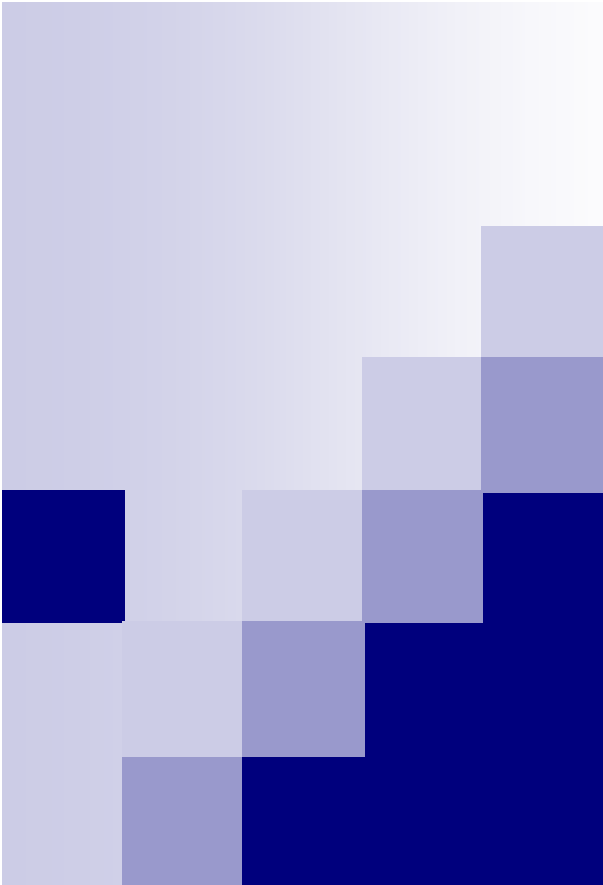




Multitimbral Sound Module

Valerie Gordeski

Susan Hwang

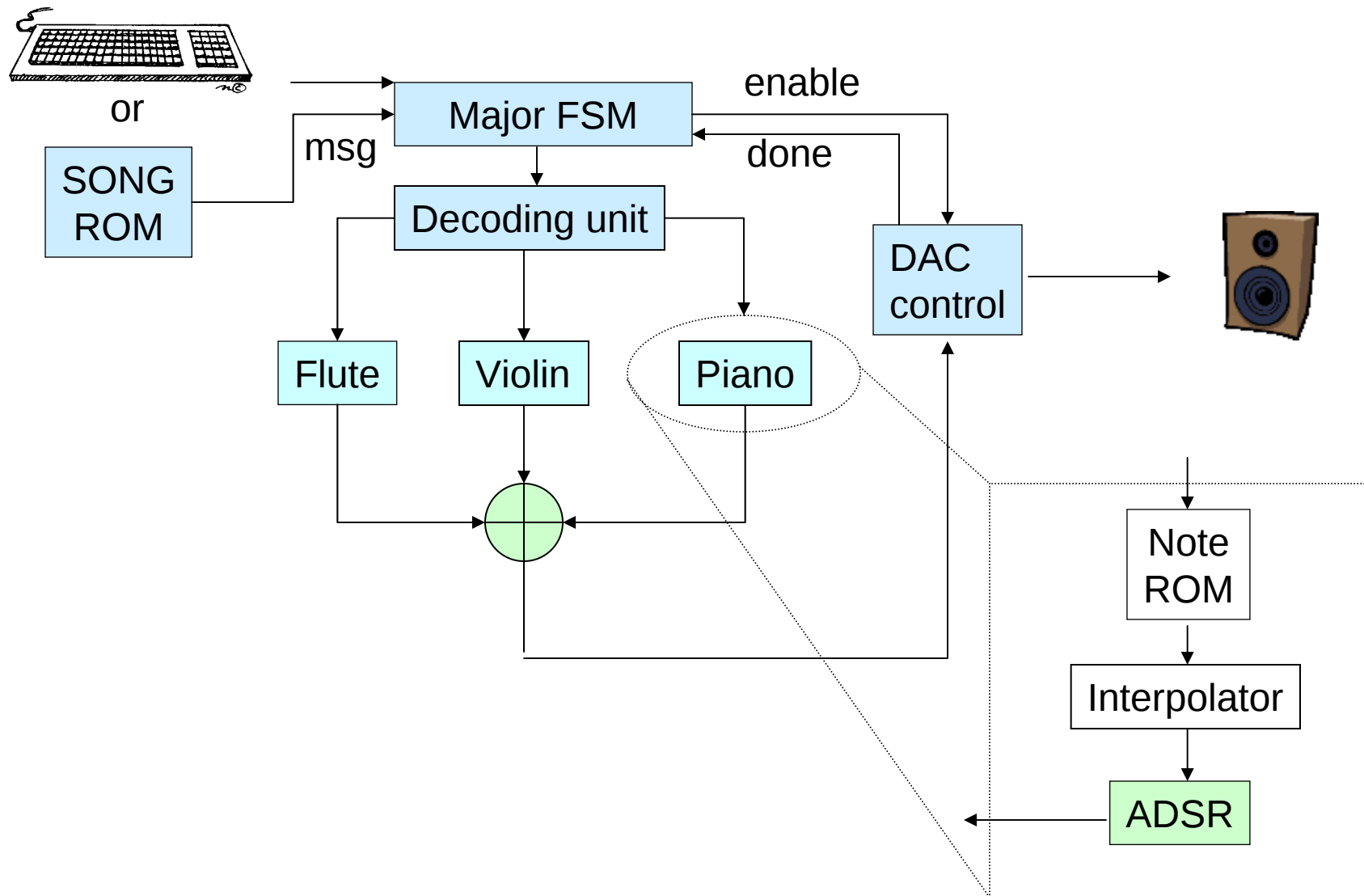
Christopher Sheehan



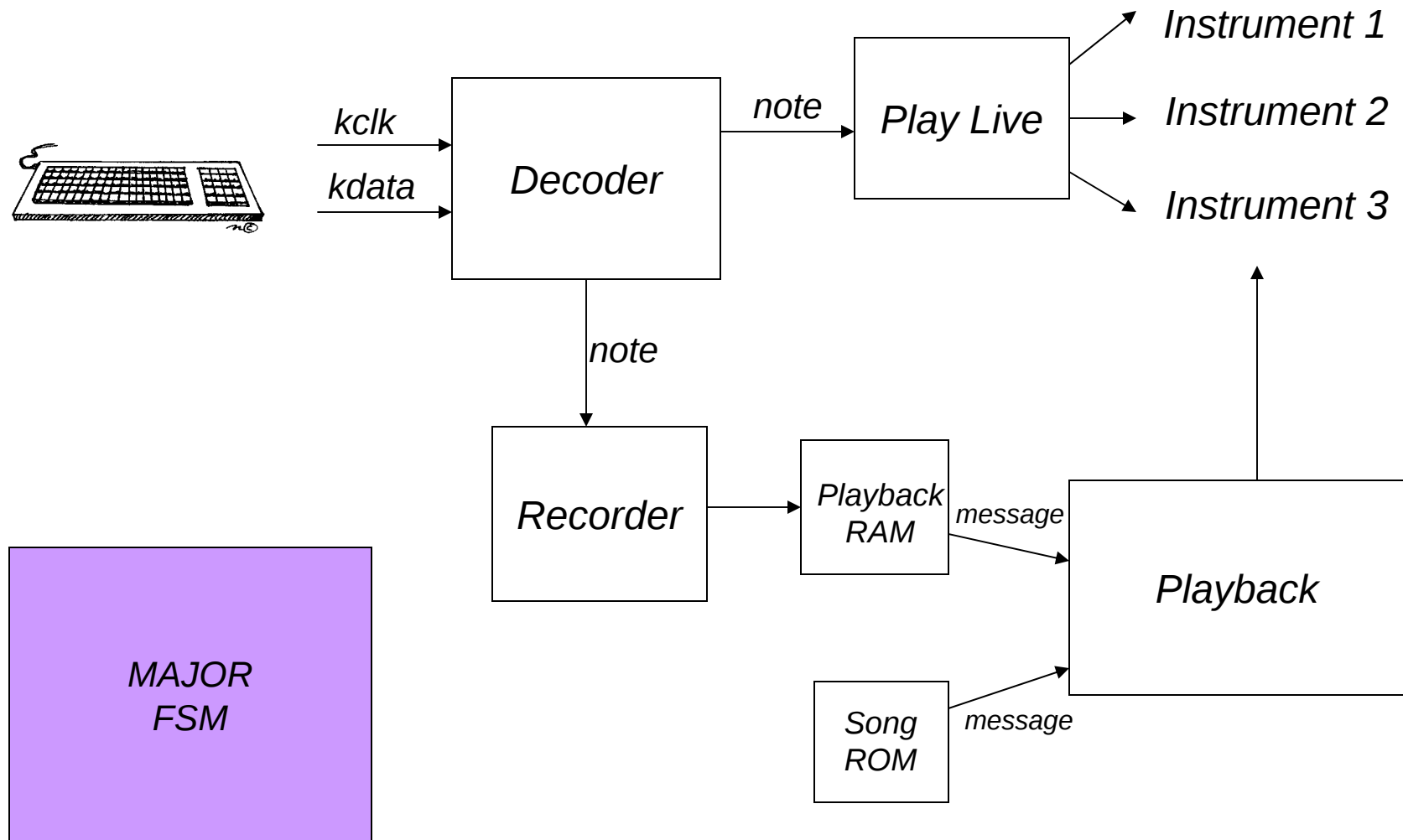
What is it?

- Reads a song from ROM or keyboard for live play or later playback
- Interpolates stored note samples to obtain the correct pitch
- Shapes the pitch to imitate the sounds of a piano, violin and a flute
- Plays a magnificent trio (Bach? Mozart?)

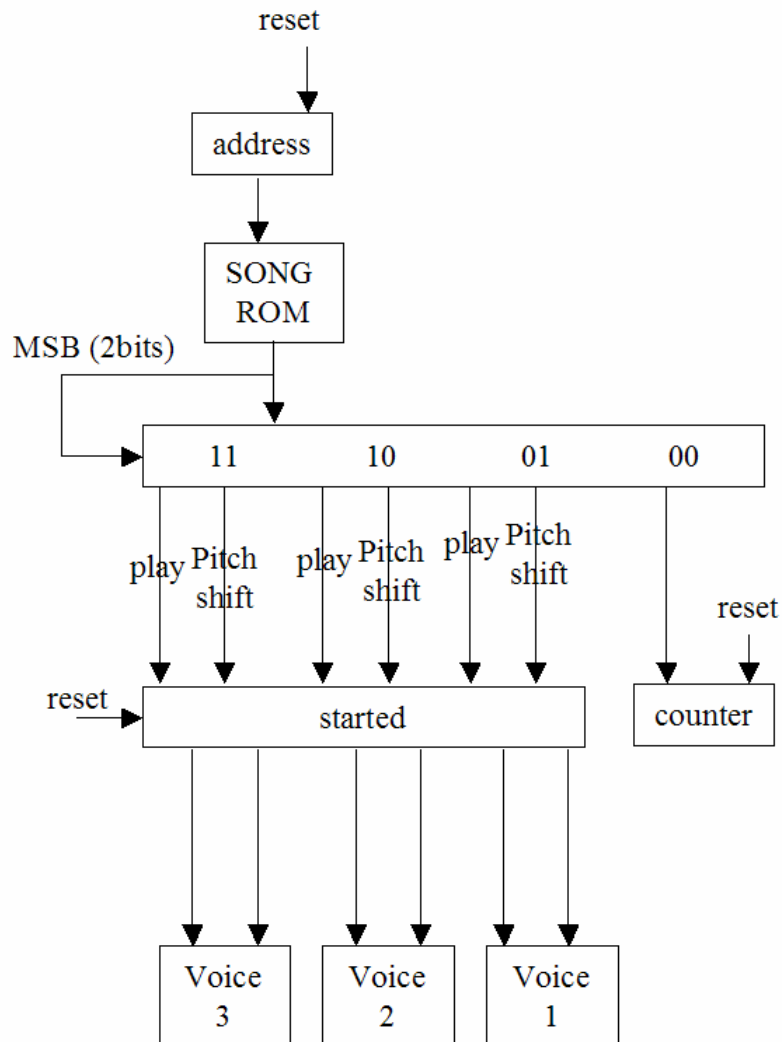
The Block Diagram



Frontend Block Diagram



Encoding



Message Encoding

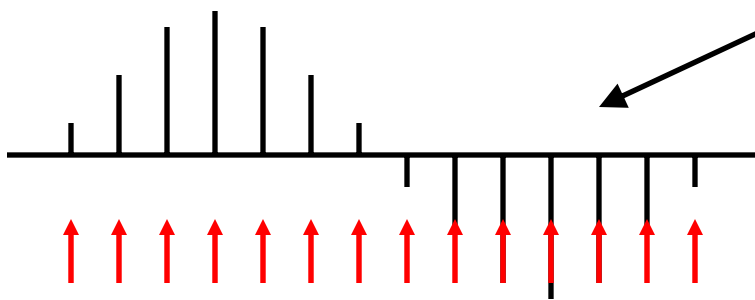
MSB (2)	00	01	10	11
Type	Pass	Voice 1	Voice 2	Voice 3

Note Encoding

Type/ Instrument(2)	Note On/OFF(1)	Pitch Value (5bits)
01 (voice 1)	1 (on)	0 (lower C)
01	0 (off)	Nothing (ignored)
00 (pass)	Time value (6 bits)	

Sound Generation

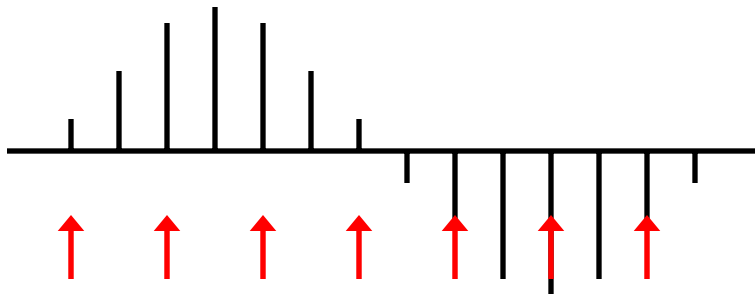
A = 440Hz



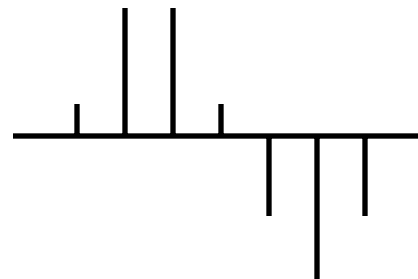
Sampled Waveform in ROM

Constant sampling rate,
Variable Pointer

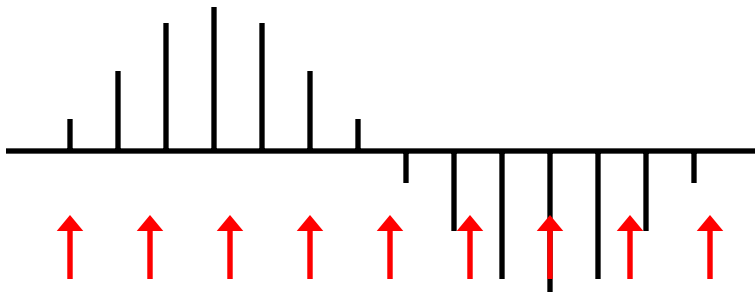
Generate an "A" one octave higher



A = 880Hz



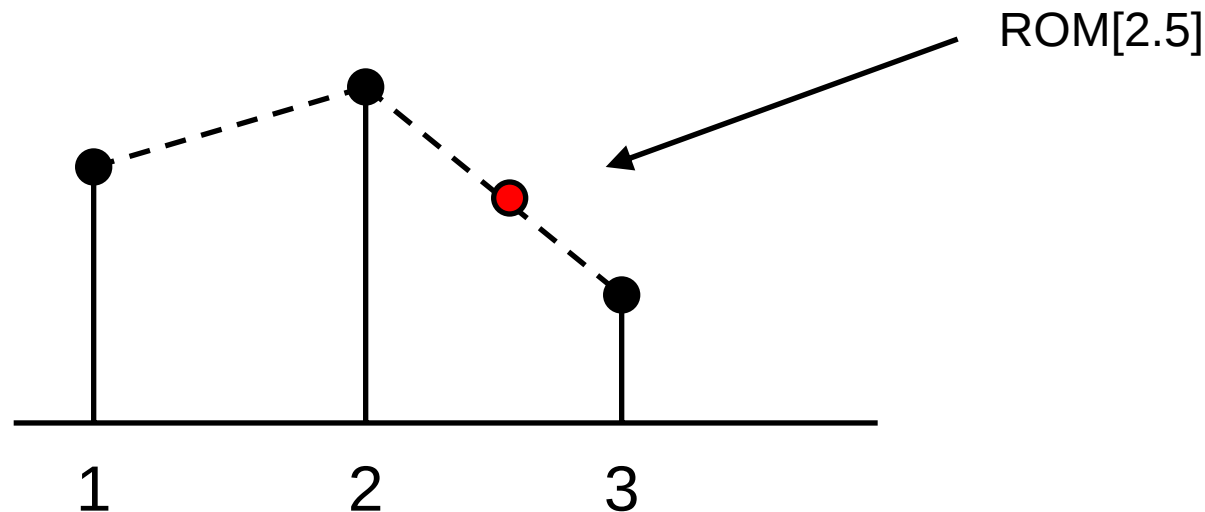
Generate a higher "E"



E = 659Hz

?

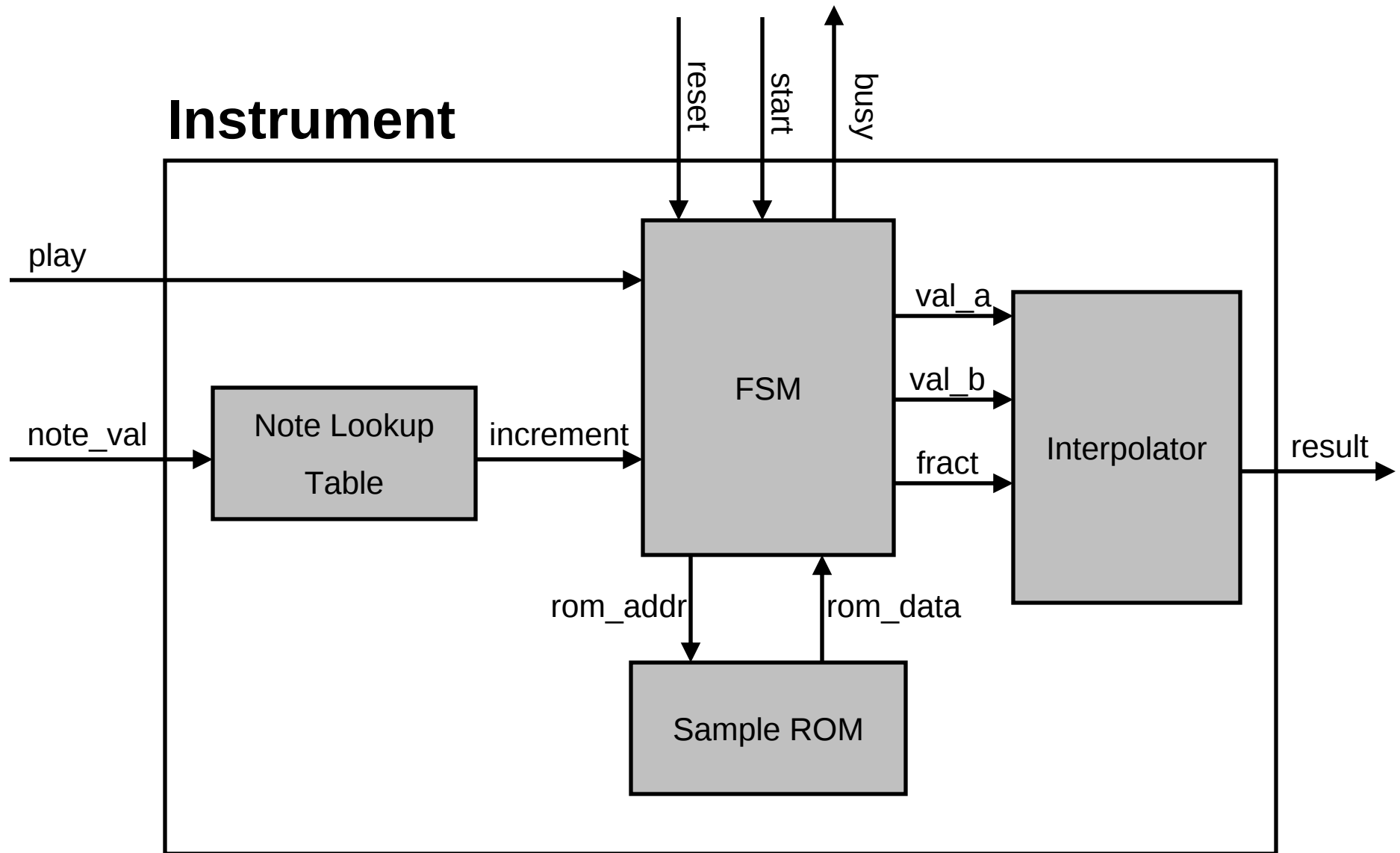
Linear Interpolation



$$ROM[K + F] = (1 - F)ROM[K] + (F)ROM[K + 1]$$

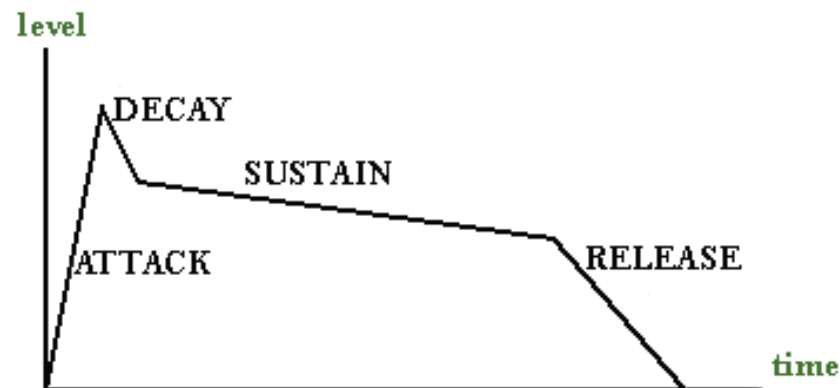
$$ROM[2 + 0.5] = (1 - 0.5)ROM[2] + (0.5)ROM[2 + 1]$$

Interpolation: Block Diagram

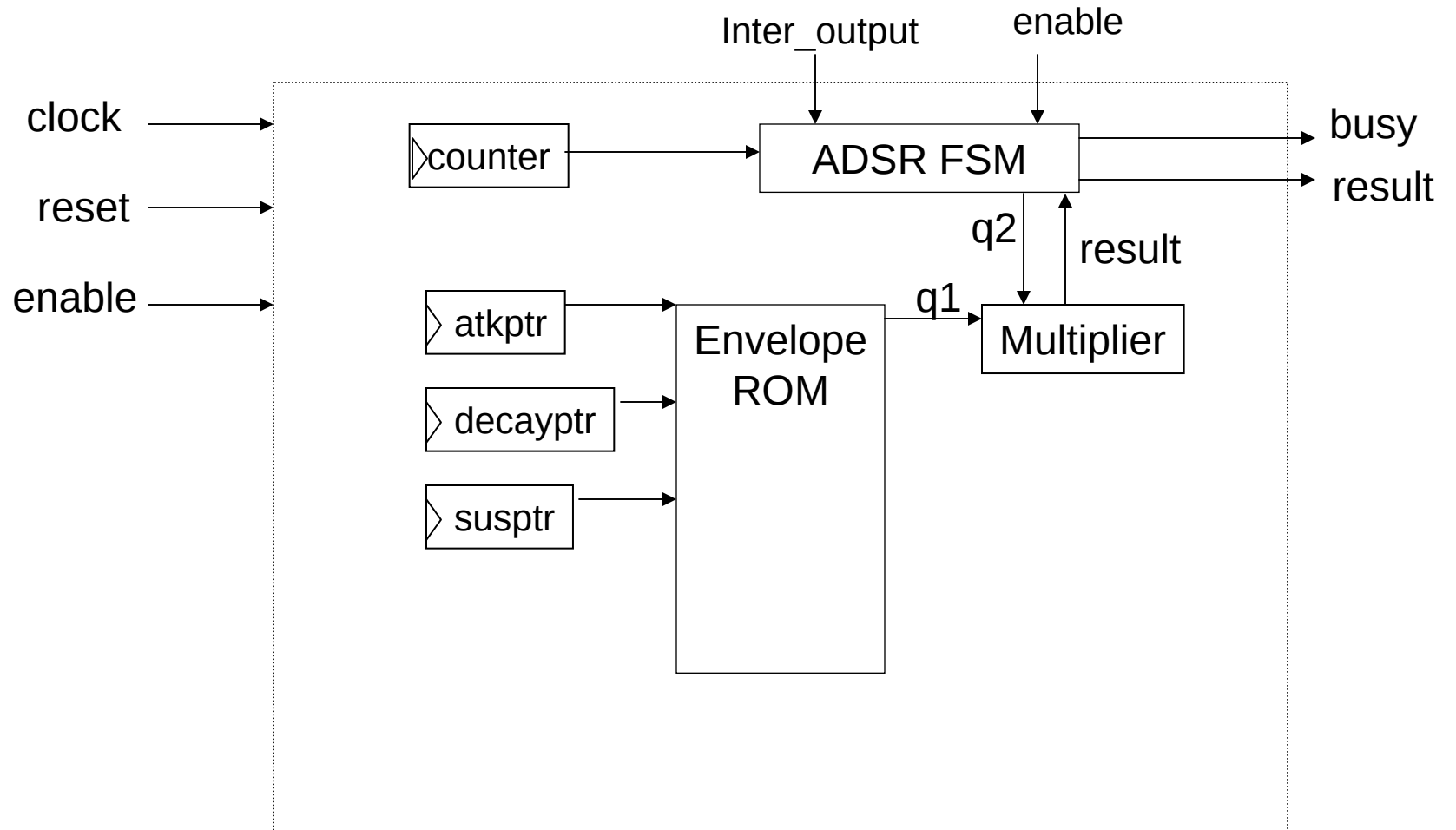


ADSR: An Overview

- Determines what “instrument” we hear
- Typical Envelope:



ADSR: The Diagram





Future Extensions

- Real MIDI keyboard input
- Expand number of instruments to full ensemble, including percussion (gated noise)
- Secure Digital card for extended music
- Dynamic shaping of the note depending on the input: staccato (fast attack versus slow attack), vibrato, trills etc.