Giant Steps
for percussion trio & live electronics
Kier Hall
**Giant Steps**

Duration: c. 6 minutes

**Electronic Equipment Required**
Microphone, MIDI drum pad, Computer with Pure Data (vanilla) installed, Giant Steps electronic resource folder. Pure Data will require the following extensions: list-abs, maxlib, cyclone and freeverb.

**Preparation**
- Connect drum pad and microphone to Pure Data.
- Position microphone at percussion 1’s snare head.
- Load giantsteps.pd.
- Enable audio processing (DSP on) in PD.
- Set mic threshold on the main page of the patch.
- Press ‘Reset’ to move the trigger counter back to zero (the start of the piece).
- To run the patch from partway through, select one of the letters in the ‘Rehearsal Marks’ box.
Programme Note

Giant Steps, written for three human percussionists and three virtual percussionists, is based on the 1959 John Coltrane standard of the same name. Over six minutes, the human percussionists interact with the virtual percussionists and vice-versa, offering both notated and improvised interplay. Each virtual percussionist has twenty six percussion instruments, each tuned to a different pitch. Together with the human percussionists, they reassemble modes and chords written by Coltrane and give their interpretation of the standard.
C

Continue to improvise over approx. twenty seconds. Reduce activity/ energy as you approach the next section. The patch will behave similarly.

D

\( \text{\( \dot{\text{d}} \) } \approx \text{c.150} \)

Snare mic: triggers delay effect from the patch. Delay will start with quavers and move to more complex beat divisions as the section proceeds.

RH: stick (over the snare)
LH: stick (cross-stick position, muting snare head)

ppp on hoop
f

mute toms
Appendix A: Patch Notes

Interface

The signal from the snare drum microphone is converted to a bang atom when it crosses a threshold (1). This allows the snare drum to activate events in the piece.

Each virtual instrument (sticks, timps and vibes) has its own signal pathway to the mixer.

The performance can be rehearsed from different points by selecting one of these letters that correspond to rehearsal marks on the score.

Virtual Instrument Gain

Sticks Timps Vibes

< move these sliders to set the gain of the 3 virtual instruments

Mic Threshold

< move this slider until the blue ‘mic’ button below flashes when the snare is played mp (default 50).

Rehearsal Marks

Select one of these letters from the score

A B C D E F

The signal from the snare drum microphone is converted to a bang atom when it crosses a threshold (1). This allows the snare drum to activate events in the piece.
Each trigger from the drum pad advances a counter within this subpatch. There are two bangs sent sequentially for each event; the first loads the next set of parameters and the second activates the event. Triggers within this patch are sent from the MIDI pad. The snare microphone also triggers events within the piece.
This patch loads audio samples and tabulates mode data to be interpreted by the patch throughout the piece.
This subpatch provides a consistent pulse that is used by the virtual instruments to synchronise rhythms within the patch solo section (letter E on the score). Roles are delegated by first determining a phrase length from four to eight dotted crotchets (1). The same phrase length is never selected twice consecutively which promotes an inconsistent, natural sound (2). The three virtual instruments will pass the solos between one another, sometimes overlapping slightly. This improvisation technique resembles ‘trading’ in jazz culture and generates a dovetailed dialogue between the virtual instruments (3).
This subpatch governs the mode used within the piece. When a mode is called (dictated by the subpatch, *pd trigger*), the pitches from the active mode are routed through independent amplifier stages to allow chord tones to be accented within the mode.
In this subpatch, each snare drum microphone impulse advances the harmonic rhythm played by the virtual instruments in the final section of the piece. The twenty-six chords, and therefore their diatonically-appropriate modes are advanced sequentially, referencing the harmonic progression in the head of Coltrane’s *Giant Steps*. 
pd sticks

This is the first of three 'virtual percussionists'. Drum stick sounds are created by this subpatch. The orange bangs are triggers from the MIDI pad and the blue bangs are triggers from the snare drum microphone.
pd sticks: s1

The left side of this subpatch calculates the tempo set by the first percussionist in the opening bar of the piece. The time between each stroke is recorded (to a 5ms tolerance) and an average over 10 strokes is used to determine the tempo for the piece (1). This gives the performers confidence that the patch will play at the tempo they choose at the very start of the piece and negates the requirement for a click track to synchronise the performers with the patch.

The right side of this subpatch is the electronic response to the tempo set in the opening seconds of the piece. As the first percussionist plays increasingly more quietly, the patch fades in with a responsive pattern that develops throughout the opening section (bar 2) (2).

pd sticks: s4

This subpatch creates a descending pitch sequence. Pitches are randomly chosen from a pair. The pair that is available for selection descends in pitch over two seconds creating a ricocheting, tumbling effect (1). The volume and rhythmic activity both descend alongside the pitch, following the sigmoid curve (2).
pd sticks: s3

This subpatch is used in the sections where the sticks virtual instrument has a supportive and varied role. The ‘pulse’ value that governs the piece’s tempo in milliseconds equates to quavers on the score. This value is multiplied by three to create the millisecond value of dotted crotchets (1). The result then splits into five channels, each with a different division of the dotted crotchet from three to seven (2). The final stage converts the bang impulse into a number from zero to eleven, with equal probability of each value being produced (3). The left outlet controls the volume of this subpatch (4). The volume level follows a bell curve pattern to subtly bring the audience’s attention to the patch’s material (5). The volume fluctuation, which completes a cycle approximately every two seconds, is mimicked by the percussionists.
**pd sticks: stickssolo**

This subpatch, used in the sections where the *sticks* virtual instrument has an independent role, generates material based on the pulse in a similar fashion to **pd sticks: s3**. The signal pathways are configured to randomly generate short phrases similar to a jazz drum solo. Divisions of the pulse range from two to seven with rhythms created to maintain a sense of pulse, albeit sometimes heavily syncopated.

**pd vibes: vibessolo**
pd timps

This is the second of three 'virtual percussionists'. Timpani beater sounds are created by this subpatch.
In this subpatch, supportive material using the *timps* sound library is randomly generated. This subpatch counts using a metre that randomly shifts between counting in four and six (1). The start of each cycle triggers a new phrase to be improvised by the subpatch. The rhythm of these short phrases is determined by dividing the pulse into either two, three or five. These beat subdivisions reference dotted quavers, quavers and quintuplet semiquavers (5:6) on the score.

![Diagram of the subpatch](image-url)
pd timps: timpssolo
(see pd sticks: stickssolo)

This subpatch creates rolls on a single pitch, randomly chosen from a chord tone of the appropriate chord. The rolls fade in and out (1) with a short pause of a few seconds between each gesture (2). To emulate a natural open roll, the tempo of the roll slightly increases and decreases in tandem with the volume (3). The pedal-like harmonic role of this subpatch grounds the otherwise-chaotic chord progression before the virtual instruments are showcased in their solo section (letter E on the score).

pd timps: t4

This subpatch creates rolls on a single pitch, randomly chosen from a chord tone of the appropriate chord. The rolls fade in and out (1) with a short pause of a few seconds between each gesture (2). To emulate a natural open roll, the tempo of the roll slightly increases and decreases in tandem with the volume (3). The pedal-like harmonic role of this subpatch grounds the otherwise-chaotic chord progression before the virtual instruments are showcased in their solo section (letter E on the score).

pd timps: t.head

Each impulse from the snare drum microphone (1) triggers a single, random pitch from the correct mode. The subpatch is configured so the same pitch cannot be repeated consecutively, creating a winding melody that references the original head to Coltrane’s Giant Steps (3). The final impulse of the piece automatically cuts the volume of the subpatch, resembling the drums being muted in unison (2).
pd vibes

This is the third 'virtual percussionist'. Vibraphone mallet sounds are created by this subpatch.
pd vibes: s2

This subpatch is used in the free-time bursts of improvisation increasingly found throughout the first half of the piece. The leftmost inlet (1) instructs the rhythmic activity and volume of the subpatch to follow the sigmoid curve (2) from right to left. When the second inlet from the left (3) is triggered halfway through the free-time section the rhythm and volume follow the curve in reverse, bringing the virtual instrument back into the foreground and signaling the return to a fixed tempo. The reverb level also follows the pattern of the curve for this subpatch (found in pd vibes.fx)

pd vibes: v4

(see pd sticks: s4)
The following eight pages contain the subpatches that load (1), play (2) and control the amplitude (3) of the three sound libraries used in this piece. Each sound library contains twenty pitches within a single timbral profile, creating three virtual instruments named *sticks*, *vibes* and *timps* depending on the sticks/mallets used to record the original samples.
pd sticks: d4a – e4a
pd vibes: cs4b – e4b

pd timps: g2c – c3c
pd timps: cs3c - a3c
The outlet of each virtual instrument signal is processed through reverb and frequency filters in these three subpatches. The parameters change throughout the piece, triggered by the MIDI pad.
The three virtual instrument signals are sent through this mixer subpatch. The grey sliders are from gain controls in the interface.