla Electronic Music synthesizer, to visualize sound. The color images, formed by audio tied to video were named by Brice Howard, director of NCET as "Direct Video".

The difficulty of using audio that "sounds good", to form an image that "looks good" was problematic in DV #0. The most interesting images were found from sound sources which were harmonically related to the vertical field rate (60 HZ) and/or the horizontal rate (15,750 KHZ), frequencies not common to audio synthesizers. The search for dedicated sources of video patterns, and a grant from the National Endowment for the Arts (NEA) in 1971 evolved into the Direct Video Instrument One (DV #1).

The central element of DV #1 to generate the "direct video" image was called by Beck a "voltage to position converter". The converter was loosely based upon a "wipe generator" of a conventional video switcher. The wipe generator consists of a horizontal and vertical locked ramp generator locked to the horizontal and vertical sync. The ramps are compared against "wipe voltages" from knobs to determine the size and position of a switching signal, that appears "wipes" to one image over another. The wipe circuitry was modified, replacing the knobs with voltage control of its operation. An input voltages change the size and/or position of the waveforms triggered by the comparison point along the horizontal or vertical axis. DV #1 modularized this converter, then added an edge extracting "Outliner" that wires to binary logic gates. The combined signals are patched into multiple color voltages, which are summed together to feed an RGB to NTSC Color Encoder. The use of the NTSC encoder, replaced driving the guns of the CRT in DV#0, and enabled recording on video tape of the results.

DV #1 was constructed in a rack mount chassis with two rows of modules, with patch cables formed from 1/8" mini-phono plug cables

The modules include:

1) Dual two axis joystick controls
2) A Horizontal and Vertical Ramp generator
3) A H or V phase-locked voltage controlled oscillator generating a triangle and square wave output. Non-linear waveshaping was later added.
4) Eight Voltage to Position Converter - switch selected on H or V, generates a rectangular pulses. These pulse could be controlled in position and width under voltage control. Output of these modules were gated together in the binary "geometric region processor".
5) An array of binary functions called an "octal geometric region processor" A collection of eight digital functions of two signals: A and B, A or B, A EXOR B ...were used to combine the rectangular pulses formed by the Voltage to Position Converter modules.
6) a Video Outliner called a "geometric unit generator" was generating lines and points. The outliner was an horizontal edge extractor formed through delay of the video signal, and "exor" gating it with itself. The extracted left and right edges were selected to pick off the leading or trailing edges of the image. These horizontally derived edges could triggered a 1-8 line "monostable" to form a rough approximation of vertical edge. The use of a one line delay to extract the vertical edge was too expensive at the time.
7) One Dual video processor - with gain and a "threshold control", to "core" out, and truncate video signals below a certain level. The processor could alternately be used as a level converter to translate audio signals to DV1 levels. This was a concession to allow for camera images to enter the direct video data path.
8) One Quad Mixer module - with 11 inputs patches connectors. Four front panel thumbwheel switches assigned the patched signals from the pattern generators to one of the four color channels labeled A,B,C and D. Each of the four channels has a "gate" input to "turn-to-black" or turn off the signal with a video speed control voltage. Switch #0 is connected to a flat color field, switch #9 and #10 are hard-wired for the two external cameras inputs of the Dual Processor. Each of the four channels has a low pass filter to smear the image, called a "texture generator" and can be set to either a horizontal or vertical time constant. Each of the four outputs drive a master level control which wires over to the Color Chord modules.
9) Four Color Chord modules - These modules superimpose the Quad Mixer output into triplets of red, green and blue levels which drive amplifiers with non-inverting and inverting inputs. Each module is controlled by its own set of six knobs, the superposition of the signals appearing as "color chords". Three knobs are assigned to the non-inverting Red, Green and Blue amplifiers, and three other knobs to the inverting or "negative side of these differential output amplifiers. The amplifiers outputs are DC restored then passed along for final output to the RGB to NTSC encoder.

A 3M NTSC color encoder and Telemation Color sync generator developed the timing and final video output for DV #1. A simultaneous monochrome and color video output were made available.

I'M STILL FINISHING UP THE WEAVER JUFFS