

Digital Signal Processing for Music

Part 1: Introduction

Andrew Beck

Digital Technology – Production

Sound Synthesis

Product	Year
NED Synclavier Synthesizer/Sampler	1979
Fairlight CMI Synthesizer/Sampler	1979
Linn LM-1 Drumcomputer/Sampler	1980
E-MU Emulator I Sampling Keyboard	1981
Yamaha DX-7 Synthesiser	1983



Sound Processing / Effects



Product	Year
Lexicon Delta-T 101 Digital Delay	1971
EMT 250 Digital Reverberation	1976
Lexicon L224 Digital Reverberation	1978

Digital Technology – Production

Sound Editing

Product	Year
Sony DAE-1100 Digital Audio Editor	1971
Sony DAE-3000 Digital Audio Editor	1976
Sonic Solutions Harddisk Editing	1978



Other



Product	Year
MIDI Standard	1983

Digital Storage & Consumer

Professional

	Year
PCM-1600 (U-matic)	1978
PCM-1 (Betamax)	1978
Digital Multitrack (3M, Sony)	1978
Alesis ADAT	1991
Tascam DA-88	1993



Consumer

	Year
Compact Disk	1982/83
Digital Audio Tape (DAT)	1987
MiniDisc	1991
Digital Compact Cassette	1992
DVD-Video	1997
DVD-Audio	1999
SACD	1999

Driving Forces for Digital Adoption

Storage

- Lossless Copying and Archiving of Digital Content

Editing & Processing

- Splicing of Recordings
- Fast Convolution
- Granular Processing/Time-stretching/Pitch-shifting

Technical Characteristics

- SNR, Distortion, Transfer Functions, ...

- **Dropping prices** for digital hardware and software

Current Trends

Resolution & Data Rates

- Lower data rates for compression formats

Spatialization & Environment

- Formats: Multichannel, WFS, Object-based
- Environmental Modelling
- Sophisticated HRTF

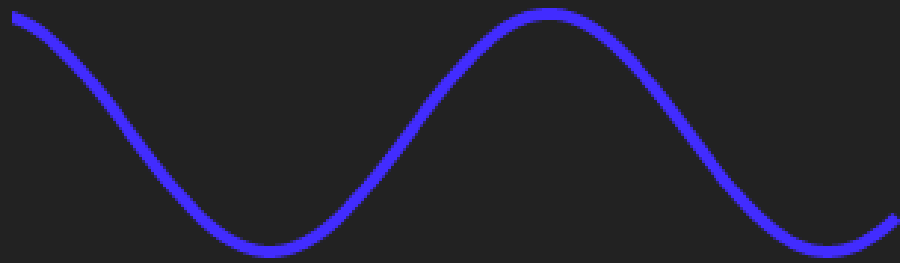
Production Environments

- Online Collaboration
- Machine Musicianship

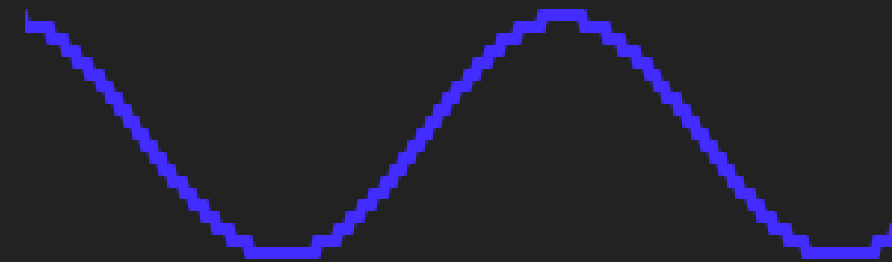
- Content-based recommendation / Listening
- Signal- & User-adaptive audio production
- Computer-aided editing, composition & performance
- Interactive & Creative audio consumer software
- Deep AI production

Class Content

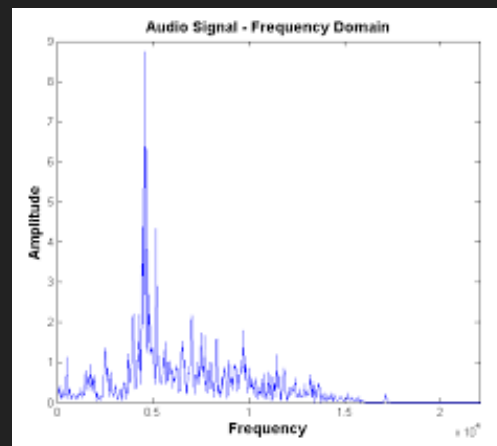
Properties of Signals



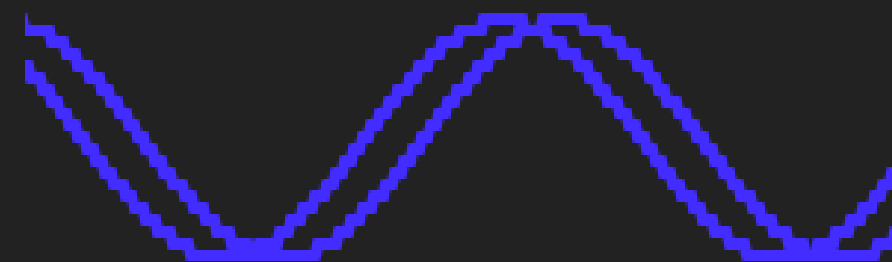
Digitizing Signals



Transforming Signals



Processing Signals



Encoding Signals