

# Live Drum Transcription (L.D.T.)

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## Description

INESC Live Drum Transcription (L.D.T.) is a Max For Live device developed at INESC Porto for real-time drum transcription to be used in Ableton Live.

This device can transcribe kick, snare and hihat sounds from a single audio stream of drum sounds, either live performances or pre-recorded audio files, and generate a real-time feed of MIDI events for each detected sound.

This system was first implemented in MaxMSP and PureData and it's open-source to any interested user. Available at GITHUB:

[https://github.com/SMC-INESC/drumtranscription\\_maxmsp](https://github.com/SMC-INESC/drumtranscription_maxmsp)

[https://github.com/SMC-INESC/drumtranscription\\_max-for-live](https://github.com/SMC-INESC/drumtranscription_max-for-live)

The MaxMSP/MaxForLive patchers and the source code for the MaxMSP externals are distributed under GPLv3 license, Copyright 2012-2013 - INESC Porto - Marius Miron - Diogo Cocharro.

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For more info about this project and other work check:

<http://smc.inescporto.pt/shakeit/>

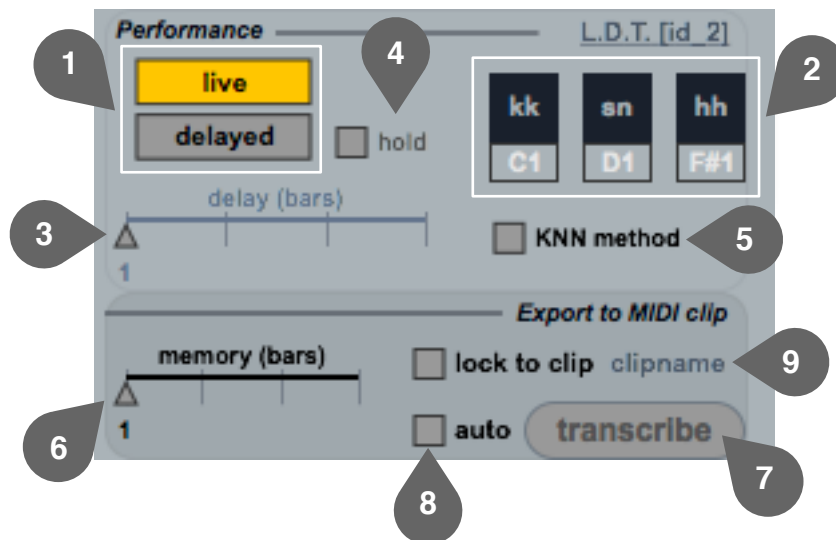
## Input

- Real-time audio stream from a live source (microphones) or a sound file;

## Output

- L.D.T. outputs a feed of MIDI notes in 2 ways:
  - Export to MIDI clip: dump up to 4 bars of the transcribed performance to a MIDI clip in Ableton Live's session view.
  - Live feed: outputs MIDI events in real-time for each detected kick, snare and hihat sounds, which can be used to play a virtual instrument or to trigger effects.

## Parameters



### 1. Performance Mode

Select the mode to broadcast the live drum transcription feed.

In **Live** mode, the device broadcasts a direct feed of the real-time transcription. A latency (aprox. ~56ms) can happen due to the algorithm computation time.

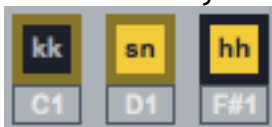
In **delayed** mode the broadcasting has a minimum of 1 bar delay in order to keep the transcribed events position aligned within the bar range, but there is no algorithm latency.

### 2. Event detection indicator and Pitch selector.

This feature provides to the user visual feedback that indicate which events are being transcribed. Below each led the user can select the pitch triggered for each transcribed drum sound.



The led behaviour changes in delayed mode. The dark border keeps blinking in live mode, while the bright interior colour blinks in delayed mode. This can be useful to align the delay of the playback with the live source, when they blink simultaneously.



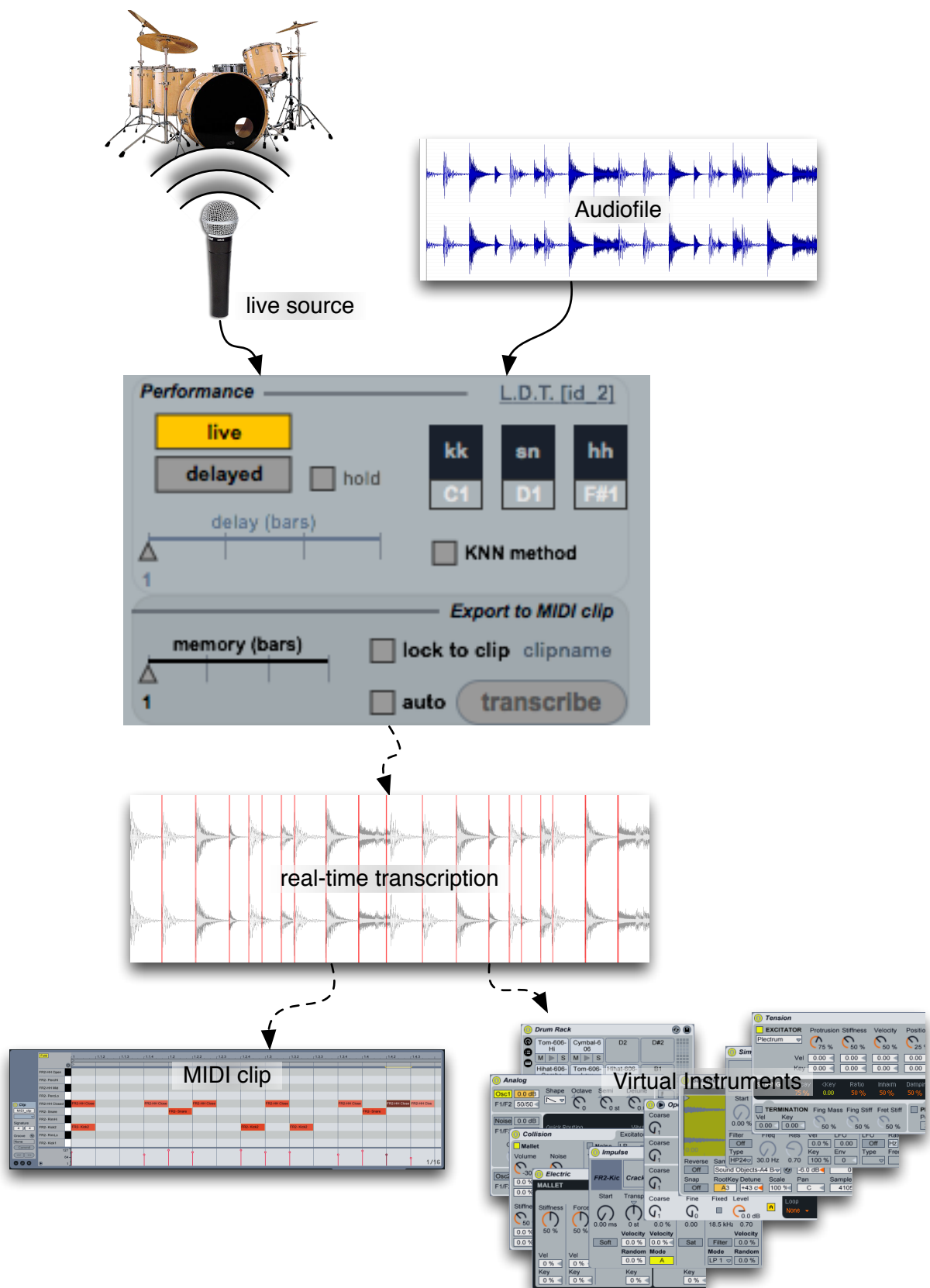
### 3. Delay Amount of transcription playback.

This parameter is only active in **delayed** mode. It can be used for phase correction between a live source and the delayed playback.

So, if the user is playing a 4 bar drum loop, this parameter makes possible to correct phase between the transcribed playback and the audio source, by delaying the transcription 4 bars.

4. **Hold** last transcription in memory (only active in **DELAYED mode**).  
When activate, the device will keep looping the last transcribed pattern(s), if the transcription stops for 1 bar. The memory parameter sets also the loop length (described in #6). This parameter allows the user to use the device as a looping instrument.  
Deactivated, the device will play in CONTINUOUS mode, which will result in playback interruption if the audio stream for transcription stops.
5. **Drum Transcription Method.**  
This parameter allows the user to select which Drum Transcription method is being used by the device. The user can choose between KNN algorithm (default) OR Kmeans algorithm.
6. **Memory Size.**  
This parameter affects two functionalities. Sets the size in number of bars of the export to MIDI clip functionality, and sets the loop length when the Hold functionality is activated.  
In order to keep the transcribed events aligned within the bar, the memory size has a minimum of 1 bar length.
7. **Transcribe:** Export the last transcribed bars to MIDI clip.  
Trigger the Export to MIDI clip functionality of the latest transcribed bars in memory to the selected MIDI clip.  
  
The latest selected MIDI clip is used to dump MIDI data, if LOCK is OFF (described in #9).  
When L.D.T. is inserted in a audio track, this button becomes active only after selecting the first valid MIDI clip.
8. **Activate automatic transcription dump every bar.**  
Trigger automatically every bar the export to MIDI clip function.
9. **Lock** automatic MIDI clip selection to the last one.  
This device observes automatically which MIDI clip is selected.  
By activating Lock, the device stops observing which MIDI clip is being selected, henceforth, when export to MIDI clip functionality is triggered, the device always uses the same MIDI clip that was selected before **Lock ON**.  
The name and color of the last selected MIDI clip is shown after this button.

## Examples



### Real-Time transcription to MIDI clips

In order to dump the drum transcription to a MIDI clip, the user must place L.D.T. device in a audio track of Ableton Live, and feed a audio stream from an external input or a audio file.

Then select a destination MIDI clip by highlighting one of MIDI clips inside Ableton Live session view and finally press the “TRANSCRIBE” button in the L.D.T. device.

The L.D.T. device has a automatic mechanism that checks always what was the last highlighted MIDI clip, in order to be used for transcription dump.

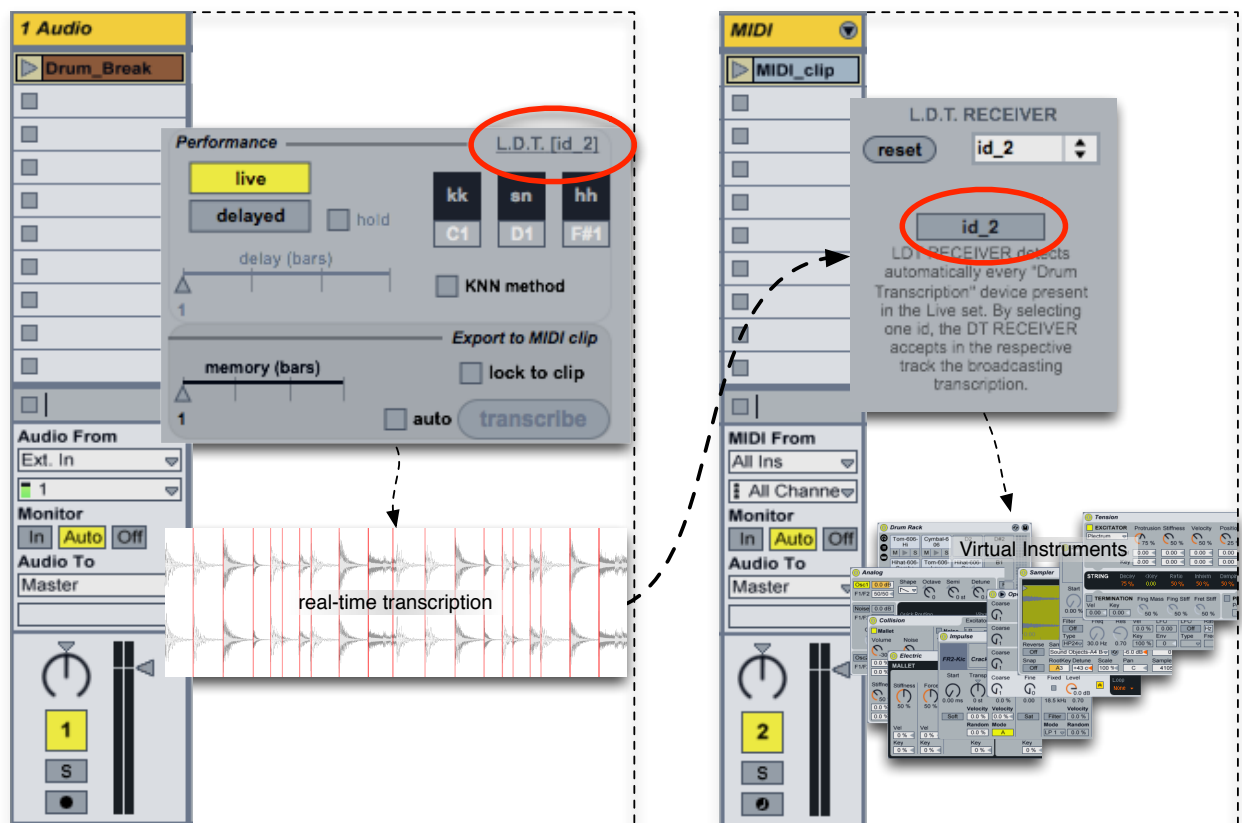
If the user wishes to keep dumping the transcription to the same MIDI clip, he/she must activate “LOCK TO CLIP” button.

### Real-Time transcription to other Virtual Instruments/Devices

Ableton Live does not allow for an audio device to feed MIDI data directly to the input of a MIDI track or device. In order to trigger in real-time virtual instruments and devices with the output of the L.D.T. device, the user must use the accompanying MIDI effect **L.D.T. RECEIVER**. This device should be placed in a MIDI track. When an **L.D.T.** device transcribes the input audio, it broadcasts the transcribed MIDI note events to all **L.D.T. RECEIVERS** loaded in the Live set. Each player then forwards the events to its output and all subsequent MIDI devices.

When more than one L.D.T. is transcribing audio, the user can distinguish between each transcription using the **L.D.T ID** found in both the L.D.T. device and the **L.D.T. RECEIVER**. Each L.D.T. has a unique identification number (ID), so that every **L.D.T. RECEIVER** accepts the broadcasting transcription by selecting the respective L.D.T. ID.

The RECEIVER can connect only to one L.D.T. device at a time, but the user can place several RECEIVERS in one MIDI track, receiving from different L.D.T.’s.



## Acknowledgements



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**smcGROUP**

RESEARCH IN SOUND AND MUSIC COMPUTING AT INESC PORTO / FACULTY OF ENGINEERING OF THE UNIVERSITY OF PORTO

Shakelt –Mechanisms of Groove and Applications– is a scientific research project of the [SMC Group](#) at INESC Porto/FEUP, in Porto, Portugal.

- Topic: Musical “groove” description and applications
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