This page is to describe the operation of the MB808 Sequencer application. It is a work in progress, comments are welcome and usually appreciated :)

Forum Thread: http://www.midibox.org/forum/index.php?topic=7391.0

This document is split into 3 sections:

- Application Summary
- Operation Manual
- Technical details

Application Summary

The first thing to understand is that this application is not meant to be part of a modular system or even a standalone box, it's origins are a simple adaptation of the MBSEQ v2.4 application to mimic to functionality of the original 808's digital section. As such the primary task for this application is to provide 13 tracks to cover the 12 instruments + accent data and to create the proper pulse signals for the inputs of the instruments. However, MBSEQ v2.4 is a very deep application and it would be a shame to ignore many of the features it has so the primary task is to create an interface using the available buttons and encoders that can access as many menu functions as possible, without making the whole thing obscure.

Theory of operation

The MB808 application will essentially be unchanged from the SEQ v2.4 application. The changes that will be made reguard the interface, specifically the LCD screen and encoders will not be present. At this time I also think it is best to use TK's drummode for the operation of the sequencer. Although this prevents each step from having it's own flam value, what we gain is much more than what we loose. Firstly using drum mode gives us 12 instrument tracks + accent all in one pattern as opposed to reworking the handling of the pattern sets to allow the use of 12 complete tracks, this keeps things compatible with the base application and hopefully with the upcoming SEQv3 application :) Using drum mode also allows us to use the morph feature, but in a way that mimics the original 808. Each pattern can be linked to the same pattern in the lowercase bank switched between like with the "A+B" toggle switch on the original, my favorite feature. This will take a bit of trickery in code to keep things compatible, so it may not be implemented in the first version. The second big advantage I realized this morning while thinking about the Pro-1. It's sequencer was absolutely minimal, you just switched into edit mode and entered notes until the phrase was entered. No rests. The Pro-1 would then play it back, automatically looping it. I realized that with the extra tracks avaiable and using the arrpegiate mode along with the step edit mode the mb808 could also sequence basslines and trigger arrpegios! This is very cool!

Description of the interface

There are 35 elements to the MB808 interface. They are:

- 16 GP buttons
- 4 Menu buttons (m1 m4)

- 4 Mode buttons (Song, Pattern, Mute, Edit)
- 5 Transport controls (Play, Stop, Fwd, Rwd, Loop)
- 2 Control buttons (Select, Exit)
- Instrument Encoder
- Tempo encoder
- Swing/Morph pot
- Datawheel

Operation Manual

NOTE: this is still a hypothetical interface. The changes reguarding V3 are not represented here and this is really just to show how the F buttons can be used as menu buttons to reduce dependancy on an LCD screen.

Modes of operation

The MB808 application has 5 different modes that it can operate in, they are:

- Song Play
- Song Edit
- Pattern Play
- Pattern Edit
- Mute

In each mode the 16 GP buttons have a different function and each mode has it's own set of menus accessed with the menu buttons. The operation of the 16 GP's for each mode and menu are described below

Pattern Play																									
GP#	GP1 (GP2 G		SP3	23 GP4		GP	5 GP6	GP7	G	P8	GPS	9	GP	10 0	GP11	(GP12	G	P13	GP14		GP15	GP16
Default	Bank 1		3ank 2 3		Bank B	Ban	nk 4 Ba 5		nk Bank 6	Banl 7	: Bank 8		Patter		n Pa 2	ttern F	Patte 3	ttern Patter 4		n P 5	atterr	n Patte 6	rn	Pattern 7	Pattern 8
F2	Forward		Backward Pin		Ping Pong	Random		BPI / 1	M BPM / 2	BPM / 4	M BPM / 8		BPN 16	BPM / 16		M / E	BPM / 64		ļ						
Patterr Edit	ttern it																								
GP#	GP1		GP2		GP3	SP3 GP			GP5	GP6	GP	7 סי	GP8	P8 (GP10	GP1	.1 (GP12 GF		13	GP14	G	GP15	GP16
Defaul	ılt Step 1		Step 2		Ster 3	^{•p} Step ·		1	Step 5	Step 6	Ste 7	itep Ste 7 8		Step 9		Step 10	Ste 11	о (Step Ste 12 13		p	Step 14	S 1	itep .5	Step 16
F1	BD		SD		LT/L			С	HT/HC	СР	MA		RS/CL		СВ	CY	ОН		СН	Co 1	ntrol	Control 2		Control B	Control 4
F2	Forward		Backward		Ping Pon	ng Rand		om	BPM / 1	BPM / 2	BP / 4	PM E	BPM B	/ E /	3PM 16	BPM / 32	BPN / 64	1							
Song Play																									
GP#	GP1	P1 GP2		GP3		GP4 GP5			GP6	GP7	(GP8		GPS)	GP10	GP11		GP12		GP13	GP14	1	GP15	GP16
Default	Song 1	ong 1 Son		ig 2 Song 3		Song 4 Song		5	Song 6	ig 6 Song		Song	g 8 Sor		g 9	Song 10	Song 11		Song 12		Song 13	Song 14	J	Song 15	Song 16
F1	Position Po 1 2		sition Positio		n Pos 4	Position Po 4 5		ion	Position 6	Positior 7		Posit 8	tion Pos 9		ition	Positio 10	ion Posit 11		n Position 12		Positio 13	on Posit 14	ion	Position 15	Position 16

Song Edit																						
GP#	P# GP1		GP2	GP3	GP4	G	GP5		5 G	P7	GP8	G	P9	GP	10	GP1	1 GP1	.2	GP13	GP14	GP15	GP16
Default	afault Bank 1		Bank 2	Bank 3 Bank 4		4 Ba	Bank 5		Bank 6 B		Bank 8	3 Pa 1	Pattern 1		tterr	Patt 3	ern Pati 4	rn Pattern 4		rn Patter 6	n Patterr 7	Pattern 8
F1	Position 1		osition	Position 3	Positic 4	sition Posit 5		n Position 6		osition	ition Positio 8		1 Position 9		Position I 10		tion Pos 12	Position 12		on Positio 14	on Positio 15	Position 16
F2	-2 Part 1		Part 2	Part 3	Part 4	Pa	Part 5		t6P	art 7	Part 8									_		
Mute Play	/ute /lay																					
GP#	P# GP1		GP2	GP3	GP3 GP4		GP5		6 G	P7	GP8	GP	9	GP1	0 0	GP11	GP12	GF	°13	GP14	GP15	GP16
Defau	efault BD		SD	LT/LC	с мт/мс		HT/HC		М	A	RS/CL	СВ		CY	C	ЭН	СН	Control 1		Control 2	Control 3	Control 4
F1	1 Group 1		Group 2	Group 3	Group Group 3 4		Group 5		oup G 7	roup	Group 8	Gr 9	oup	Gro 10	up Group 11		Group 12	0 Gr 13	oup	Group 14	Group 15	Group 16
Global Functions																						
GP#	P# GP:		GP2	GP3	GP4	P4 GP5		P6 GP		GP8	GP9		GP10		GP1	1	GP12	GP	13	GP14	GP15	GP16
F3	Bar 1		Bank Banl 2 3		Bank 4	ank Bank B 5 6		ink Banl 7		Bank 8	Patte	ern	Patt 2	ern	Pattern I 3		Patterr 4	Pattern 5		Pattern 6	Pattern 7	Pattern 8
F4	F4 Nex bar		t Next quar	Next Next quart. 8th		16t	6th Cle		Clear Track	Copy Trac	/ Copy k Patt	/	Past		Sav	'e	MIDI	Sy	sEx			
Button		Loop			Fwd					Rwd				opl	Play	Тар	<u>ו</u> כ		Select	Dataw	heel	
Pattern Play		Set loop points		oints	Next M		etaBank		Pre	v Met	MetaBa		St	op	Play	Тар		Ins.	Select			
Pattern Edit		Set loop points			Ne	xt Ba	ar		Pre	v Bar	•		Ste	op	Play	lay Auditi		Ins	Select	Meter		
Song Play		latch loop			Ne	xt Pc	DS.		Pre	Prev Pos				Stop Pla		Тар		lns.	Select			
Song Edit		Jump point			Ne	xt M	eta	Banl	Pre	Prev MetaBank					Play	Тар		Ins.	Select			

Technical Details

There are 3 main components to this modification:

- The sequencer needs to output 1ms active high pulses to the gate inputs of the 12 instruments and a 1ms active low pulse to the common trig circuitry which creates the accent signal.
- The interface needs to be modified so that the LCD and datawheel are not neccessary
- Special functions need to be added to the application to steamline operation

Connecting with the analog circuits

The 808's instruments are all comprised of a combination of twin-t oscillators, a noise source and simple envelopes. Both the twin-t and the envelope take a breif pulse of varying amplitude to trigger and set the amplitude and each of the 808's instruments have a AND gate made up of 2 transistors to interface with the digital controller. These AND gates have inputs for 2 signals, called common trig and instrument data. Each instrument has it's own data line but there is only one common trig which is shared by all instruments. The common trig signal is active high for 1ms in synchronization with the master clock. Each instrument data signal is a 5v active high 1ms pulse which is only present when that instrument should be triggered. The AND gate insures that both signals are present before sounding an instrument. Creating the instrument data signal is easy using MB hardware, a DOUT pin does the job nicely. Altering the code to flash a DOUT pin on a note event is fairly simple as well. The common trig signal is a little more complicated. The accent data, which is a voltage between 5v and 15v is also represented in the common trig signal. As such it is the pulse present on the common trig

input that triggers the instrument while the instrument data signal insures the instrument is only triggered at the rigt step. Luckily the accent signal only needs two states, on and off, where off is always 5v and on is a higher voltage determined by a potentiometer. Now, this could be solved by using a logiv switch like the 4016 or 4066, using a DOUT pin to toggle between connecting the common trig line to 5v or the wiper of the accent pot. However, looking over the schematics I've found an even simpler way that only needs a couple transistors. The concept is simple, we still use a pot connected as a voltage divider between the 5v and 15v rails to get our accent voltage but a simple transistor can be used to shunt the voltage of the wiper to the 5v rail when it is turned on. If we invert the common trig signal in code so that it is active low we only need the single transistor;)

Now, in the original, the common trig pulsed on every clock tick. This isn't neccessary, instead the common trig line will only be pulsed when a note on occurs.

Modifying the interface

In order to get the most out of the SEQ application without using a datawheel or an LCD and without risking becoming incompatible with future versions I decided it was best to use the 4 function buttons as menu buttons to modify the action of the general purpose buttons. In order to do this I need to modify the code in each of the f buttons handlers. These can be found starting on line 681 of seq_buttons.inc. First I cleared out the code that was in there. Now, the simplest way to do this is to set a bit representing when one of the menu buttons is pressed. Since I want them all ro be momentary I can then simply clear the bit when the button is released.

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