The EMU10K1 Digital Audio Processor

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Joint E-mu/Creative Technology Center

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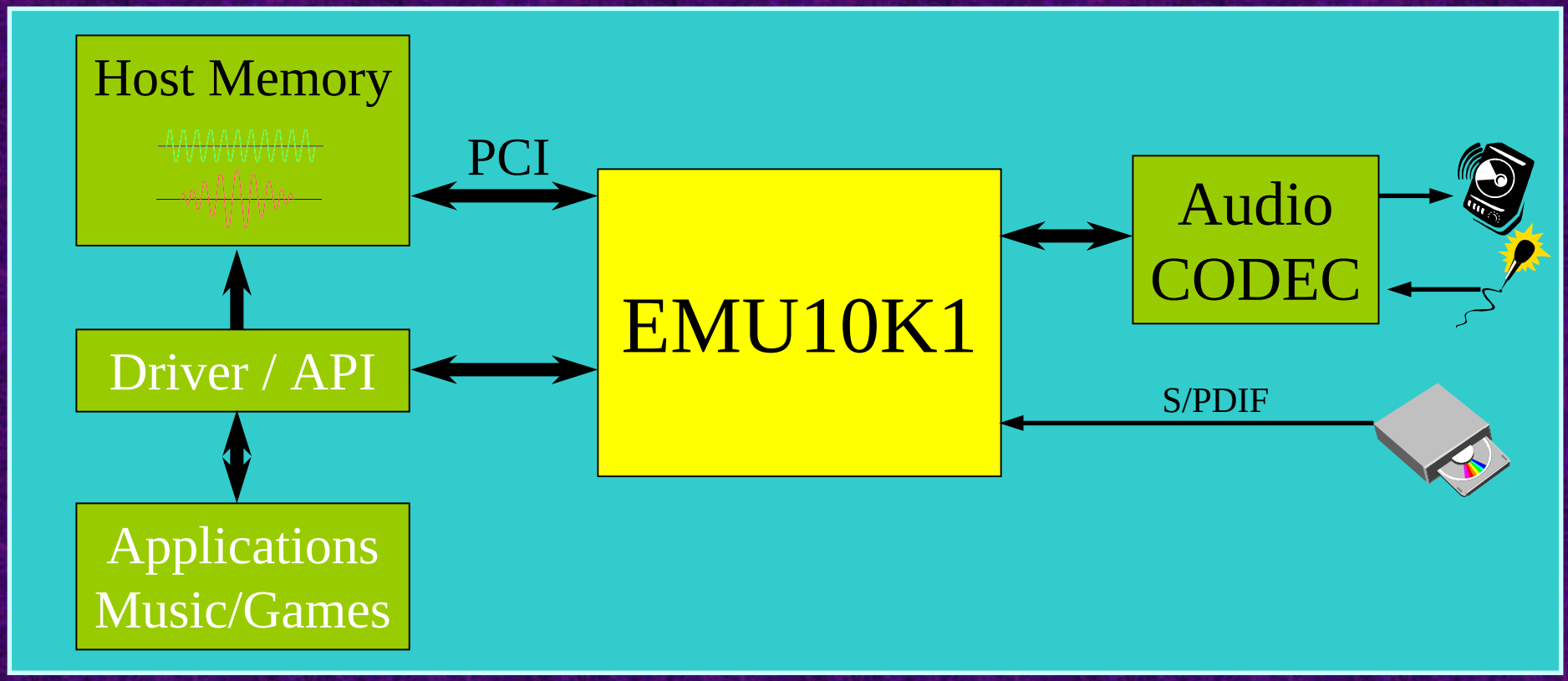
PC Audio Subsystem



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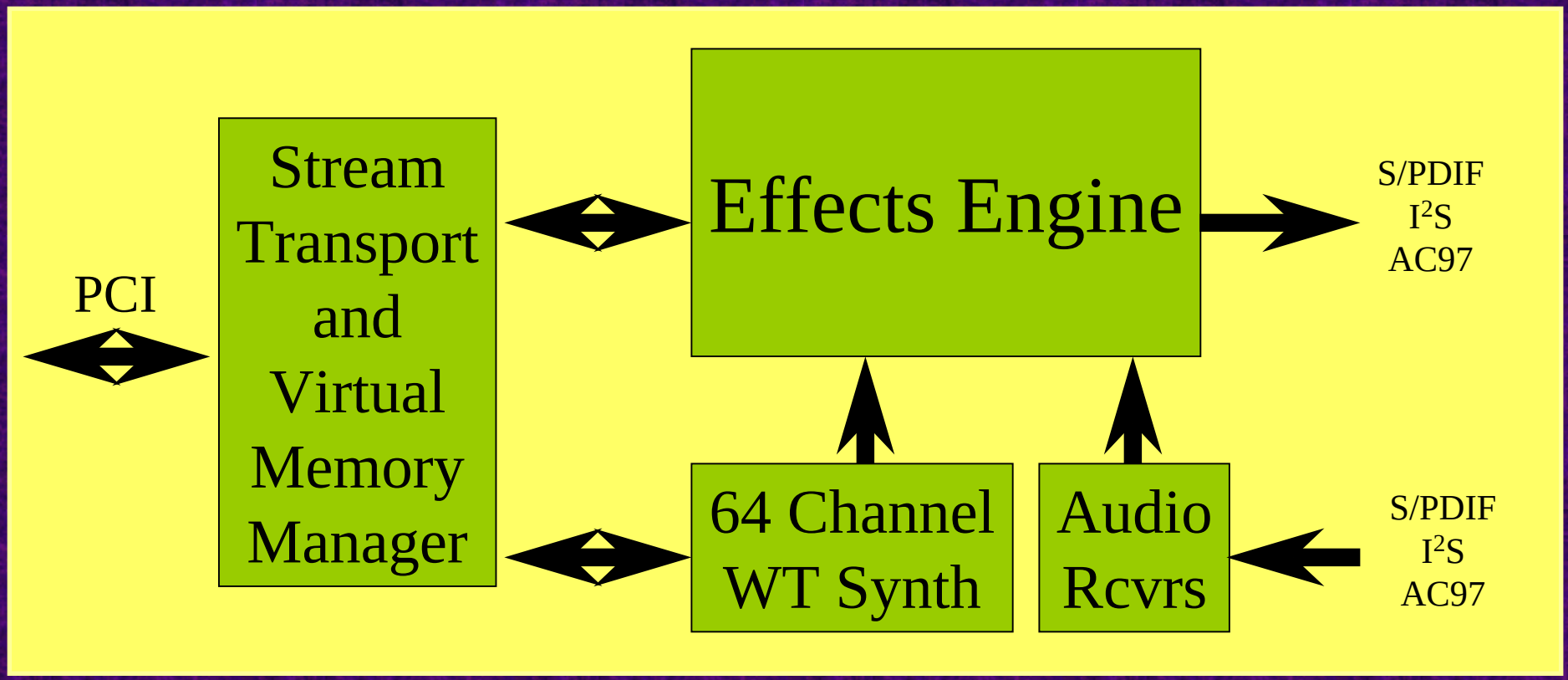
The EMU10K1



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Virtual Memory Stream Manager

- PCI Bus Master
- True Virtual Memory
- Hardware accesses copy of page table
- Mapping same as in Intel chipset
- All audio dynamically mapped into single logical memory space
- Logical-to-physical translation done inside chip with translation lookaside hardware

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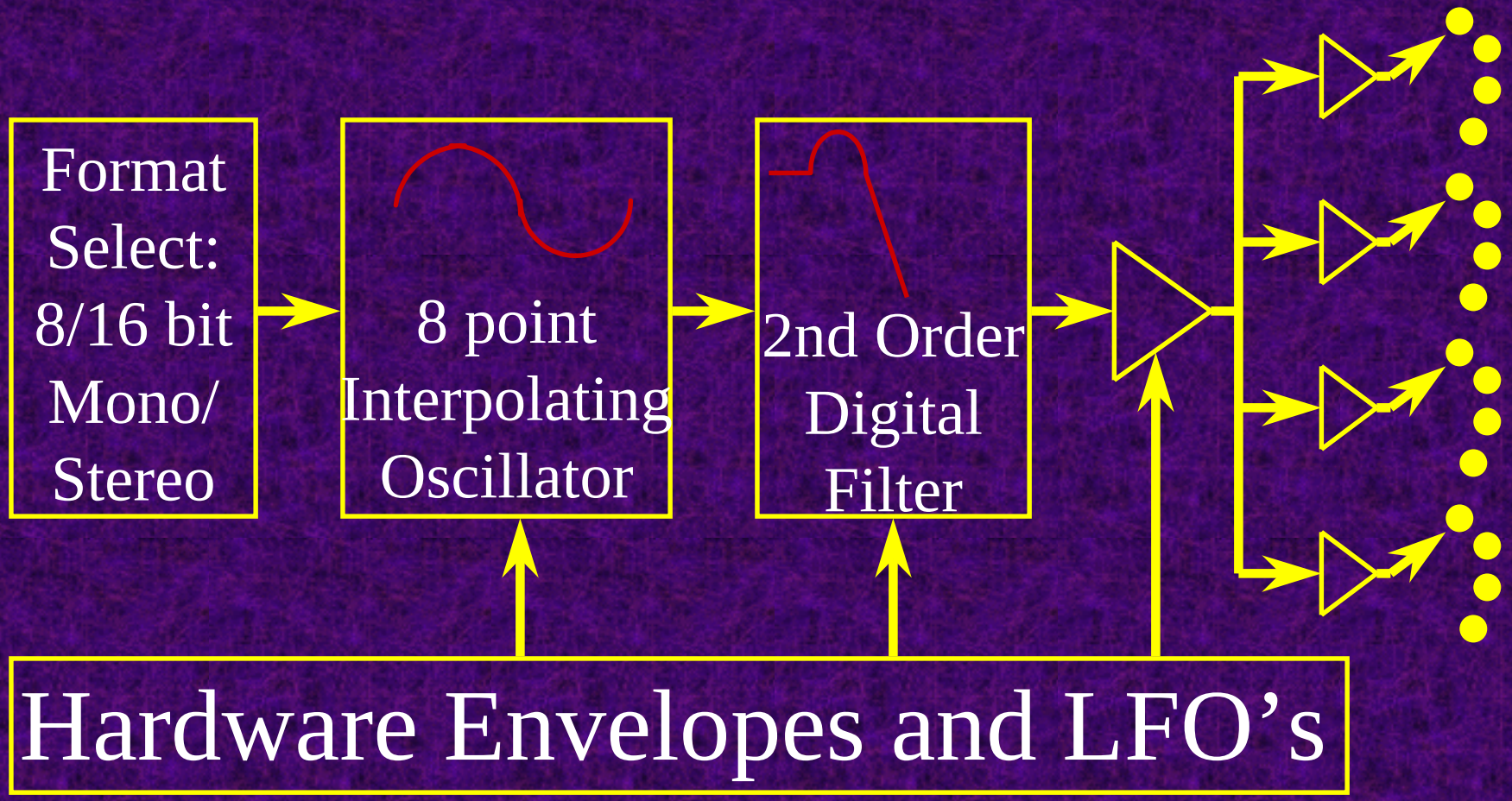
The EMU10K1 Wavetable Synth



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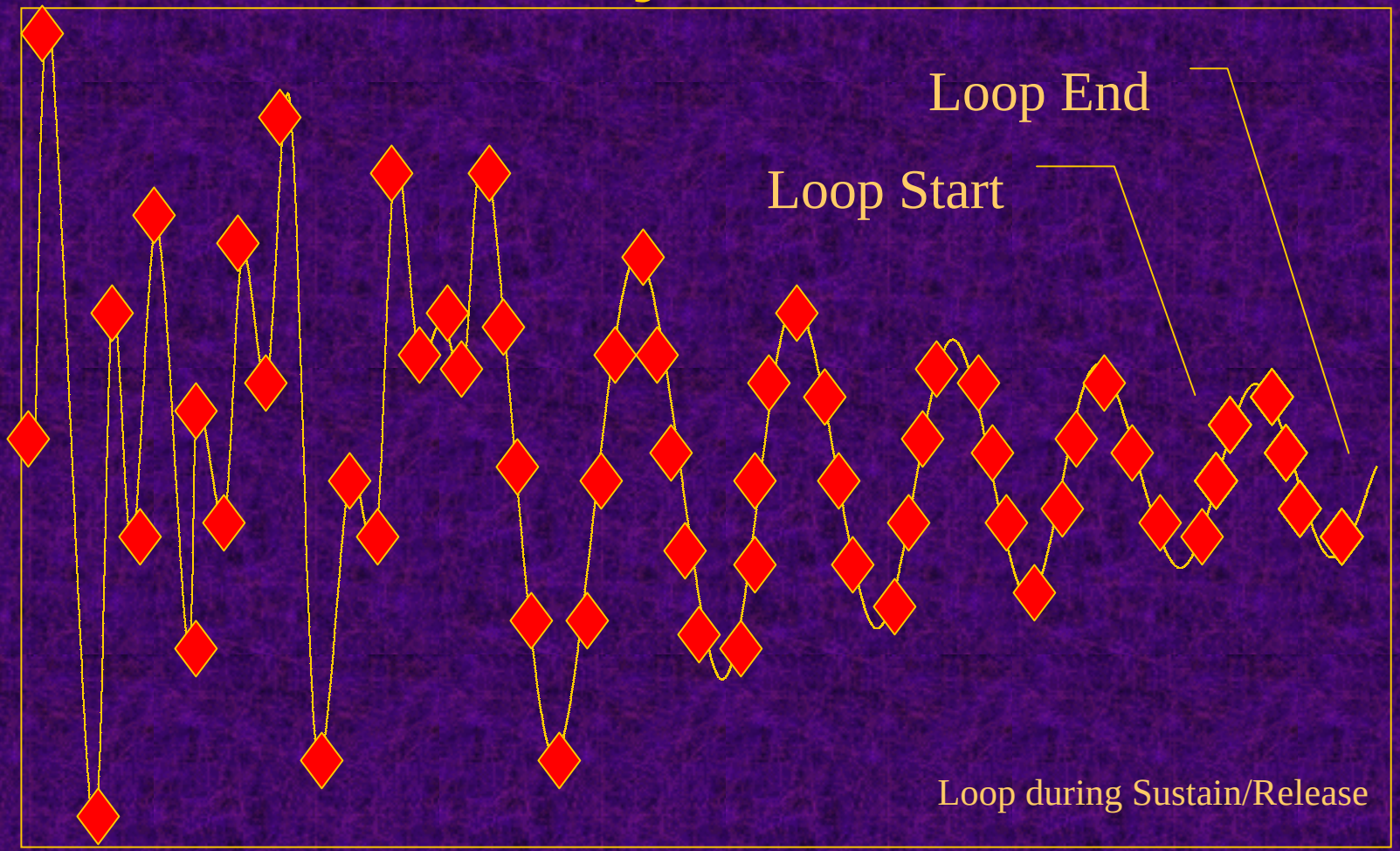
A Wavetable Synthesis Oscillator



Attack Decay Sustain/Release

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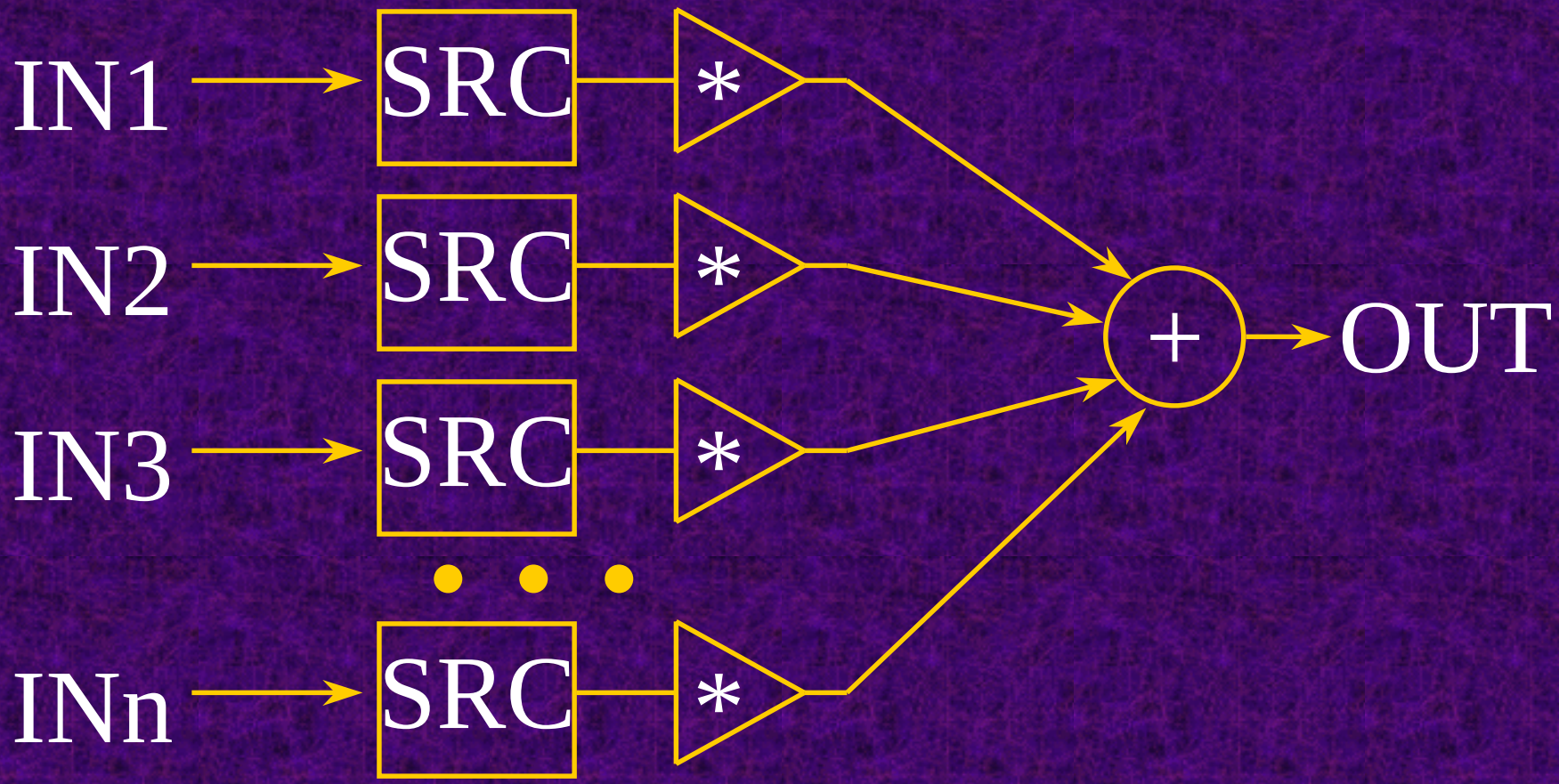
Digital Mixing Fundamentals



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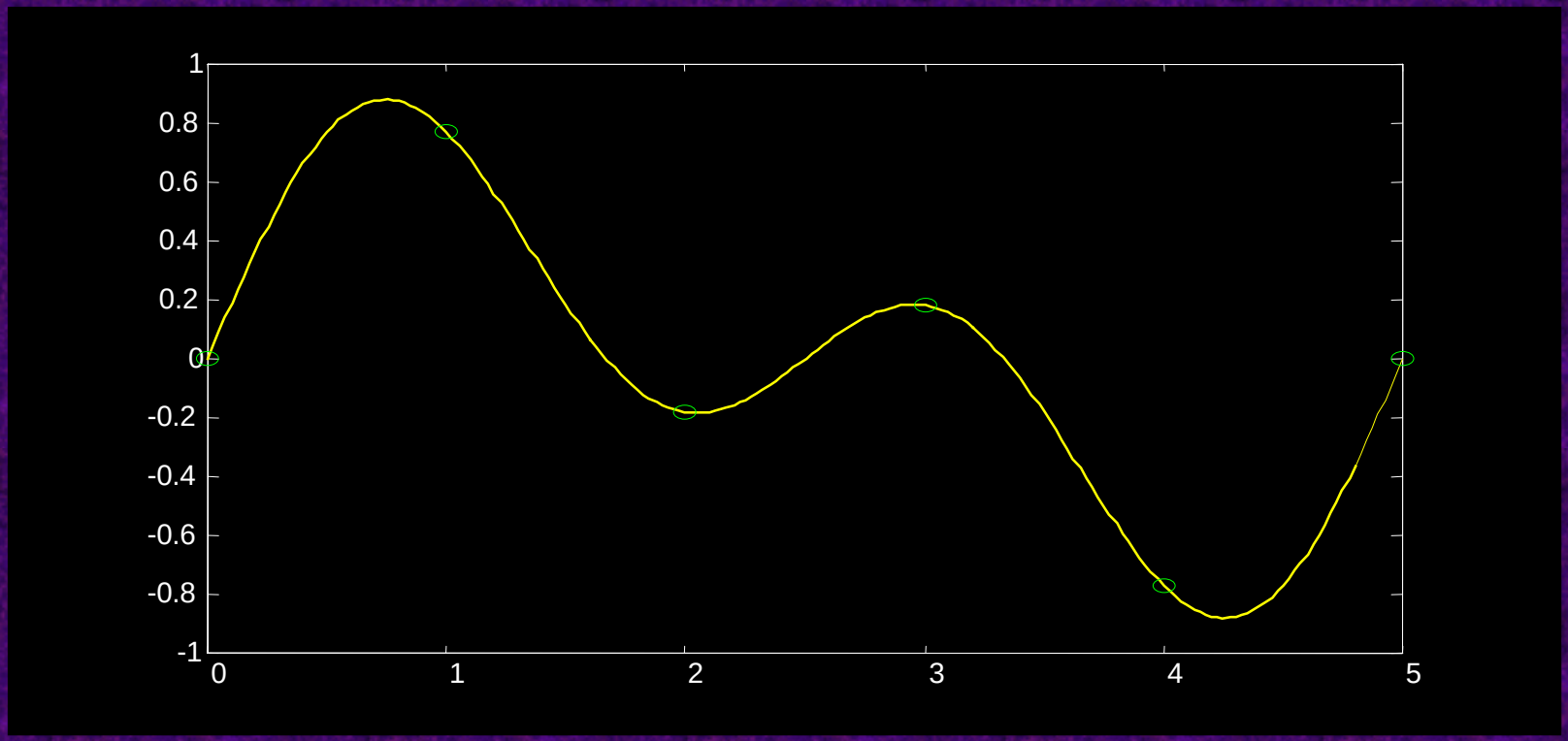
Interpolating Audio

- Consider an Analog Audio Waveform



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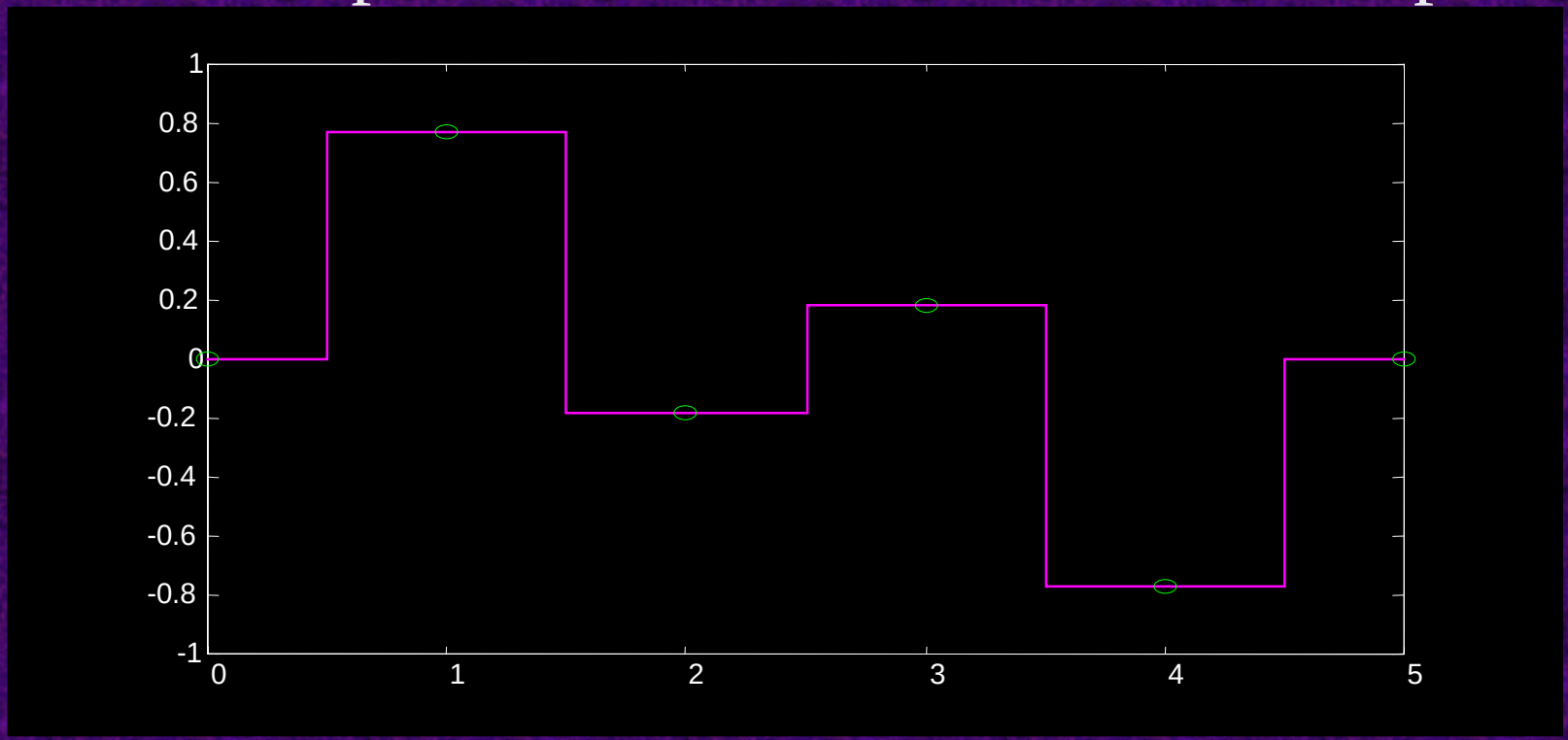
Interpolating Audio

- The simplest solution - take nearest sample



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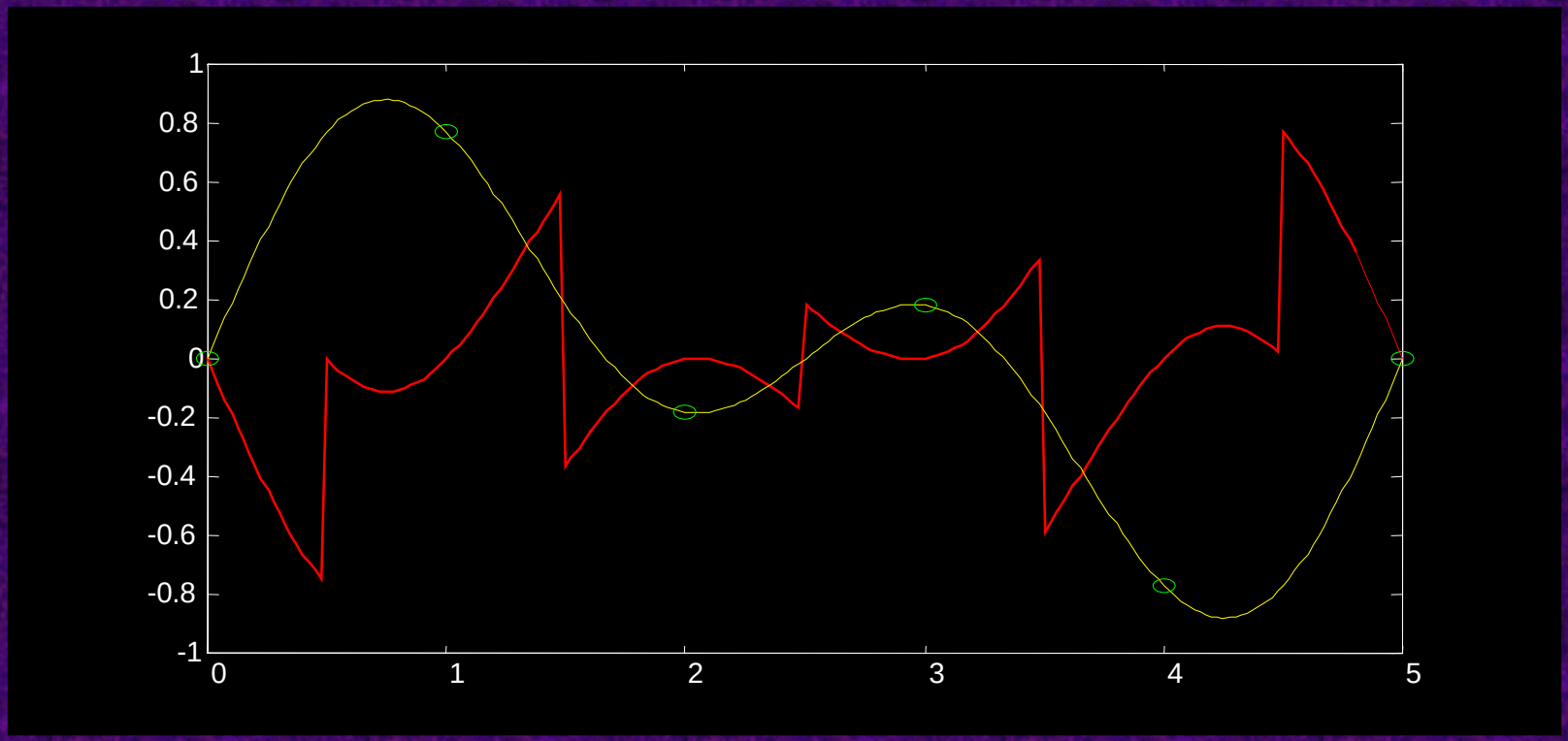
Interpolating Audio

- Unfortunately, this creates a lot of distortion:



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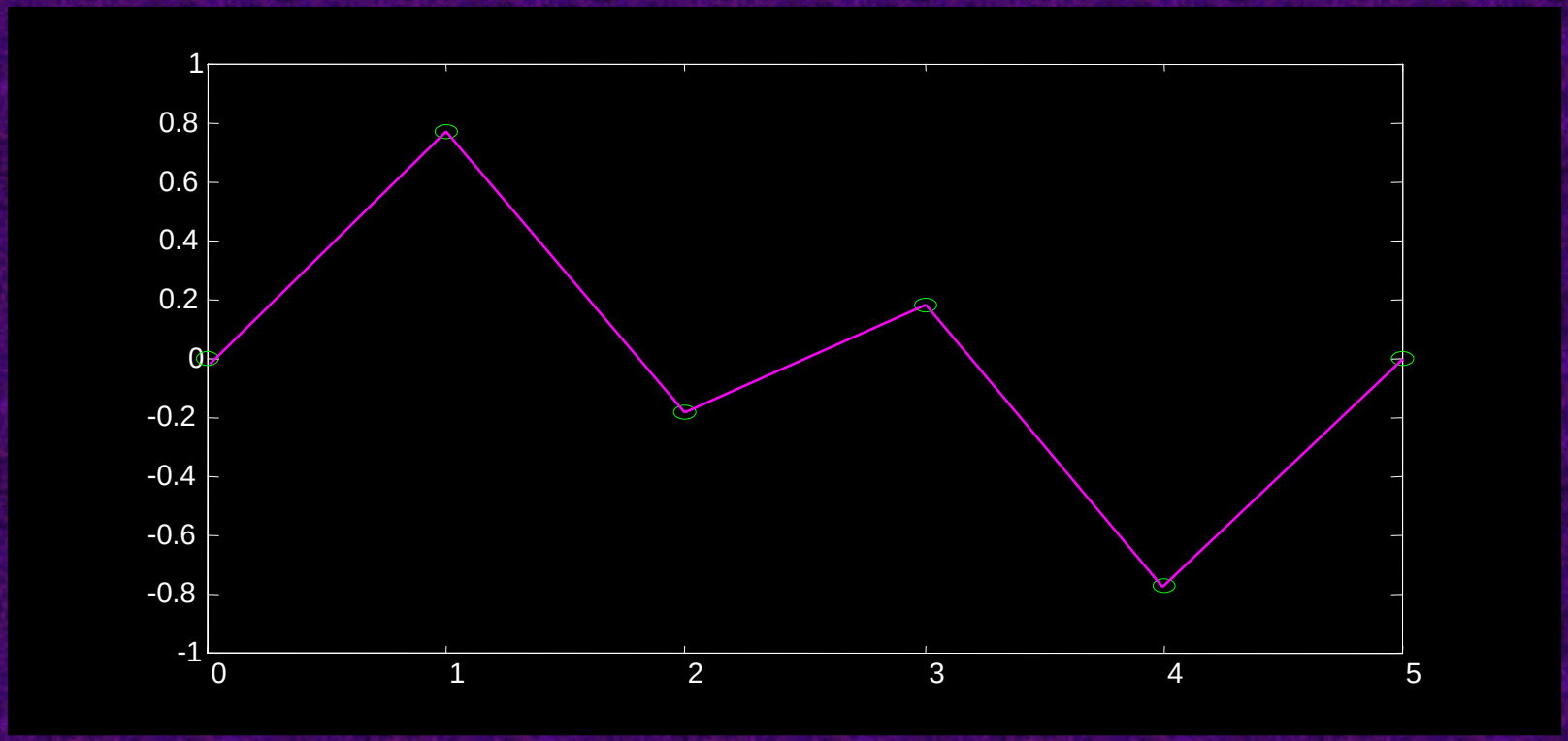
Interpolating Audio

- Linear Interpolation is obvious alternative:



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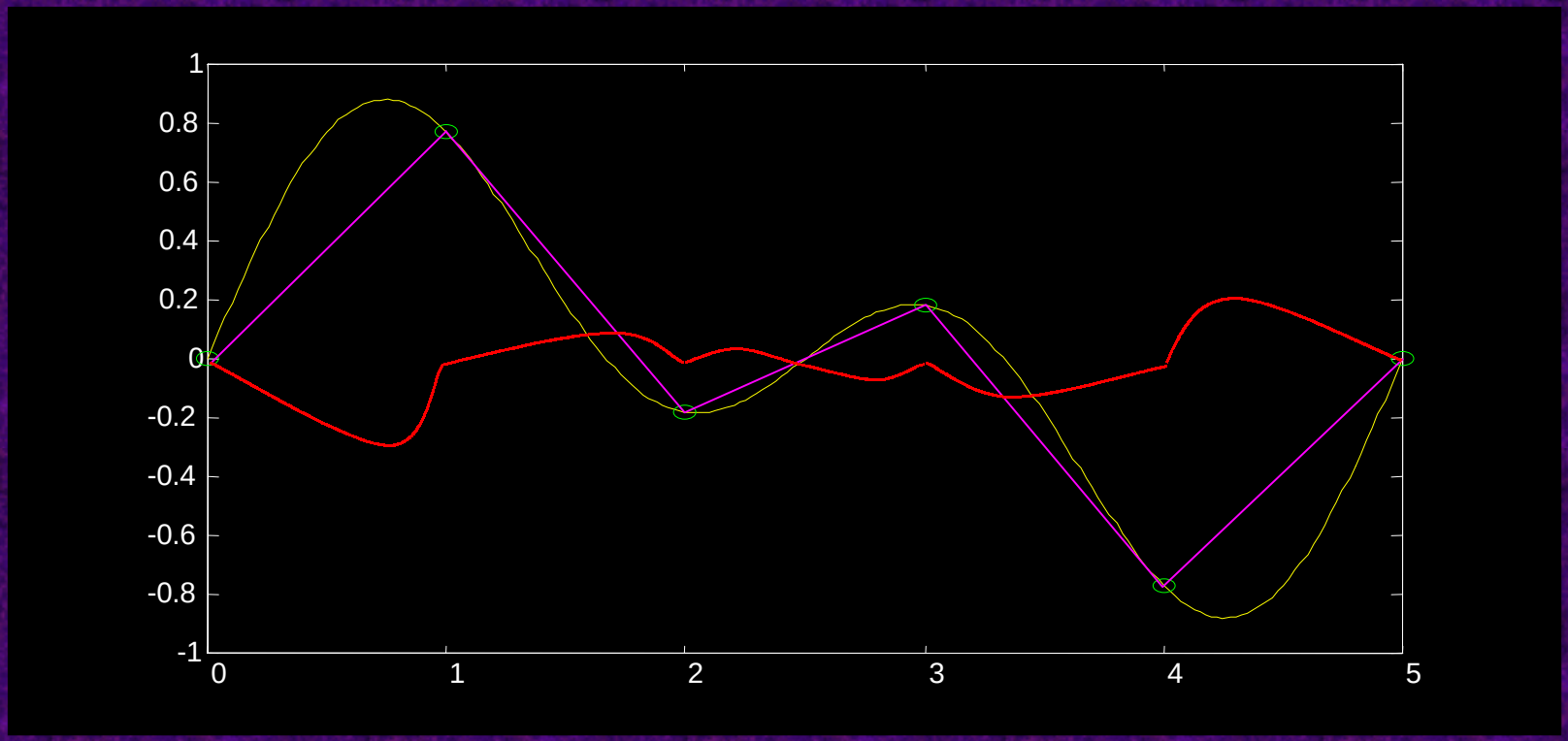
Interpolating Audio

- Linear interpolation still a significant source of distortion:



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Interpolating Audio

- "Ideal" interpolation needs complex math
  - More than 380 MIPS for a 20 bit stereo signal
- "Perceptual" approach (like AC-3) needed
  - E-mu patented technology
  - Perceptually based 8th order interpolation
  - Produces professional fidelity at modest cost

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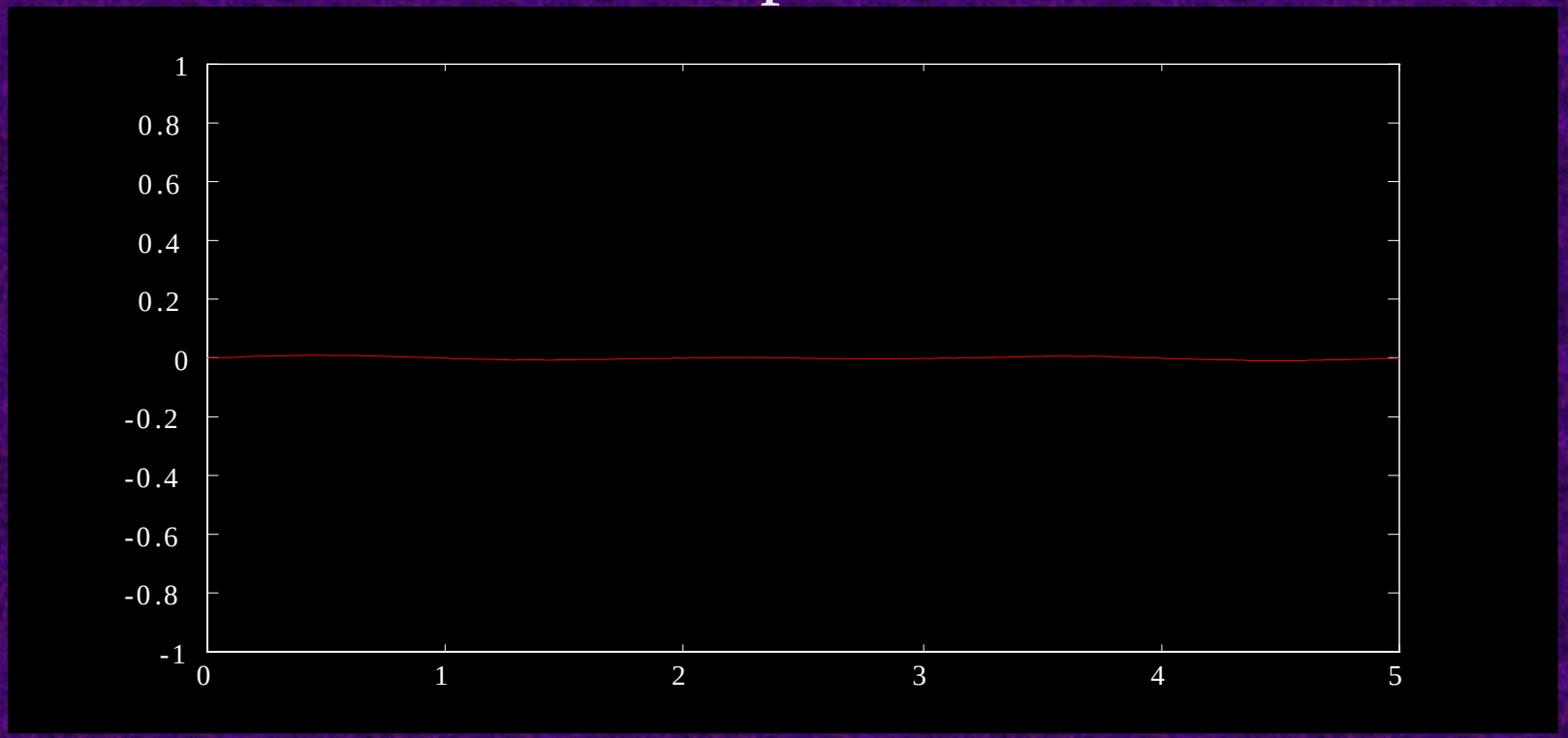
Interpolating Audio

- E-mu 8th order interpolation error:



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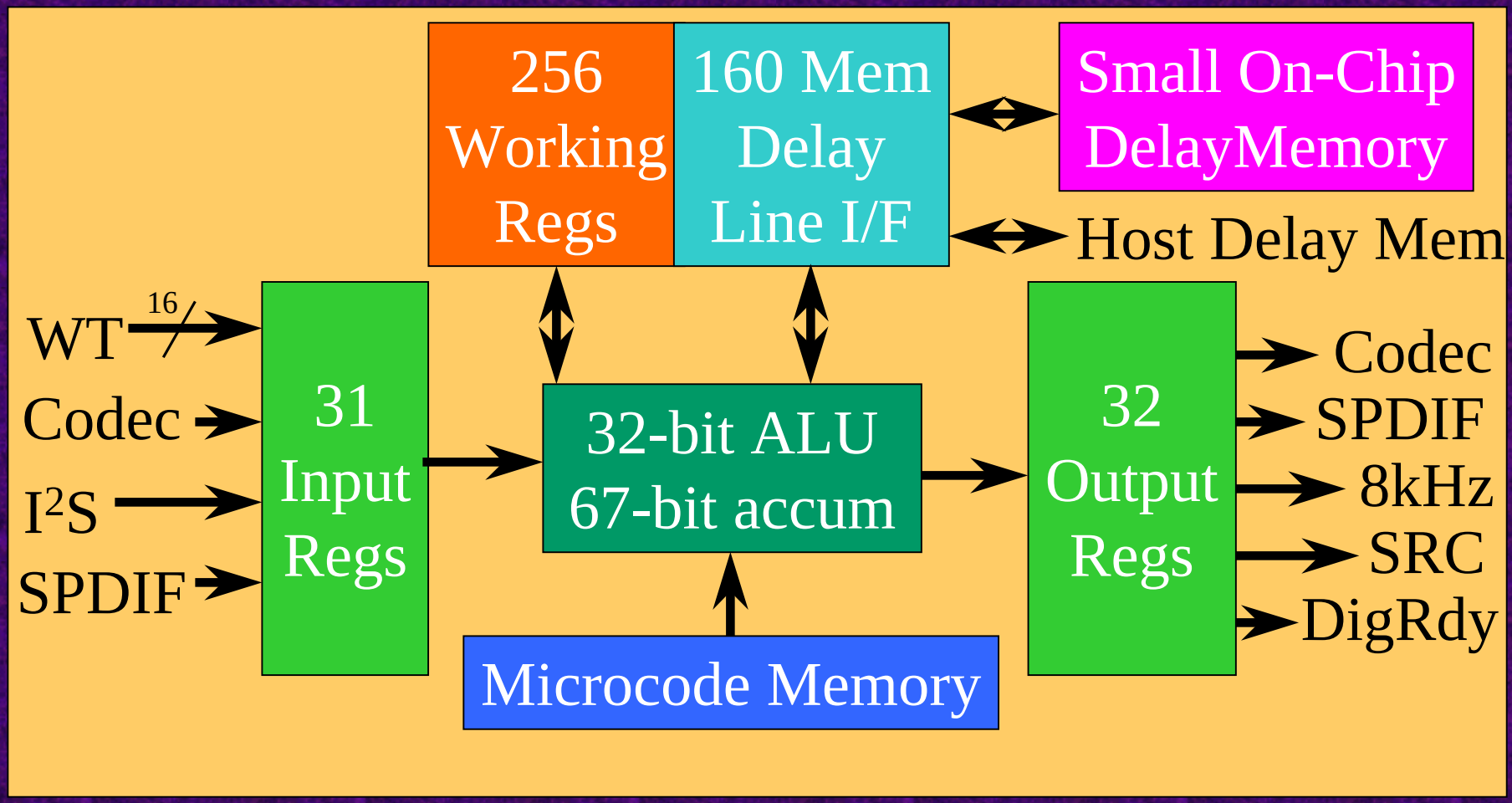
EMU10K1 Effects Engine



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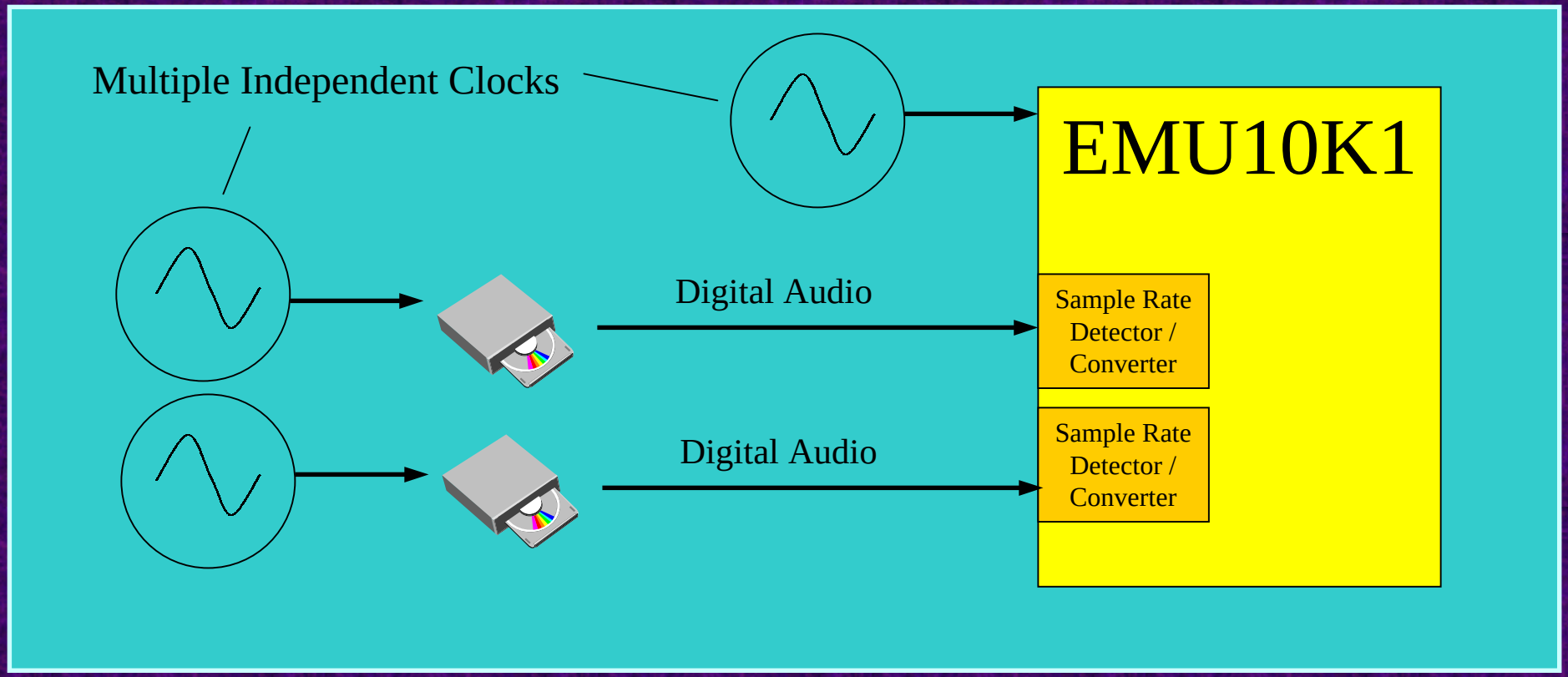
Asynchronous Digital Audio Receivers



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EMU10K1 Audio Receivers

- Sample Rate Detectors
  - Determine true realtime incoming sample rate
  - Fast locking (typ. 300 ms)
  - Patent applied for
- Sample Rate Conversion to Local Rate
  - Very high order (16 point) interpolators
  - 20 bits of fidelity maintained

Digital Audio Recording

- PCI bus master DMA
- Stereo Down-Samplers to lower rates
  - 8, 11, 16, 22, 24, 32, 44.1, and 48 kHz
  - Very high order (64 point) interpolators
- Multi-channel interleaved record
  - Up to 32 channels

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EMU10K1 Summary

- PC Audio Subsystem
- PCI Bus Master
- Digital Mixer
- Hardware Wavetable Synthesizer
- Powerful Audio DSP
- Asynchronous Digital Audio Receivers
- Digital Audio Recorder

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