

Audio Beat Tapping : Usage instructions with screenshots

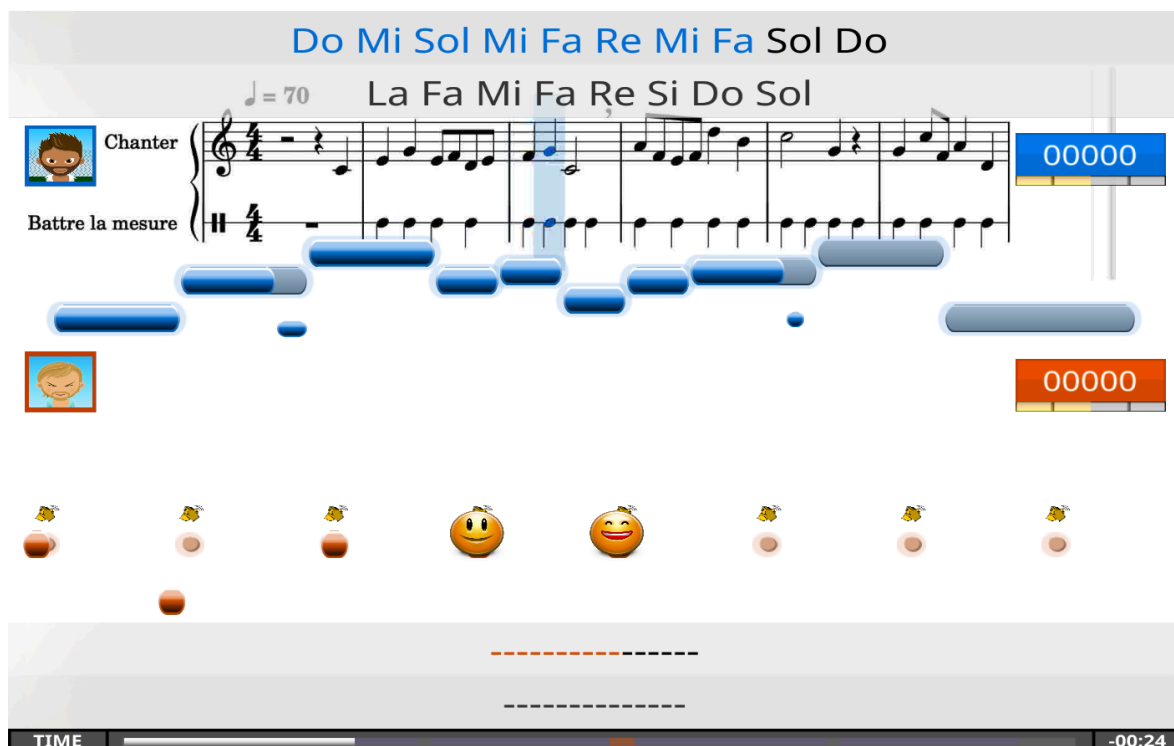
tbgitoo, October 2021

1. Playing with beat tapping

With suitable songs available (see section3), beat tapping is integrated into the usual modes of Ultrastar Deluxe Karaoke playing.

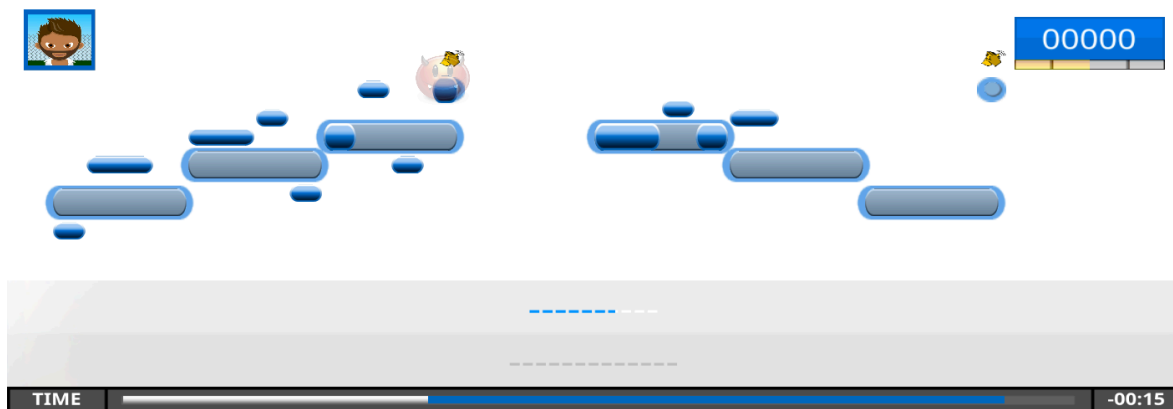
The basic concept is to evaluate whether a given players claps (or otherwise makes a sharp, loud sound) with correct timing at the musical beats.

Screenshot 1 shows a two-player duett where player 1 sings and and player 2 taps the rhythm. For player 2, the smileys outline correctly timed beats, while non-animated notes drawn at the lower edge of the track indicate beat sounds detected at incorrect time points. Player 1 is performing karaoke singing.



Screenshot 1. Duett playing with beat tapping configured solely for Player 2. Missed beats are shown as red bars, on-time beats are rewarded with smileys.

Beat notes and regular notes can be mixed (although they should not occur at the same time), as shown in Screenshot 2. In the lyrics text files, the beat notes are represented as rap notes, but are interpreted in a specific rap beat mode dedicated to beat detection.



Screenshot 2. Mixed line with singing notes (6 in total, most of the missed...), and 2 beat notes labelled with a yellow clap sign. The first beat note was hit (smiley animation), the second not yet evaluated.

2. Configuration options

2.1. Overview configuration beat tapping

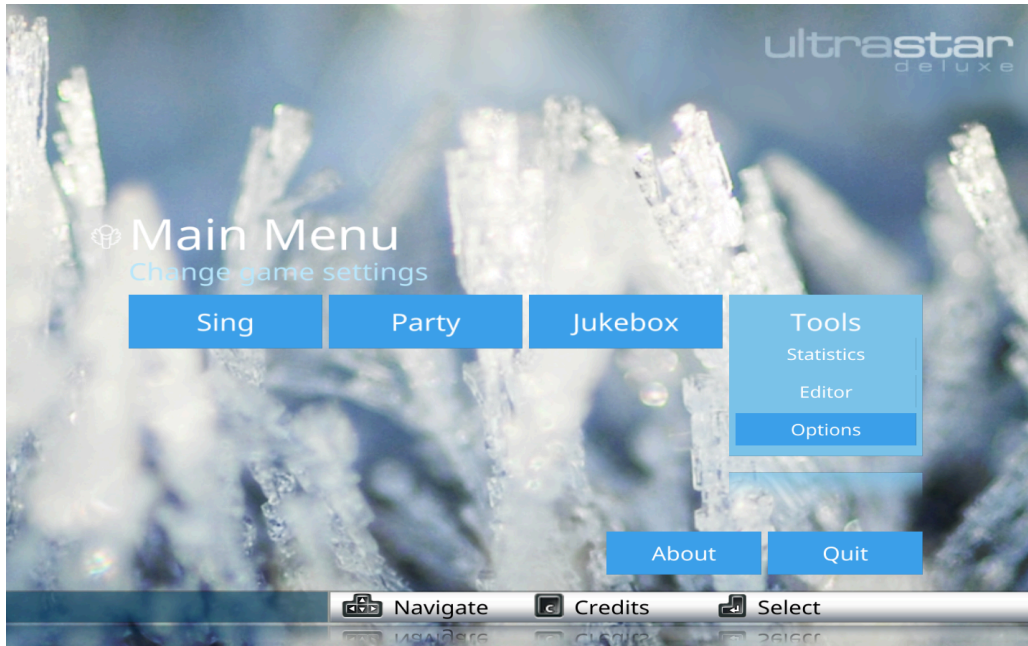
The configuration options for beat tapping includes both configuration for audio detection and for tapping with the keyboard.

2.2. Detailed instructions for configuration

Accessing the configuration screen

To access the beat tapping configuration, proceed as follows:

- 1) Go to Tools -> Options, as shown in Screenshot 3.
- 2) Then, in the Options screen opening, select the "Beat Tapping" section, as shown in Screenshot 4.



Screenshot 3: Go to Options by selecting Tools -> Options



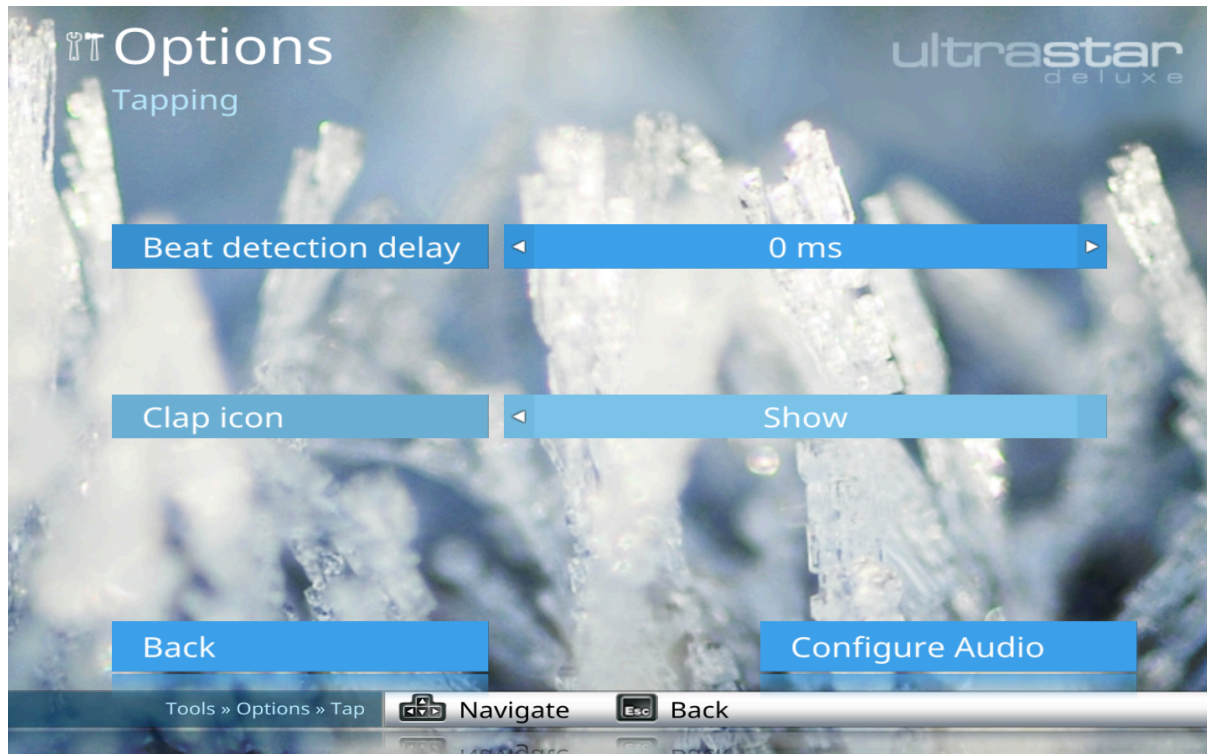
Screenshot 4. Beat Tapping Options in the Options screen

Configuration options

General options

In the beat tapping configuration screen (Screenshot 5), details of the beat tapping mode can be configured. This involves a general delay setting (different from microphone delay

for singing since beat detection is more rapid than pitch analysis), and also the possibility to specifically highlight the clap notes by a clap sign (recommended). The specific configuration of the detection of claps from the audio signals can be adjusted by clicking on “Configure Audio”.



Screenshot 5. Beat tapping configuration screen

Details on the options in Screenshot 5:

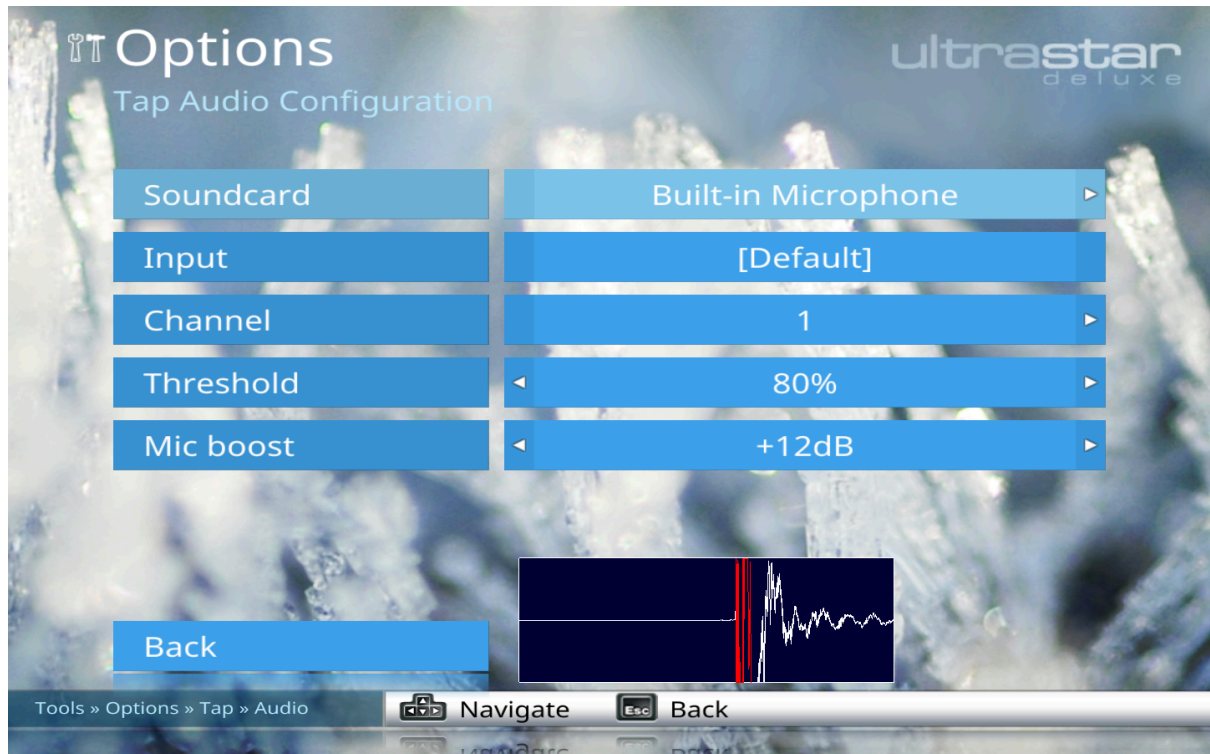
- “Beat detection delay”: The beat detection delay is shorter than the standard microphone delay (accessible through Game -> Microphone Delay from the start screen). The reason is that shorter buffers can be used for beat event detection as compared to pitch detection. A typical value is between 20ms and 50ms, whereas typical microphone delays are often at least 100ms.
- “Clap icon”: Whether you want to **show** or **hide** the clap symbol specifically outlining beat notes during song Karaoke singing.

Audio

The beat detection from the microphone audio signals can be configured by clicking “Configure Audio” in the screen shown in Screenshot 5. This opens a new configuration screen shown in Screenshot 6.

For each acquisition channel (i.e. for the individual channels available through the different sound cards), a detection threshold can be configured. As setting this threshold and adjusting the general Mic Boost settings are tightly coupled, the Mic Boost can be set here as well (it is usually set through Tools -> Options -> Record from the startup screen of Ultrastar Deluxe). The audio configuration screen includes an oscilloscope test bench where the threshold setting can be tested against actual clapping. If a clap is detected, the

oscilloscope signal is stopped for short time and the detected pulse is shown. The segment detected as the primary beat pulse is shown in red as in Screenshot 6. Similarly to the threshold applicable for singing (i.e. Tools -> Options -> Record), a different threshold can be set for each channel.



Screenshot 6. Configuration of detection of clapping from the audio signal

3. Lyrics file editing

3.1. Syntax in the lyrics txt files

To activate the beat evaluation mode, the lyrics text file header needs to contain the following tag:

```
#RAP:BEAT
```

So a minimal admissible header could for example read:

```
#TITLE:Beat detection demo  
#ARTIST:tbgitoo  
#MP3:demo.mp3  
#BPM:80  
#RAP:BEAT
```

With the beat evaluation mode activated, the beat notes are implemented as a particular case of rap notes. Rap notes in Ultrastar Deluxe are evaluated for timing only, not for pitch. Contrary to freestyle notes, which are meant for illustrative purposes only, rap notes are scored. The default scoring mode for rap notes evaluates whether they are sung correctly regarding the timing and duration. Activating the rap beat mode with the tag #RAP:BEAT changes the scoring scheme: instead of for the duration, points are attributed if a tapping sound (beat) is detected at the beginning of the rap note, but subtracted if beats are detected at incorrect timing during the note.

Whether in default or specifically rap beat mode, the syntax for rap notes in Ultrastar is always the same and follows the general lyrics file notation. This syntax is: first position the note type, second position beat number, third position length, fourth position pitch and fifth position Lyrics:

<type> <timing> <duration> <pitch> <text>

For example, for a standard note followed by a rap note, this could be:

```
: 0 4 9 Oh  
R 4 12 9 my
```

Which would mean that on beat zero (the first of the song), the player would be expected to sing for 4 beats, at pitch 9 (“a”, also referred to as “la”); the syllable is “Oh” but at present Ultrastar Deluxe does not check the lyrics. Technically, the “Oh” note here will span the intervals from beat 0 to beat 1, beat 1 to beat 2, beat 2 to beat 3, and beat 3 to beat 4 with sound sampling roughly in the middle of these four intervals. In the example, on beat 4, a rap note of duration 12 starts (the “my” note). The scoring depends on the analysis mode. By default, the player would be expected to sing a note 12 beats long; in rap beat mode, instead, a clap on beat 4 is expected followed by absence of clapping during the remainder of the duration of the rap note.

Also of note, in Ultrastar Deluxe, the elementary beats are $\frac{1}{4}$ of the length of the beat determined by the BPM setting.

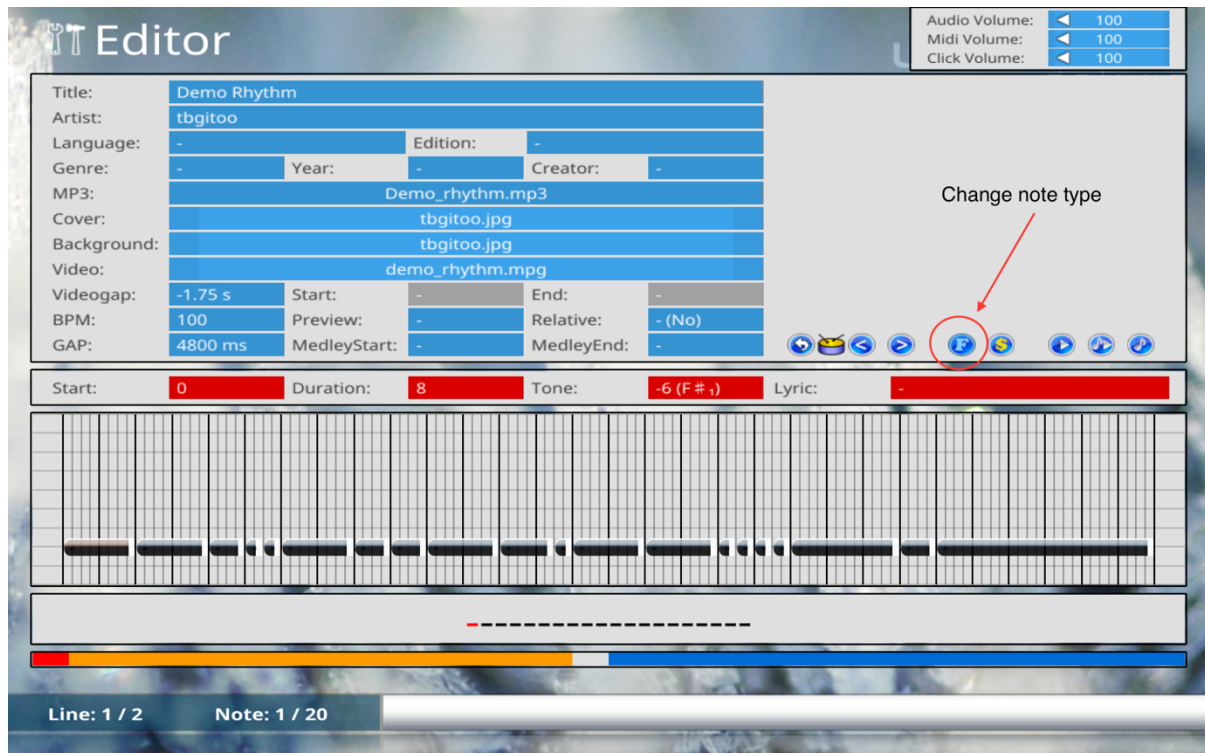
3.2. Lyrics file editing in UltrastarDeluxe

Changing note style to obtain rap notes

The lyrics file can also be edited from within UltrastarDeluxe, with the built-in editor. Within the built-in editor (Main Menu -> Sing, choose song in song list, hit “e”; this assumes you have obtained mp3 and created a corresponding working lyrics text file, otherwise Ultrastar Deluxe will not show the song), many options regarding the song and also the individual notes can be set.

The first action of relevance here is the possibility to change the note type from standard to free-style to rap and back to standard. This is done via the “F” icon provided by the UltraStar

Song Editor, which provides cycling between standard, freestyle, and rap notes (outlined in Screenshot 7).

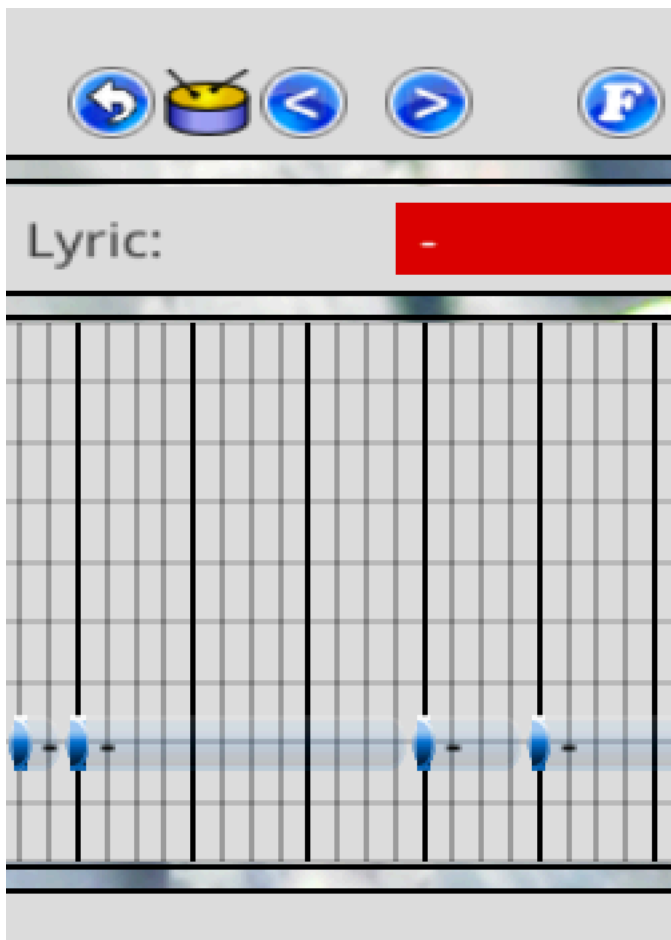
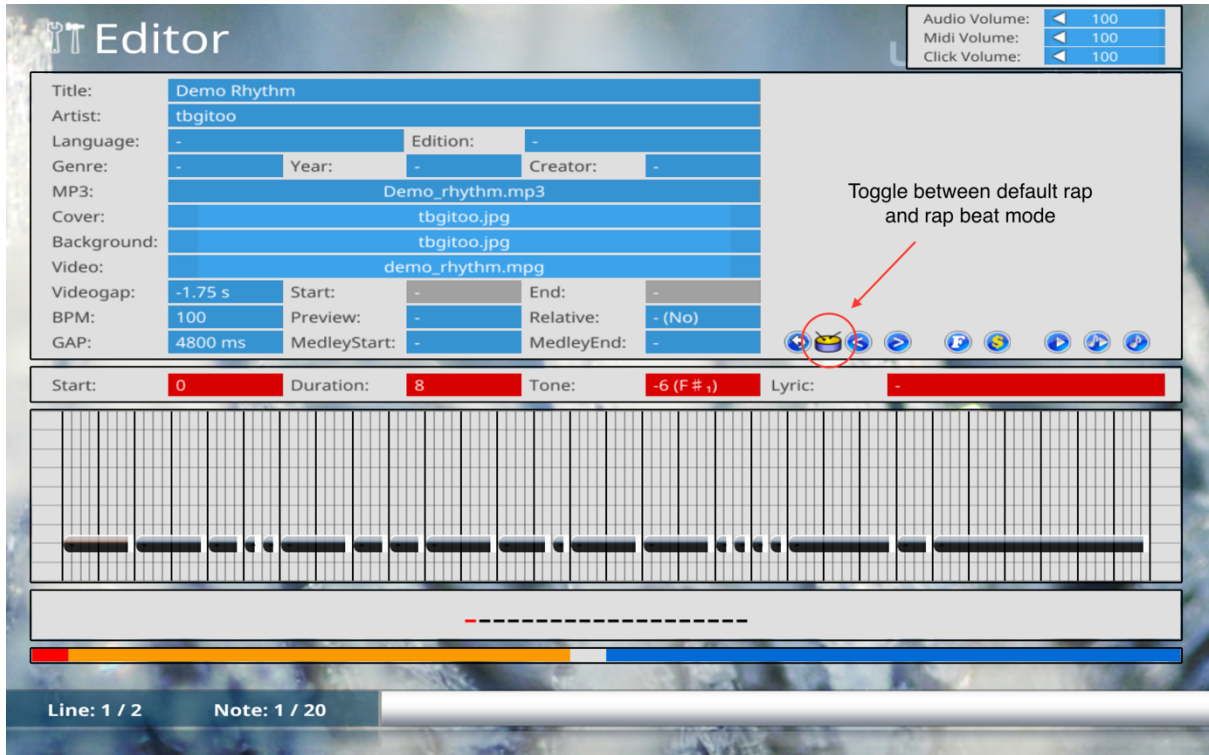


Screenshot 7. Changing the note type

Of note, changing a long sequence of note to rap notes (shown black in the editor, c.f. Screenshot 7) can be tedious and it might be easier to use a text editor on the lyrics file to do appropriate search-replace operations. This typically involves replacement of the note symbol (standard is “:”) by the rap symbol (“R”), although care needs then to be taken to not also replace : symbols where they shouldn’t be replaced (i.e. header tags).

Activating the rap beat mode

To activate the rap beat mode, a first possibility is to use an external text editor to place the #RAP:BEAT tag into the header of the lyrics file (see section 3.1). A second possibility is to use the drum icon switch button newly provided in the Ultrastar song editor (Screenshot 8). When rap notes are presented, this also toggles their graphical display to show the beat evaluation scheme. As shown comparatively in Screenshot 8, with the beat evaluation mode activated, the expected timing is on the first beat of each note (second image), whereas in default mode, the expected timing is along the beat intervals covered by the entire rap note.



Screenshot 8. Note editor in UltrastarDelux, indicating

3.3. A word on beat timing

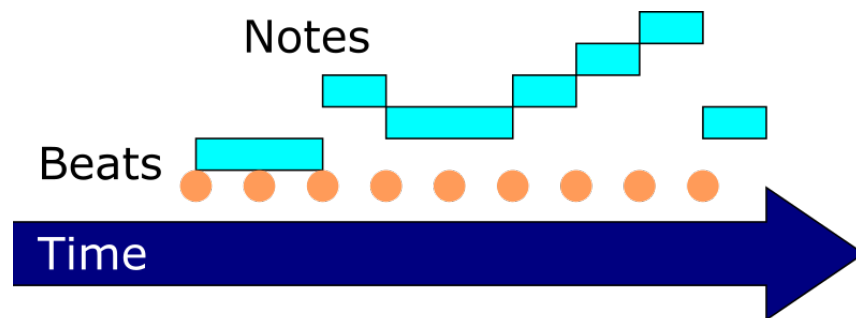


Figure 1. Relation between rhythmic beats and notes to be sung

Figure 1 illustrates the relation between the rhythmic beats. Beats inaugurate the notes. One can also think of the beats being points on the time arrow, and the notes spanning intervals between adjacent or more distant points.

This time relation between beats and notes is applied when evaluating beat and singing timing. The beat inaugurates the corresponding notes, so when a song contains both a beat and a sing note noted at the same beat in the lyrics file, the program expects the beat to coincide with beginning (rather than middle) of the sing note, as is customary in musics.

This relation can be seen explicitly by the shift of the rap notes onto the beats when activating the rap beat mode in Screenshot 8 (second image).