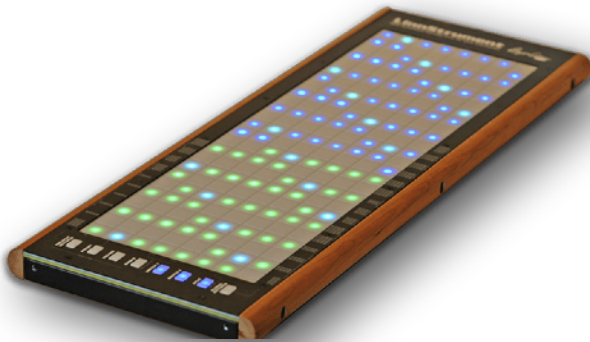# MPE/MIDI for Instrument Creators

Pat Scandalis
Jordan Rudess
Dr. Julius O. Smith III
Nick Porcaro

CCRMA Open House 10/21/2022

This Presentation Can be Found at:

http://www.moforte.com go to the "News and Media" section

Or

https://www.moforte.com/ccrma-open-house-presentation-10-21-2022/

MPE
MIDI Polyphonic Expression

- A set of *conventions built on MIDI 1.0* to communicate per note, *multidimensional (x|y|z) control data*.

- Enables *independent expression* for each note or row.

- *Already supported* by over 100 hardware and software products.

- The spec was ratified in January-2018, and a clarification revision was released April-2022: https://www.midi.org/specifications/midi1-specifications/mpe-midi-polyphonic-expression

History

- Similar to how Guitar Controllers have used MIDI 1.0 for 35 years.

- The Haken Continuum (x|y|z) expression (1999, Lippold Haken)

- The LinnStrument is one of the first instruments to implement MPE (2014, Roger Linn and Geert Bevin)

- Roli later adopted MPE for the original Seaboard (2014, Roland Lamb)

MPE in a Nutshell

- Derivative of MIDI Modes 3/4; enabled with RPN-6

- Can be Channel-Per-Note (for Keyboards, like the Seaboard) or Channel-Per-Row (String) (GeoShred, LinnStrument, Guitar Controller).

- Expression Control Conventions (per Channel)
    - o KeyX – Pitch Bend (Roli calls this *Glide*)
    - o KeyY – CC-74 (Roli calls this *Slide*)
    - o KeyZ – Channel Pressure (Roli calls this *Press*)

- Provides for Manager Channel (typically 1 or 16) that globally controls the MPE Member Channels (ie modWheel to all Member Channels)

- Provides for a low/high split, and each split can have it's own Manager Channel.
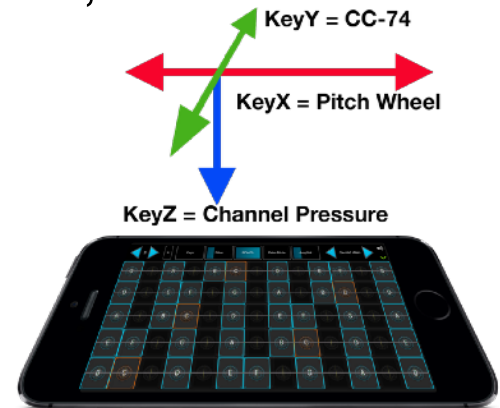
Modeling Synthesis and MPE

- Models are parameterized and as such can be musically expressive.

- Until recently, the options for expressing musical parameters were limited, *and affected all notes,* pitch wheel, mod wheel, knobs…

- **MPE creates a standard for individual expressive control on a per-note or per-row (string) basis.**
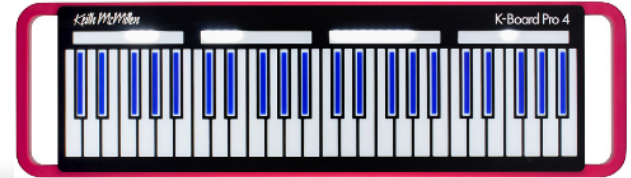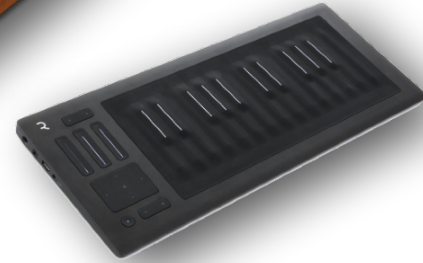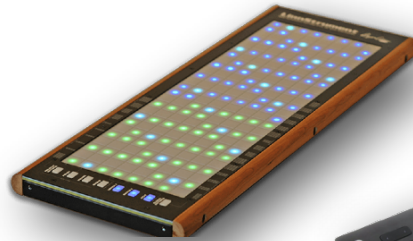
MPE + Modeled Synthesis
… **BIG DEAL**

- MPE makes a whole new generation of controllers possible. **Whatever instrument makers dream up!**

- MPE offers an expressive performance mechanism for parameterized synthesis methods. Physical Modeling, Virtual Analog, FM, … others

- **Together, whole is greater than the sum of the parts!**

Some MPE Controllers

- LinnStrument

- Seaboard

- GeoShred

- KMI K-Board Pro 4

- Haken Continuum

- Artiphon INSTRUMENT 1

- Sensel Morph

- Joué
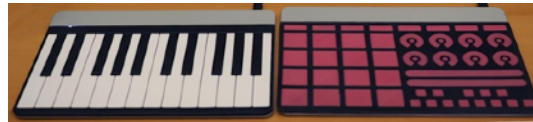
Some MPE Modeled Synths

- GeoShred

- SWAM

- Animoog
  Model-D
  Model 15

- [Roger Linn's list of MPE sound sources](#)

- [Roli's List of MPE Products](#)

Demos

MPE Control of Physical Models

Ok Instrument Creators, here's what ya gotta do!

- Decide if you want to support Channel-Per-Note (MIDI Mode 3, Aka Poly) or Channel-Per-Row (MIDI Mode 4, AKA Mono).

- Program your instrument to send the MCM, MPE Configuration Message with RPN6. The MCM will identify the Manager Channel (usually 1) and the number of Member Channels (usually 15).

- Program your instrument to send Pitch Bend Sensitivity with RPN0. The default Pitch Bend Sensitivity for MPE receivers is +/- 48

- The default MIDI Mode for MPE receivers is Channel-Per-Note (MIDI Mode 3). If you implement Channel-Per-Row (MIDI Mode 4), you will need to send MIDI Mode messages to configure the receiver for MIDI Mode 4.

- Send MIDI Channel Voice Messages, NoteOn, NoteOff on individual channels.

- Send (x|y|z) expression using Pitch Wheel Change, Channel Pressure and CC#74 on individual Channels.   You may need to send reset values for these before the Note On to clear the channel.

The MCM

[REGISTERED PARAMETER NUMBER]

CC#101	CC#100	Function
(MSB)	(LSB)	

===

| 00 | 06 | MPE Configuration RPN |

Message Format: `[0xBn 0x65 0x00] [0xBn 0x64 0x06] [0xBn 0x06 <mm>]`

Where n = MIDI Channel Number:

`n=0x0:` Lower Zone Manager Channel

`n=0xF:` Upper Zone Manager Channel

All other values are invalid and should be ignored.

And *mm* = Number of Member MIDI Channels in the Zone:

`mm=0x0:` MPE is Off (No Channels)

`mm=0x1 to 0xF:` Assigns that number of MIDI Channels to the Zone (see below)

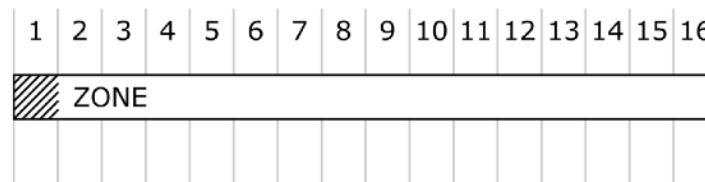`[0xB0 0x65 0x00] [0xB0 0x64 0x06] [0xB0 0x06 0x0F]`

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

ZONE

Figure 1 Single Lower MPE Zone

MPE in MIDI 2

- MCM is replaced with MPE MIDI-CI profile

- Profiles are receiver centric. The receiver will report back the range of channels that it can support and the sender will adapt.

- Zones are gone and are handled by enabling multiple profiles.

- A profile can use any base channel as the Manager Channel, not just 1, 16.

- Will work with legacy MIDI 1.0 or MIDI 2, Profiles, CI, UMP.

- 6 additional high resolution dimensions of expression per note.

- MIDI Modes 3/4 are now called Polyphonic Channel Response and Monophonic Channel Response and are determined by the current program on the receiver, NOT the receiver and NOT the sender.

Now That You Know How Simple MPE is ... Make Some New Expressive Instruments!

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PAOLO PUGGIONI
CONCEPT ART & ILLUSTRATION

Questions?

You can reach me at
gps@ccrma.stanford.edu or
gps@moforte.com