CM3106 Chapter 6: MIDI and MPEG-4 Audio Compression

Prof David Marshall

dave.marshall@cs.cardiff.ac.uk

and

Dr Kirill Sidorov

K.Sidorov@cs.cf.ac.uk

www.facebook.com/kirill.sidorov

School of Computer Science & Informatics
Cardiff University, UK

MIDI

What is MIDI?

- **No Longer** Exclusively the Domain of Musicians.
- MIDI provides a very low bandwidth alternative on the Web:
    - transmit musical and
    - certain sound effects data
- also now used as a *compression control language (modified)*
    - See MPEG-4 Section **soon**
    - See also HTML5 **soon**

MIDI as a Compression Tool?

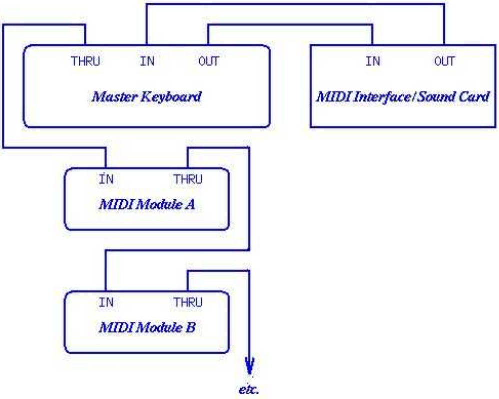
Few 100K bytes storage/Very low bandwidth transmission

- The responsibility of producing sound is moved to the **client**:
  - Synthesiser Module
  - Sampler
  - Soundcard
  - Software Generated
- Most Web browsers can deal with MIDI.
  - MPEG-4
  - Available as plugins (e.g. Quicktime) and (as of 2013) as Web MIDI API in HTML 5 — (**More Soon**)

Definition of MIDI

MIDI Definition

A protocol that enables computers, synthesisers, keyboards, and other musical devices to communicate with each other.



Brief History of MIDI

MIDI is now 40 Years old (2022/3)

However MIDI is still very much alive and kicking.

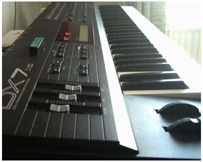
- Old meets new: (10 Years Ago) iPad plays old Commodore Sequencer!
- Brief History:
  - (10 Years Ago) BBC News Web Article
  - (Now) 2023 Article
- The protocol is still evolving: MIDI 2.0 High Definition MIDI. (**More soon**)

Not bad for a 40 Year Old Hi-Tech Media Protocol!

Components of a MIDI System

Synthesiser/Sampler

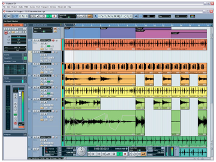
- It is a sound generator (various pitch, loudness, tone colour)
- Can use a variety of synthesis or Sample-based synthesis to make sound.
- A good (musician's) synthesiser often has a microprocessor, keyboard, control panels, memory, etc.
- For our purposes we define a synthesiser as the tone generation unit.
- It has one or more MIDI INs and MIDI OUTs and/or USB/Bluetooth/Wifi connectivity
- Can be software based these days so virtual midi connections.

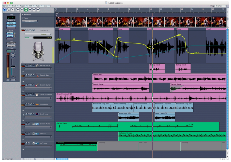


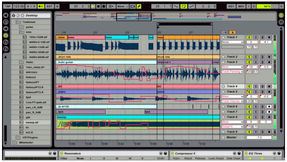
Components of a MIDI System (Cont.)

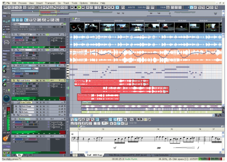
Sequencer

- It can be a stand-alone hardware unit or a software running on a computer.
- It has one or more MIDI INs and MIDI OUTs and/or USB/Bluetooth/Wifi connectivity
- If software based — internal (to computer apps) *virtual* midi connections also available.





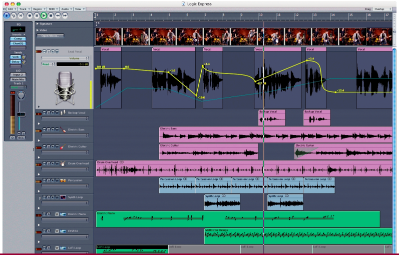




Components of a MIDI System (Cont.)

Computer:

- Heart of a MIDI system
- Controls the scheduling, synchronisation and recording of all data.
- Sequencer usually software based and now part of larger applications that control all aspects of Audio and MIDI — **Digital Audio Workstation** packages such as Cubase, Logic, Sonar, Live, Reason.
- Nowadays, includes many software synthesisers/samplers to make sounds in real time — Softsynths: VSTi, Audio Units *etc.*
- Real time effects
- Control of Video also integral these days.



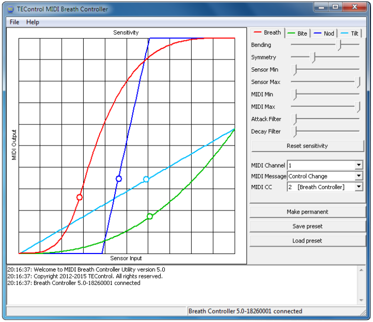
Components of a MIDI System (Cont.)

MIDI Control Input Devices:

- Usually a Keyboard with additional control: sustain, pitch bend,modulation, aftertouch and other controllers
- Can be another musical device e.g. Customised Guitar, Wind Controller
- Can be just a bunch of controllers.
- Can be even more strange: Motion Capture, or Virtual Input or Mind Control!!

Midi Breath, Motion and Bite Control

Midi **Breath**, **Motion** and **Bite** Control:



MIDI Channel: 1
MIDI Message: Control Change
MIDI CC: 2 [Breath Controller]

```
20:16:37: Welcome to MIDI Breath Controller Utility version 5.0
20:16:37: Copyright 2012-2015 TEControl. All rights reserved.
20:16:37: Breath Controller 5.0-18260001 connected
```

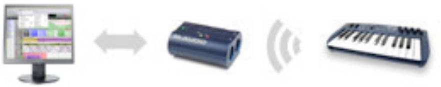
Breath Controller 5.0-18260001 connected

Components of a MIDI System (Cont.)

MIDI Interfaces:

MIDI devices (still) need to connect to computer with some interface

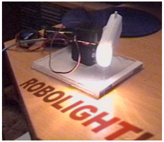
- MIDI Interface — Wired or Wireless
- Often functionality bundled with Keyboard or controller
- Audio Interface via Midi Cable, USB or Ethernet
- Even Wireless — Bluetooth or Wifi

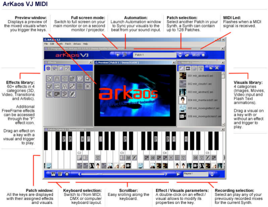


Components of a MIDI System (Cont.)

MIDI Control Output Devices:

- Not just making sounds
- MIDI controls other things
- Lighting
- Robotics
  - Even Pat Metheny and his Musical Robot Band: Orchestrion!!
- Video Systems e.g. Video DJing
- MPEG4 Compression — More soon
- Even Hamster Control!!!
- Lots of other applications
  For a full range of MIDI I/O Controllers check out
  http://www.synthzone.com/ctrlr.htm




ArKaos VJ MIDI

Preview window: Displays a preview of the mixed visuals when you trigger the keys.

Full screen mode: Switch to full screen on your main monitor or on a second monitor / projector.

Automation: Launch Automation window to Sync your visuals to the beat from your sound input.

Patch selection: Select another Patch in your Synth, a Synth can contain up to 128 Patches.

MIDI Led: Flashes when a MIDI signal is received.

Effects library: 60+ effects in 4 categories (3D, Video, Transitions and Artistic).

Additional FreeFrame effects can be accessed through the "F" effect icon.

Drag an effect on a key with a visual and trigger to play.

Visuals library: 4 categories (Images, Movies, Video input and Flash Text animations).

Drag a visual on a key with or without an effect and trigger to play.

Patch window: All the keys are displayed with their assigned effects and visuals.

Keyboard selection: Switch to / from MIDI, DMX or computer keyboard layout.

Scrollbar: Easy srolling along the keyboard.

Effect / Visuals parameters: A double-click on an effect / visual allows to modify its properties on the key.

Recording selection: Select an play any of your previously recorded mixes for the current Synth.

Basic MIDI Concepts

Track:

- Track in sequencer is used to organize the recordings.
- Tracks can be turned on or off on recording or playing back.

Channel:

- MIDI channels are used to separate information in a MIDI system.
- There are 16 MIDI channels in one '*cable*'.
- Channel numbers are coded into each MIDI message.

Timbre:

- The quality of the sound, e.g., flute sound, cello sound, etc.
- Multitimbral – capable of playing many different sounds at the same time (e.g., piano, brass, drums, etc.)

Basic MIDI Concepts (Cont.)

Pitch:

- The musical note that the instrument plays

Voice:

- Voice is the portion of the synthesiser that produces sound.
- Synthesisers can have many (12, 20, 24, 36, etc.) voices.
- Each voice works independently and simultaneously to produce sounds of different timbre and pitch.

Patch:

- The control settings that define a particular timbre.

Hardware Aspects of MIDI

MIDI connectors:

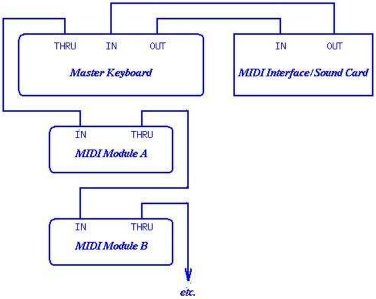
Standard Interface: USB or (older) Three 5-pin ports found on the back of every MIDI unit

- **MIDI IN**: the connector via which the device receives all MIDI data.
- **MIDI OUT**: the connector through which the device transmits all the MIDI data it generates itself.
- **MIDI THROUGH**: the connector by which the device echoes the data receives from MIDI IN.

Modern interfaces:

- Many devices bundle direct MIDI IN/OUT/THROUGH and have a direct connection to the computer.
  - **Wired**: e.g.USB/Ethernet

  or **Wireless**:
  - e.g. Bluetooth/Wifi



MIDI Messages

MIDI Messages

MIDI messages are used by MIDI devices to communicate with each other.

MIDI messages are very low bandwidth:

- Note On Command
  - Which Key is pressed
  - Which MIDI Channel (what sound to play)
  - 3 Hexadecimal Numbers
- Note Off Command Similar
- Other command (program change) configure sounds to be played.

Structure of MIDI messages:

MIDI message Structure:

- MIDI message includes a status byte and up to two data bytes.
- Status byte
    - The most significant bit of status byte is set to 1.
    - The 4 low-order bits identify which channel it belongs to (four bits produce 16 possible channels).
    - The 3 remaining bits identify the message.
- The most significant bit of data byte is set to 0.

Classification of MIDI messages:

MIDI Message Types:

```
                                            -- voice messages
                   --- channel messages ---|
                  |                         -- mode messages
                  |
MIDI messages ----|
                  |                         -- common messages
                   ---  system messages ---|-- real-time messages
                                            -- exclusive messages
```

MIDI Channel messages:

Channel voice messages:

Messages that are transmitted on individual channels rather that globally to all devices in the MIDI network.

- Instruct the receiving instrument to assign particular sounds to its voice
- Turn notes on and off
- Alter the sound of the currently active note or notes

MIDI Channel Control Messages

MIDI Channel Control Messages:

Voice Message	Status Byte	Data Byte1	Data Byte2
Note off	8x	Key number	Note Off velocity
Note on	9x	Key number	Note on velocity
Polyphonic Key Pressure	Ax	Key number	Amount of pressure
Control Change	Bx	Controller number	Controller value
Program Change	Cx	Program number	None
Channel Pressure	Dx	Pressure value	None
Pitch Bend	Ex	MSB	LSB

Notes: ‘x’ in status byte hex value stands for a channel number.

MIDI Command Example

MIDI Note On Example:

A Note On message is followed by two bytes, one to identify the note, and on to specify the velocity.

To play:

- Note number **80** (HEX **50**)
- With maximum velocity **127** (Hex **7F**)
- On channel **13** (Hex **C**),

The MIDI device would send these three hexadecimal byte values:

```
9C   50   7F
```

MIDI Channel mode messages:

MIDI Channel mode messages:

- Channel mode messages are a special case of the Control Change message (**Bx** (Hex) or **1011nnnn** (Binary)).
- The **difference** between a Control message and a Channel Mode message, is in the **first data byte**.
  - Data byte values 121 through 127 have been reserved in the Control Change message for the channel mode messages.
  - Channel mode messages determine how an instrument will process MIDI voice messages.

System Messages:

System Messages:

- System messages carry information that are **not** channel specific, Examples:
  - Timing signal for synchronisation,
  - Positioning information in pre-recorded MIDI sequences, and
  - Detailed setup information for the destination device
  - Setting up sounds, Patch Names etc.

MIDI System Real-time Messages

Real-time Messages:

- These messages are related to synchronisation/timing etc.

System Real-Time Message	Status Byte
Timing Clock	F8
Start Sequence	FA
Continue Sequence	FB
Stop Sequence	FC
Active Sensing	FE
System Reset	FF

System common messages

System common messages

- These contain the following (unrelated) messages

System Common Message	Status Byte	Number of Data Bytes
MIDI Timing Code	F1	1
Song Position Pointer	F2	2
Song Select	F3	1
Tune Request	F6	None

MIDI System exclusive messages

Sysex Messages:

- Messages related to things that cannot be standardized:
  - System dependent creation of sound
  - System dependent organisation of sounds (**Not General MIDI Compliant? (more soon)**)
- An addition to the original MIDI specification.
- Just a stream of bytes
  - all with their high bits set to 0,
  - bracketed by a pair of system exclusive start and end messages:

    `F0` — **Sysex Start**

    `F7` — **Sysex End**
  - Format of message byte stream system dependent.

General MIDI (GM)

The need for General Midi:

Problem: MIDI Music may not sound the same everywhere?

Basic GM Idea:

- MIDI + Instrument Patch Map + Percussion Key Map –> a piece of MIDI music sounds (more or less) the same anywhere it is played
  - Instrument patch map is a standardised list consisting of 128 instruments (patches).

    Same instrument type sounds similar if not identical sound
  - Percussion map specifies 47 percussion sounds.

    Same Drum type sounds on keyboard map
  - Key-based percussion is always transmitted on MIDI channel 10 (Default)

    Can be transmitted on other channels as well

Requirements for General MIDI Compatibility

General MIDI Requirements:

- Support all 16 channels — Default standard Multitimbral MIDI Specification
- Each channel can play a different instrument/program — multitimbral
- Each channel can play many notes — polyphony
- Minimum of 24 (usually much higher 64/128) full dynamically allocated voices — shared across all channels

General MIDI Instrument Patch Map

Prog No.	Instrument	Prog No.	Instrument
(1-8	PIANO)	(9-16	CHROM PERCUSSION)
1	Acoustic Grand	9	Celesta
2	Bright Acoustic	10	Glockenspiel
3	Electric Grand	11	Music Box
4	Honky-Tonk	12	Vibraphone
5	Electric Piano 1	13	Marimba
6	Electric Piano 2	14	Xylophone
7	Harpsichord	15	Tubular Bells
8	Clav	16	Dulcimer
(17-24	ORGAN)	(25-32	GUITAR)
17	Drawbar Organ	25	Acoustic Guitar(nylon)
18	Percussive Organ	26	Acoustic Guitar(steel)
19	Rock Organ	27	Electric Guitar(jazz)
20	Church Organ	28	Electric Guitar(clean)
21	Reed Organ	29	Electric Guitar(muted)
22	Accordion	30	Overdriven Guitar
23	Harmonica	31	Distortion Guitar
24	Tango Accordian	32	Guitar Harmonics
(33-40	BASS)	(41-48	STRINGS)
33	Acoustic Bass	41	Violin
34	Electric Bass(finger)	42	Viola
35	Electric Bass(pick)	43	Cello
36	Fretless Bass	44	Contrabass
37	Slap Bass 1	45	Tremolo Strings
38	Slap Bass 2	46	Pizzicato Strings
39	Synth Bass 1	47	Orchestral Strings
40	Synth Bass 2	48	Timpani

General MIDI Instrument Patch Map (Cont.)

	(49-56 ENSEMBLE)		(57-64 BRASS)
49	String Ensemble 1	57	Trumpet
50	String Ensemble 2	58	Trombone
51	SynthStrings 1	59	Tuba
52	SynthStrings 2	60	Muted Trumpet
53	Choir Aahs	61	French Horn
54	Voice Oohs	62	Brass Section
55	Synth Voice	63	SynthBrass 1
56	Orchestra Hit	64	SynthBrass 2
	(65-72 REED)		(73-80 PIPE)
65	Soprano Sax	73	Piccolo
66	Alto Sax	74	Flute
67	Tenor Sax	75	Recorder
68	Baritone Sax	76	Pan Flute
69	Oboe	77	Blown Bottle
70	English Horn	78	Skakuhachi
71	Bassoon	79	Whistle
72	Clarinet	80	Ocarina
	(81-88 SYNTH LEAD)		(89-96 SYNTH PAD)
81	Lead 1 (square)	89	Pad 1 (new age)
82	Lead 2 (sawtooth)	90	Pad 2 (warm)
83	Lead 3 (calliope)	91	Pad 3 (polysynth)
84	Lead 4 (chiff)	92	Pad 4 (choir)
85	Lead 5 (charang)	93	Pad 5 (bowed)
86	Lead 6 (voice)	94	Pad 6 (metallic)
87	Lead 7 (fifths)	95	Pad 7 (halo)
88	Lead 8 (bass+lead)	96	Pad 8 (sweep)

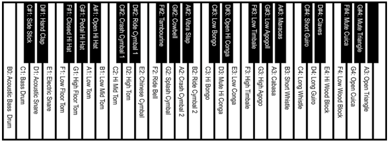
General MIDI Instrument Patch Map (Cont.)

	(97-104 SYNTH EFFECTS)		(105-112 ETHNIC)
97	FX 1 (rain)	105	Sitar
98	FX 2 (soundtrack)	106	Banjo
99	FX 3 (crystal)	107	Shamisen
100	FX 4 (atmosphere)	108	Koto
101	FX 5 (brightness)	109	Kalimba
102	FX 6 (goblins)	110	Bagpipe
103	FX 7 (echoes)	111	Fiddle
104	FX 8 (sci-fi)	112	Shanai

	(113-120 PERCUSSIVE)		(121-128 SOUND EFFECTS)
113	Tinkle Bell	121	Guitar Fret Noise
114	Agogo	122	Breath Noise
115	Steel Drums	123	Seashore
116	Woodblock	124	Bird Tweet
117	Taiko Drum	125	Telephone Ring
118	Melodic Tom	126	Helicopter
119	Synth Drum	127	Applause
120	Reverse Cymbal	128	Gunshot

General MIDI Percussion Key Map

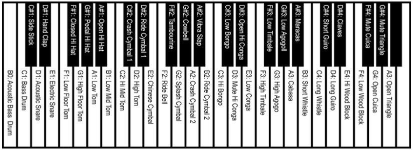
MIDI Key	Drum Sound	MIDI Key	Drum Sound
35	Acoustic Bass Drum	59	Ride Cymbal 2
36	Bass Drum 1	60	Hi Bongo
37	Side Stick	61	Low Bongo
38	Acoustic Snare	62	Mute Hi Conga
39	Hand Clap	63	Open Hi Conga
40	Electric Snare	64	Low Conga
41	Low Floor Tom	65	High Timbale
42	Closed Hi-Hat	66	Low Timbale
43	High Floor Tom	67	High Agogo
44	Pedal Hi-Hat	68	Low Agogo
45	Low Tom	69	Cabasa
46	Open Hi-Hat	70	Maracas
47	Low-Mid Tom	71	Short Whistle
48	Hi-Mid Tom	72	Long Whistle
49	Crash Cymbal 1	73	Short Guiro
50	High Tom	74	Long Guiro
51	Ride Cymbal 1	75	Claves
52	Chinese Cymbal	76	Hi Wood Block
53	Ride Bell	77	Low Wood Block
54	Tambourine	78	Mute Cuica
55	Splash Cymbal	79	Open Cuica
56	Cowbell	80	Mute Triangle
57	Crash Cymbal 2	81	Open Triangle
58	Vibraslap		

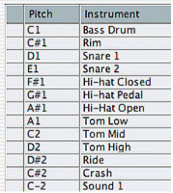


MIDI Percussion Key Mapping

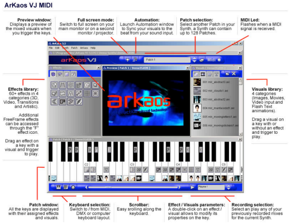
Key Mapping — See Sample-based Synthesis

- Each key is essentially a switch
- No **Pitch** information relevant — usually
- Can be extended to control other stuff e.g. Video DJ (VJ) application (Video demo)





Pitch	Instrument
C1	Bass Drum
C#1	Rim
D1	Snare 1
E1	Snare 2
F#1	Hi-hat Closed
G#1	Hi-hat Pedal
A#1	Hi-Hat Open
A1	Tom Low
C2	Tom Mid
D2	Tom High
D#2	Ride
C#2	Crash
C-2	Sound 1



ArKaos VJ MIDI

Preview window: Displays a preview of the mixed visuals when you trigger the keys.

Full screen mode: Switch to full screen on your main monitor or on a second monitor / projector.

Automation: Launch Automation window to Sync your visuals to the beat from your sound input.

Patch selection: Select another Patch in your Synth, a Synth can contain up to 128 Patches.

MIDI Led: Flashes when a MIDI signal is received.

Effects library: 60+ effects in 4 categories (3D, Video, Transitions and Artistic).

Additional FreeFrame effects can be accessed through the "F" effect icon.

Drag an effect on a key with a visual and trigger to play.

Visuals library: 4 categories (Images, Movies, Video input and Flash Text animations).

Drag a visual on a key with or without an effect and trigger to play.

Patch window: All the keys are displayed with their assigned effects and visuals.

Keyboard selection: Switch to / from MIDI, DMX or computer keyboard layout.

Scrollbar: Easy srolling along the keyboard.

Effect / Visuals parameters: A double-click on an effect / visual allows to modify its properties on the key.

Recording selection: Select an play any of your previously recorded mixes for the current Synth.

Limitations of Conventional MIDI

MIDI - The Future?

- Limited Number of Channels and Controllers
- Limited resolution in data values
  - Most midi numbers are 8-bit

Solutions:

- Some MIDI manufacturer utilities two midi data values to allow for large range of values
  E.g. Use values as Least and Most Significant Bytes:
  16 bit range
- Open Sound Control (OSC) — been around a while, MIDI still rules?
- MIDI 2.0 High Definition MIDI — fixes the above and adds more features.

Digital Audio, Synthesis, MIDI and Compression: MPEG-4 Structured Audio

Our First Compression Standard: MPEG-4 Audio

- We have seen the need for **compression** already in Digital Audio — **Large Data Files**
- Basic ideas of compression via bit quantisation studied shortly: used as integral part of audio format — MP3, real audio *etc.*
- MPEG-4 audio — actually combines compression synthesis and MIDI to have a massive impact on compression.
- Basic Idea: **MIDI** + **Synthesis** encode what note to play and how to play it with a small number of parameters

  — Much greater reduction than simply having some encoded bits of audio.
- Responsibility to create audio delegated to generation side.

MPEG 4 Structured Audio

MPEG-4:

A newer standard than MP3 Audio — which we study in detail later

MPEG-4 covers the the whole range of digital audio:

- From very low bit rate speech
- To full bandwidth high quality audio
- Built in anti-piracy measures
- **Structured Audio**
- Relationship to MIDI so we study MPEG 4 audio here

Structured Audio Tools

MPEG-4 Structured Audio tools:

MPEG-4 comprises of 6 *Structured Audio tools* are:

SAOL: the Structured Audio Orchestra Language

SASL: the Structured Audio Score Language

SASBF: the Structured Audio Sample Bank Format

MIDI semantics: describe how to control SAOL with a subset of MIDI

Scheduler: describe how to take the above parts and create sound

AudioBIFS: part of BIFS, which lets you make audio soundtracks in MPEG-4 using a variety of tools and effects-processing techniques

SAOL (Structured Audio Orchestra Language)

SAOL:

- Pronounced "sail"
- The central part of the Structured Audio toolset.
- A new software-synthesis language
- A language for describing synthesisers, a program, or instrument
- Specifically designed it for use in MPEG-4.
- Not based on any particular method of synthesis – supports many underlying synthesis methods.

SAOL Synthesis Methods

SAOL Synthesis:

- Any known method of synthesis can be described in SAOL (Open Support).
  - FM synthesis,
  - physical-modeling synthesis,
  - Sample-based synthesis,
  - granular synthesis,
  - subtractive synthesis,
  - FOF synthesis, and
  - hybrids of all of these in SAOL.

SASL (Structured Audio Score Language)

SASL

- A very simple language to **control** the **synthesisers** specified by **SAOL instruments**.
- A SASL program, or **score**, contains instructions that tell SAOL:
  - what notes to play,
  - how loud to play them,
  - what tempo to play them at,
  - how long they last, and how to control them
- **Similar to MIDI**
  - doesn't suffer from MIDI's restrictions on temporal resolution or bandwidth.
  - more sophisticated controller structure

SASL (Structured Audio Score Language) (Cont.)

SASL Limitations:

- Lightweight Scoring Language:
  Does not support:
  - looping,
  - sections,
  - repeats,
  - expression evaluation,
  - some other things.
  - most SASL scores will be created by automatic tools

SASBF (Structured Audio Sample Bank Format)

SASBF:

- A format for efficiently transmitting banks of sound samples
- Used in wavetable, or sample-based synthesis.
- Partly compatible with the MIDI Downloaded Sounds (DLS) format
- The most active participants in this activity are EMu Systems (sampler manufacturer) and the MIDI Manufacturers Association (MMA).

MPEG-4 MIDI Semantics

MPEG-4 + MIDI

SASL can be controlled by

- SASL Scripts
- MIDI
- Scores in MPEG-4

Reasons to use MIDI:

- MIDI is today's most commonly used representation for music score data,
- Many sophisticated authoring tools (such as sequencers) work with MIDI.

MPEG-4 MIDI Control

MIDI Control

- MIDI syntax external to MPEG-4 Structured Audio standard
- Use MIDI Manufacturers Association's standard.
- *Redefines* the some semantics for MPEG-4.
- The new semantics are carefully defined as part of the MPEG-4 specification.

MPEG-4 Scheduler

MPEG-4 Scheduler:

- The main body of the Structured Audio definition.
- A set of carefully defined and somewhat complicated instructions
- Specify how SAOL is used to create sound when it is driven by MIDI or SASL.

AudioBIFS

AudioBIFS:

- BIFS is the MPEG-4 **Binary Format for Scene Description**.
- Describes how the different "**objects**" in a structured media scene fit together:
  - MPEG-4 consists also of the video clips, sounds, animations, and other pieces of multimedia
  - Each have special formats to describe them.
  - Need to put the pieces together
  - BIFS lets you describe how to put the pieces together.

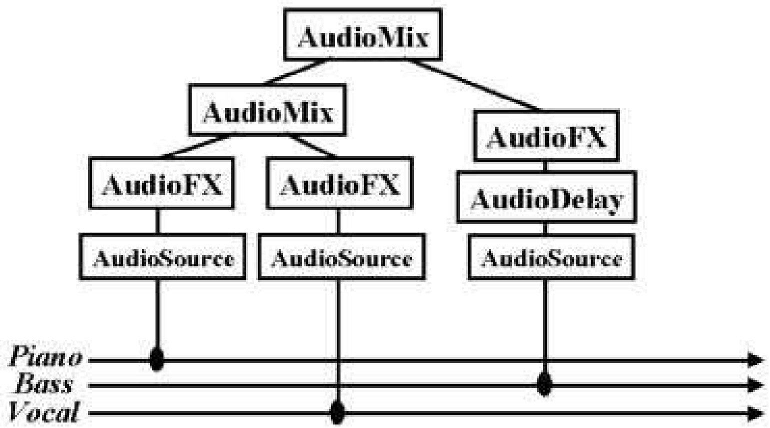
AudioBIFS (Cont.)

AudioBIFS:

- AudioBIFS is designed for specifying the mixing and post-production of audio scenes as they're played back.
- For example,
  - we can specify how the voice-track is mixed with the background music, and
  - that it fades out after 10 seconds and
  - this other music comes in and has a nice reverb on it.
- **Extended version of VRML**: **Capabilities** for
  - streaming and
  - mixing audio and video data
- Very advanced sound model.

AudioBIFS (Cont.)

AudioBIFS Example: How a simple sound is created from three elementary sound streams:



HTML 5 and MIDI

HTML 5

A new Web MIDI API [1]:

- Part of general web audio development of HTML 5

The Web MIDI API specification

- Defines a means for web developers to manipulate and access MIDI devices
  - MIDI Input and Output to hardware (outboard) and software.
  - Audio Synthesis available in Browser.
  - Total Web-Mid Control.
  - JavaScript Programming.

[1] Support of Web MIDI API is not that well developed. Not all browsers support it. See here for full spec.

Some HTML 5 MIDI Examples: Moog Doodle

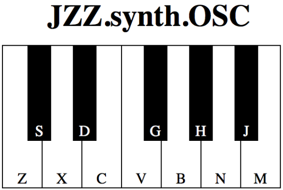
The first app was the Google Doodle for the Mini Moog.

- Uses Web Audio/MIDI API.
- Subtractive Synthesis on Web — code here.
- Celebrated Bob Moog's 78th Birthday.
- Spawned a whole community — google for others!

Some more Synthesisers

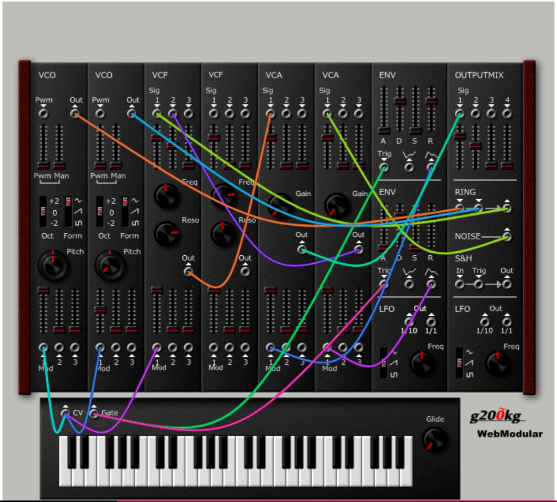
Simple HTML5 Egs:

- Basic Keyboard Input
- Music Staff



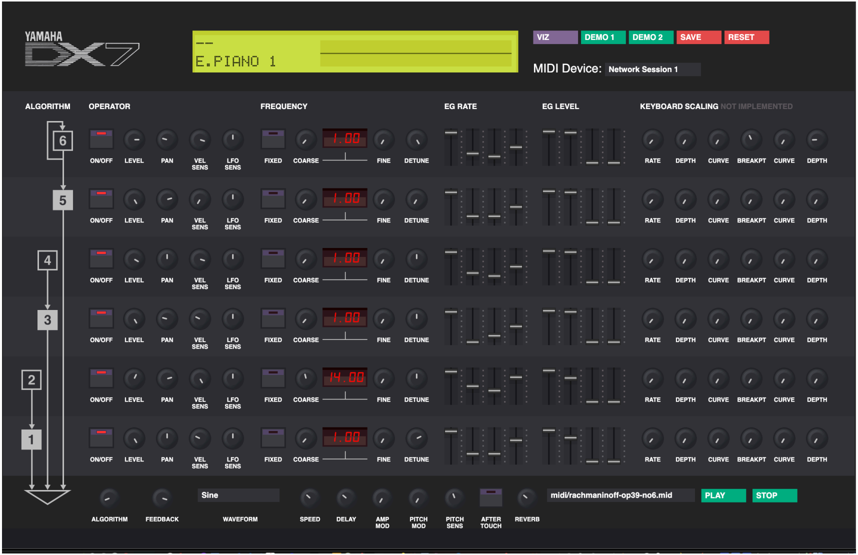
Some HTML 5 MIDI Examples: Modular Subtractive Synthesis

A fully fledged controlled Subtractive Synthesiser



Some HTML 5 MIDI Examples: FM Synthesis

A fully fledged controlled FM (DX7) Synthesiser



Some Other HTML 5 MIDI Examples

Drum Machine :

Web Audio Drumming

Granular Synthesis :

Simple Granular Synth

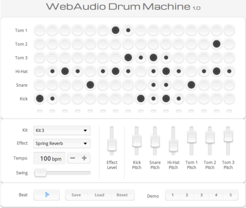
More Examples :

webaudiodemos.appspot.com

Some More Examples :

- jazz-soft.net/demo
- Chrome Music Lab
-

21 free browser based music apps


WebAudio Drum Machine 1.0

Kit: Kit 3

Effect: Spring Reverb

Tempo: 100 bpm