



Generative Belly Metal by Khepri (version 0.46)

Technical Notes:

- Open Generative Belly Metal through the ' Khepri Generative Belly Metal v0.46.exe' file.
- The patch's stability varies depending on the computer used. Generally, less programs running and a more powerful computer will run the patch more consistently.
- Lack of stability will be noticeable through sound files / instruments 'dropping out' (not playing for 2 seconds) or instruments playing out of sync with each other.
- Changing an instrument in its drop down menu whilst the patch is generating music will cause that instrument to possibly play 2 sound files at once and / or drop out. The instrument will resolve itself within a one or two generations and the chosen option will continue to play as desired.
- With the sound files it currently has imbedded within, Generative Belly Metal currently requires 421 MB hard drive space.

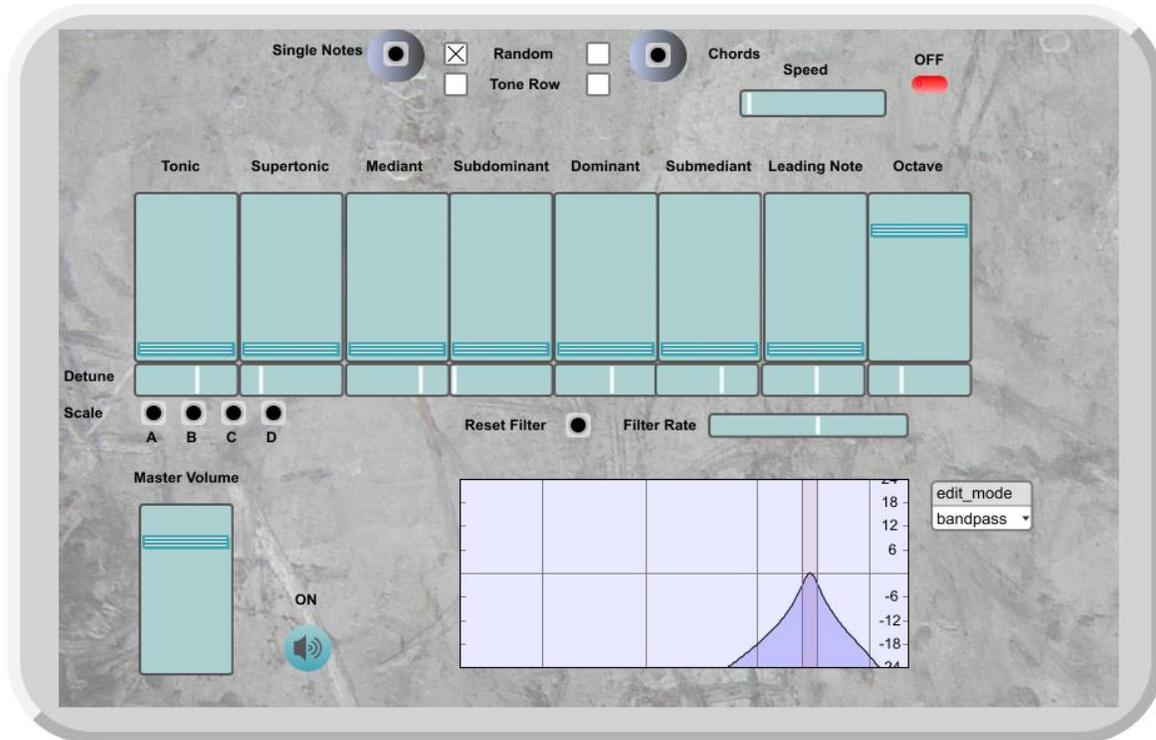
User Interface Notes:

- The orbs in the centre of the screen will be colour coded to show which 'Style' each instrument is performing.
- The blue triangles will show which sound file is being played from the designated 'Style'. Where if the top left is highlighted then it is file #1, the top right is #2 and the bottom right is #6 for percussive instruments and harmony and #14 for rhythm and lead instruments.
- With the amount of possibilities it possesses, you will never hear the same combinations of music in the same sequence. The music will develop and change over time, all you have to do is sit back and listen.

To read more about the creation and ongoing development of this Max / MSP patch then continue reading.

Original Patch and Experimentation:

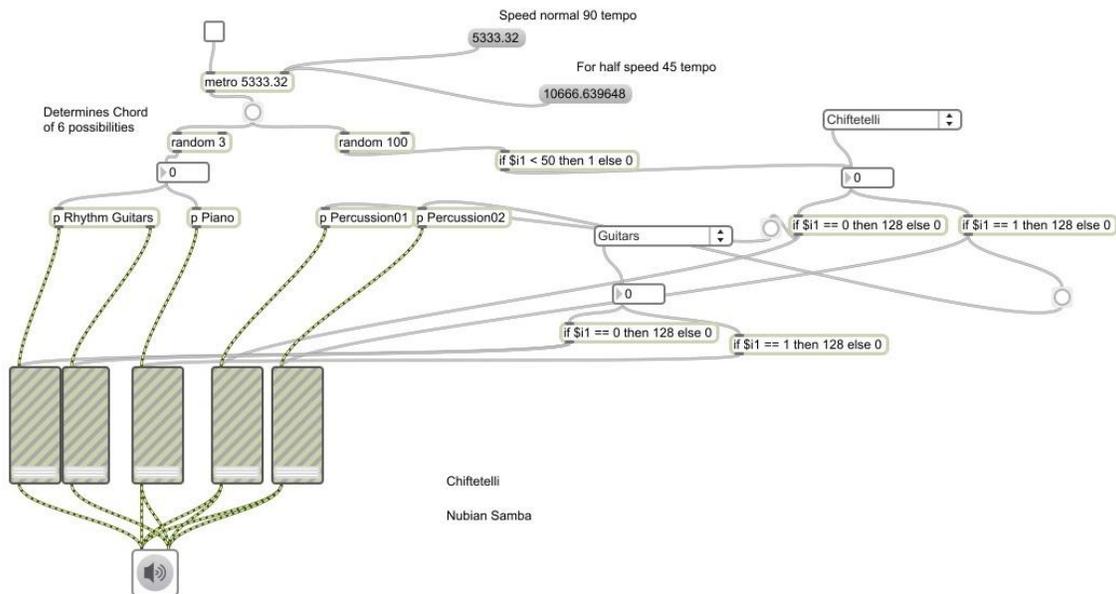
I initially began a simple Max patch that would allow me to experiment with generative music. It involved generating completely random tones and / or chords which could be shifted either as a scale or individual tones. The tempo could be altered and a filter initiated after a set amount of notes being generated, to create some basic sense of depth and change over time. The end product looked as follows:



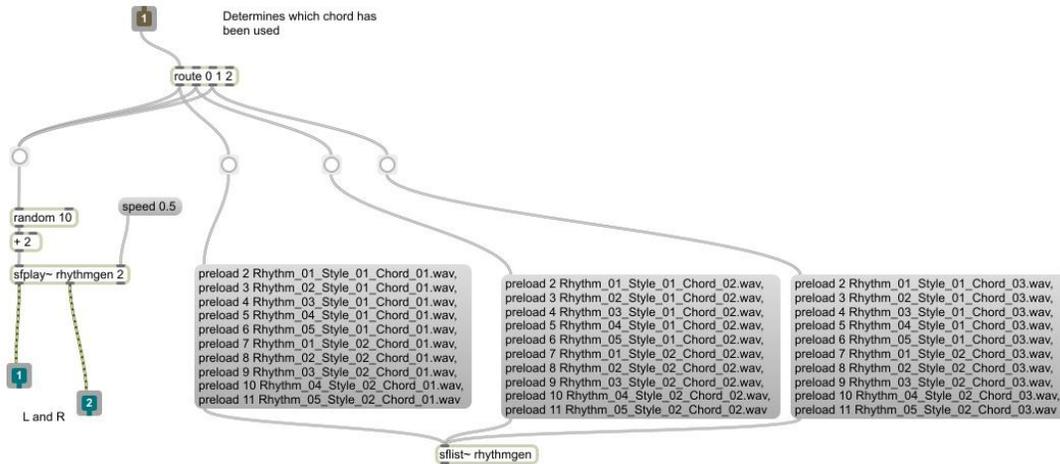
It was very simple but provided me with a starting point to develop my Max skills and ideas.

Working Towards the Current Patch:

I began constructing ideas for an essentially simple structure involving chord progressions to randomly generate engaging and complex music, rooted in tonality. I proceeded by testing a random number generator in Max to provide a chord in which all instruments could play something random yet pertaining to the necessary notes. It would continue to generate a random number through the use of 'metro'.



As demonstrated above in its rough form using a simple 'random' object to generate chords. Sub patches for each instrument would register which chord is currently active and play a random yet appropriate file for that instrument.



To make the music sound more structured, the audio files I had used were exactly the same in relation to rhythm, melody and so forth, the only difference being that the files of each list have been transposed to the correct places in a different chord.

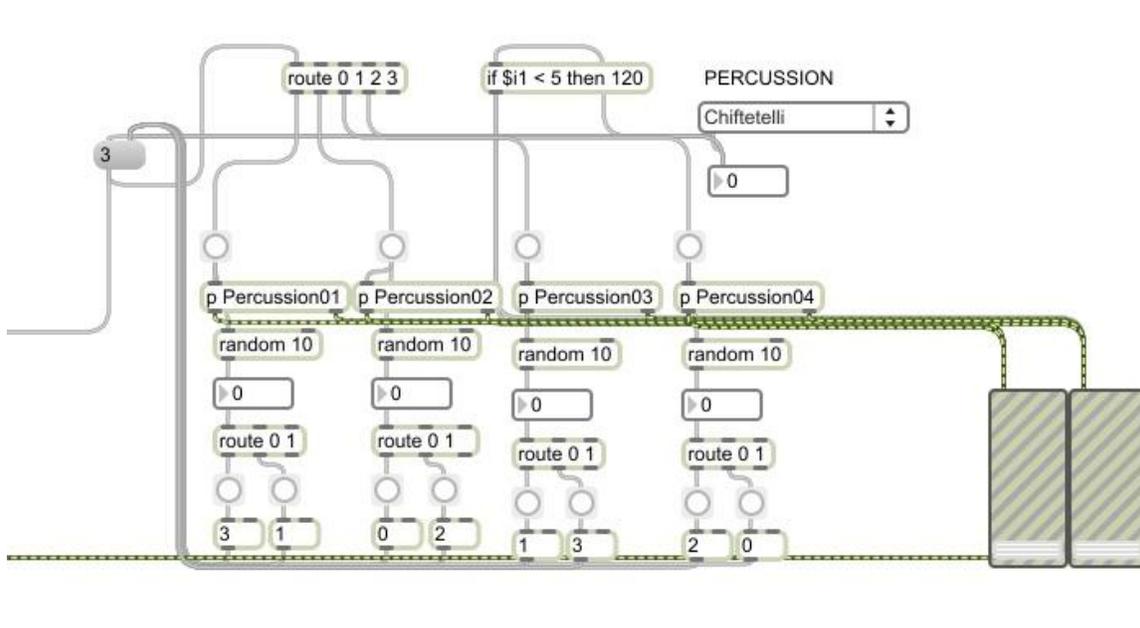
Unfortunately this idea was cut short as half way through the bar, it would become apparent that the old chord was being held on, or in some instances that a wrong one had been generated. Half way through the bar, before the next random chord was generated, the audio files would switch to use a list from a different chord set (which appeared to be the correct one). By doing this and switching between chords in the middle of a bar created much dissonance particularly within melodies.

With much struggling on this issue I had decided to develop a new idea for the structure of the patch. Something equally simple in theory yet able to create a sense of complexity and was easy to build upon.

Development of the Current Patch:

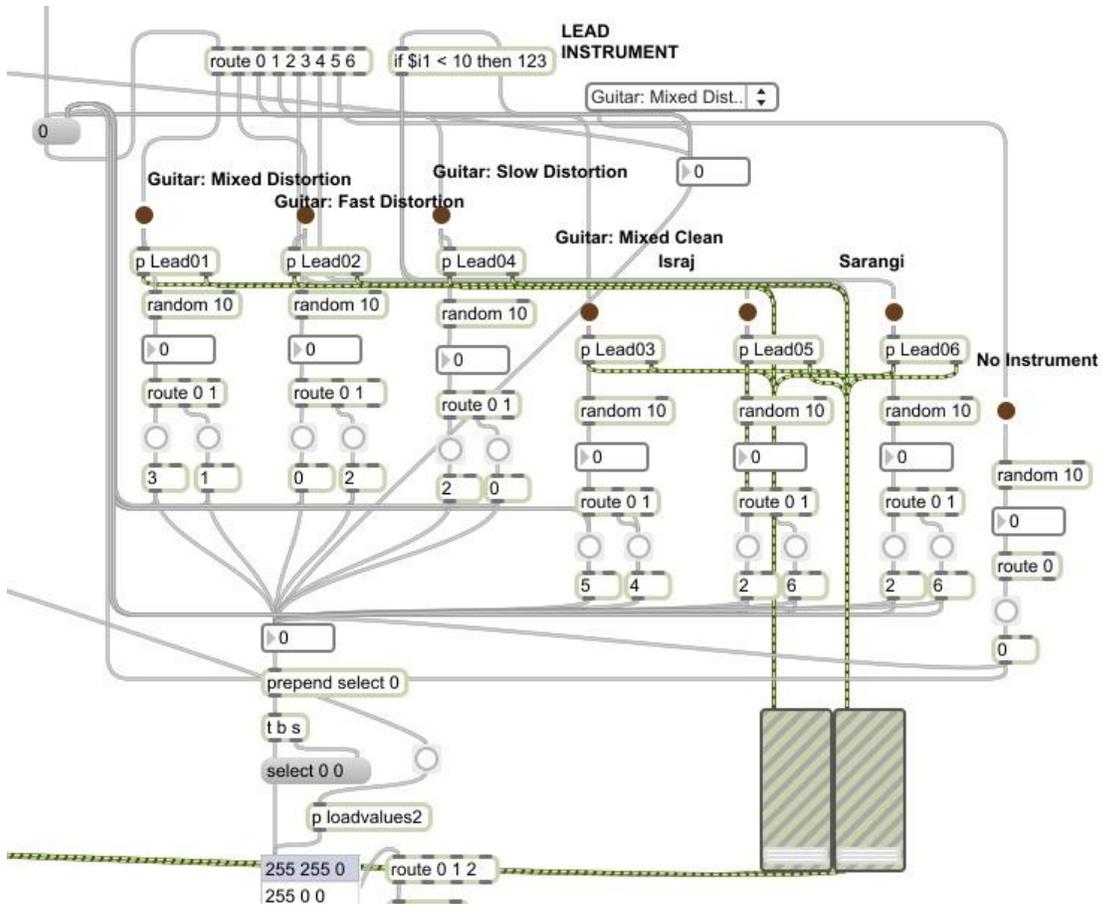
Initially I was considering the use of Conway's Game of Life cellular automaton. Having been used previously, namely Grant Muller's Game of Life Music Sequencer, I thought this would be a great option. However I struggled to find a unique way to incorporate it with the ideas I already had been experimenting with; it would be a shame to scrap my current progress. It was also limiting seeing it in use as to how I wanted to approach and where I wanted my generative composition to fit; it would not allow a genuine musical aesthetic matching that of a song. Also for good or bad, numerous people have and are using it for their own ends.

Thus I finally settled with a new and original structure, involving what can be perceived as squares. Where counting clockwise from the top left, each corner of a square is numbered 1 to 4. Each 'generation' of music lasts 2 bars at a tempo of 70 (approximately 5 seconds). If starting at corner 1, after a generation there is a 10% possibility to go to each adjacent corner; resulting in a 20% overall change rate and a 80% preference to its current corner. In this system, corner 1 can become 2 or 4. While corner 2 can become 1 or 3 and so forth. Each number pertains to a different set of musical sounds within the same style (where styles can change through multiple squares linked together).



To add depth with this I used corner 3, for instance in the rhythm instrument to represent corner 1 of a new square. As 3 cannot be instantly reached from number 1, this gives time for the random process to lurk in each square potentially longer periods of time. Negating the possibility of perpetually hopping from one style to the next in quick succession.

As each new square within rhythm and lead instruments represent different instrumentation; thus without wanting to sound too random, I built the structure in this way so that it would move more gracefully through the musical possibilities. One of the new squares reached by an eventual corner 3 in the lead instrument is simply silence, which leads back to the initial square. This was to demonstrate other possibilities of the structure as well as allow a greater appreciation of the non-lead instruments.



As I began to record music for this project with the new structure, I realised that it worked extremely well and offered more complexity and possibilities than my original unrefined plan. Simply replacing the sound files for other instruments would provide a generative tool for other genres of music. Additionally someone could use the square template and create something new, perhaps adapting the squares into larger shapes with a greater set of corners. Thus in this sense my generative Max patch is both a composition and potential tool for others; particularly if they were willing to customise the patch to their own ends.

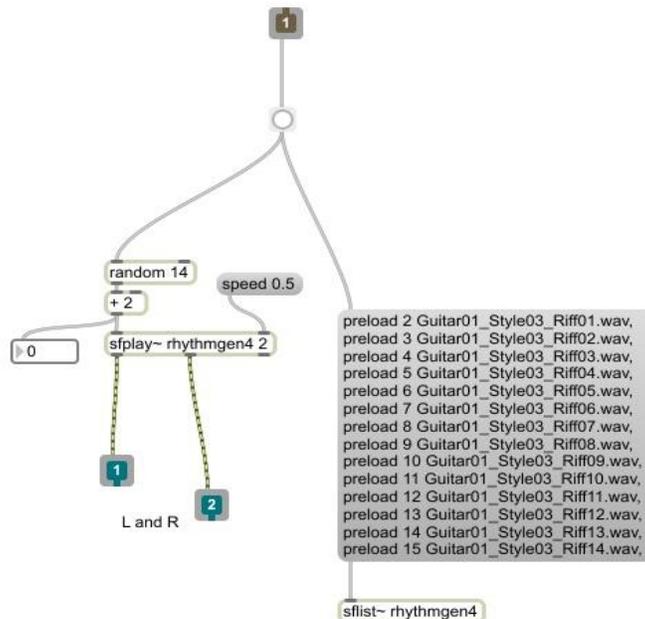
Discarded Ideas:

There were inevitably several ideas which I dismissed, some I did so through experimentation and purposefully removed them or discontinued the idea, others as I had not yet had the opportunity to explore them fully. Two important examples that reflect this are as follows:

Variable Tempo:

The first of these ideas was alterations to the tempo of the music. I had tried to implement this idea with the original early patch versions as shown in the first pictures above (patch version 12). Near the top you will note the 'message' box showing the reduce the speed to half.

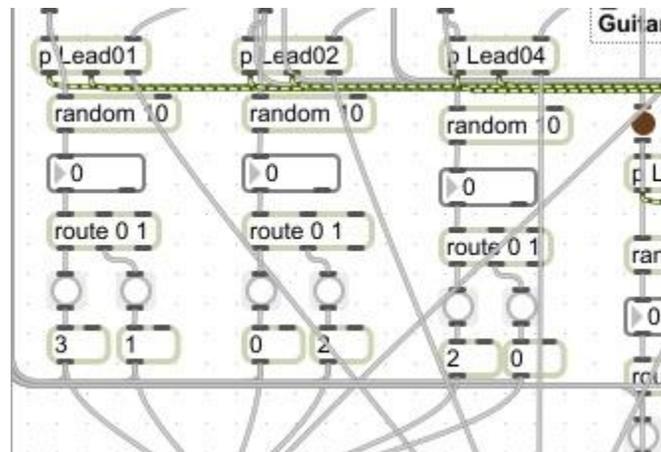
I had plans that the user could change the speed, either through a slider bar, message boxes or even to enter their own number. However it proved more difficult than initially planned; not only does the metro need to change but also the audio file in each sub patch for each track playing:



As shown above, the speed of 'sfplay' needs to be altered on the right outlet. Whilst putting together an array of connections for this to take place the patch kept crashing each time I tried to change the tempo. With several minor alterations, similar problems ensued. Thus judging this potentially as a more novel feature than an integral one, I dismissed the possibilities of tempo changes within my final patch.

Variable 'Randomness' Rates:

As previously mentioned with styles for all instruments at a 20% change rate (10% one direction, 10% to the other) each 'generation'; I had thought about alterations to this. My initial plans were that there could be an overall slider that either increased or decreased these rates. With the highest being the inverse at 80% change rate (40% each direction). And possibly down to as low as 2% change rate.



This would essentially be a relatively time consuming but easy task. To change the 'random' to a much greater number and alter the 'route' to accept these great potential values.

I left this possibility until later, unsure of how bloated my patch could become with time as I came closer to completing it. In the end I never properly attempted to integrate this feature into the patch. I feel it's a great shame, in some ways it would make the generative music sound less cohesive (with change rates around 80%) but it as a user related function it would be interesting, useful although perhaps just little more than a novel idea.

However as an integrated generative process working independently alongside the 'metro', it would be more complex to set up, yet still highly feasible, possible and a much more purposeful idea.

The thought of how to represent it in the GUI and potentially having to alter the 'route' to be from 0 to 99 (if going as low as a 2% change rate) gave me visions of an extremely huge and possibly crash-prone end result. Admittedly implementing it on a smaller scale (able to alter the change rates from 20% up to 40%) would be the obvious step, yet due to the reasons specified and a lack of time, this feature never materialised and as such has been dismissed for now.

Influences From Other Projects:

My patch is all my own original work but has many notable influences from my various generative music research. From an approach in terms of the overall idea and structure to specifics, I have been inspired in a variety of ways:

It's Gonna Rain (Steve Reich): Creative and procedural generative influences. Whereby the composer has creative input, albeit minimal where the dominant factor of the composition is its own procedural lifecycle.

Game of Life Music Sequencer (Based on Conway's Game of Life): Square / numerical system that founds the basis of my patch is was created from the theme of cells interacting with other cells next to them. Where certain cells can influence others in a manner of ways. I achieved this through change rates, certain corner numbers unable to interact with others and certain ones pushing into a new set of values (into a new style, magic corner number 3)

Random Synth Tone Generator (Goozak): Original tone based prototype experimentation with generative music drew heavily from the end result of how this sounds. A random string of tones set in a changeable scale.

Generate a Composition (Wolfram Tones): The step from my prototype to the more professional sounding final audio Max patch was influenced by this web based generative music. In the same vain, by being able to alter sound files for my patch, it can be used to alter the genre. Also influences appear in the ability to see and alter styles and instruments. However I had decided not to allow controls for individual instruments in the same manner.

Brian Eno's Sound Installations (I Dormienti, Lightness: Music for the Marble Palace, etc): Early in my research I came across various sound installations such as the two aforementioned by Brian Eno. These forms of generative music influenced me in an opposite manner to the previous in my list in that they actively inspired me to create quite

the opposite. A sound environment based generative project with the interaction taking place between the user and an application on a computer. As opposed to some form of installation. A computer being able to generative some form of traditional music appealed to me more than these interesting, each unique, yet all quite un-traditional forms of music.

Black Metal Forever (Michael Sellam): Even though this is a sound installation, it influenced me in creating a contemporary yet not uncommon genre under which to record my music.