DAN J. SANDIN IMAGE PROCESSOR (IP)

5/2/92 Jeff Schier

The Dan Sandin Image Processor or "IP" is an analog video processor, with video signals are sent through processing modules, that route to an output color encoder. The idea for the IP was conceived in a train station in Madison Wisconsin, with Dan equating how a video synthesizer might be built, extrapolating from audio synthesizer processing.

The IP's most unique attribute was it's non-commercial philosophy, emphasizing a public access to processing methods and the machines that would assist in generating the images. The IP was Sandin's electronic expression for a culture that would "learn to use High-Tek machines for personal, aesthetic, religious, intuitive, comprehensive, (and) exploratory growth". This educational goal was supplemented with a "distribution religion", that enabled video artists and not-for-profit groups to "roll-your-own" video synthesizer, for only the parts cost, sweat and labor it took to build it. It was the "Heathkit" of video art tools, with a full building plan spelled out : including electronic schematics and mechanical assembly information. Tips on soldering, procuring electronic parts and Printed Circuit boards, were also included in the documentation, increasing the chances of successfully building a working version of the video synthesizer.

The processing modules were mechanically housed in a set of rectangular aluminum boxes, with holes drilled for BNC connectors and knobs. The modules were stacked into an array or "wall-of-modules". The signal routing between modules is patched with BNC coax cables, plugged into the front panel of each module. Each box front panel had a unique layout of connectors and knobs, prompting many users to omit labeling of connectors and knobs, relying on a "knowledge" of the machine, gleaned from its construction. The number of processing modules was optional, but the "Classic IP" was formed a "wall of modules", often stacked 3 high by 8 wide, filling a table top.

An NTSC Color sync generator, analog processing modules and a NTSC Color encoder built around a Sony color camera encoder board, formed the "IP". The analog modules were :

1) A camera processor/sync stripper - takes a black and video signal DC restores it, and outputs an amplified version without sync.
2) Adder / Multiplier - Allows the combination, inversion mixing and keying of multiple image sources. The adder section can "superimpose" and inverts the image polarity of incoming signals.
   The multiplier takes the two summed video sources, and forms a linear mix between them. The mix or control signal is externally supplied.
   A fast changing control acts as a gate or "key control". A slower changing control input causes a soft mixing of the video inputs. A static control signal, turns the multiplier into a "fader" unit, fading between the two sets of inputs.
3) Comparator - Two inputs A and B are sent to a high gain video amplifier. This "discrete digital" output is developed if A is greater than B, and runs at video speeds. With the comparator output sent to the control gate of the Adder/Multiplier, a hard-edge keyer is formed.

4) Amplitude Classifier - A string of comparators is assembled to compare an input video signal against a ladder of brightness levels. The output of the classifier is 8 discrete "digital" channels, forming a set of intensity bands, corresponding to 8 contiguous grey levels evenly spaced from black to white.
5) Differentiator - this module generates an output signal based on the rate of change of the input signal. Six inputs with progressively larger time constants, respond to the edge rates of the input source. The shorter time constants respond to sharp horizontal edges, the larger time constants respond to softer edges
6) Function Generator - a non-linear amplifier with an effect "more complex and controllable than photographic solarization". Adjustments for negative, positive and near zero signals are adjusted through knob controls on the front panel
7) Reference Module - a collection of 9 potentiometers, with nine corresponding output jacks. The potentiometers dialed control voltages needed to drive other analog processing modules.
8) Oscillator - A voltage controlled oscillator with sine, square and triangle outputs made available. The oscillator can be externally triggered to lock the oscillator phase to horizontal or vertical sync.
9) Color encoder - an RGB to NTSC encoder, used as the final output stage. Was constructed from a Sony DXC500B color camera encoder PC board. Two outputs were present. A luminance output from the summed Red, Green and Blue inputs, and a color NTSC video signal formed by the R,G,B inputs. Wiring from the amplitude classifier results in a "threshold based colorizer". When driven from multiple Adder/Multipliers a combination of monochrome and color images is formed from oscillator waveforms and camera based sources.
10) NTSC Color Sync Generator - standalone NTSC color sync generator, develops all needed synchronizing or sync signals to run the IP. Composite Sync, Blanking, Burst-Flag and Subcarrier form the set of timing needed by the color encoder module. Horizontal and Vertical Drive signals are also generated to drive the timing of external black and white camera sources.
11) Power Supply - supplied all need power voltages to run the processing modules. +12, -12, +5, -5, and +14 were developed and run out on a "power bus" connecting the modules together.

Partly due to it's low cost and the free dissemination of information, the Image Processor's educational success can be found in its numbers : a larger number of IP's were built in its' time, than any other commercial "video-art" synthesizer.

The IP processor was later linked to Tom Defanti's real time computer language "Grass", teaching at the Chicago Circle Campus at the University of Illinois. The Grass language controlled a Vector General display unit, and allowed interactive control of vector graphics. The IP helped mix live video images with vector computer graphics, by pointing a camera at the Vector General display screen to transcribe the results. These images were processing, colorized and combined with camera images to video tape the results. Numerous collaborations and video tapes were made with Dan Sandin, and Tom Defanti merging vector computer graphics and synthetic video images.