EGFXSET: ELECTRIC GUITAR TONES PROCESSED THROUGH REAL EFFECTS OF DISTORTION, MODULATION, DELAY AND REVERB

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ABSTRACT

EGFxSet contains recordings of all clean tones in a Stratocaster guitar, with augmentations by processing through twelve electric guitar effects. Similar datasets apply effects using software, EGFxSet in contrast uses real guitar effects hardware, making it relevant to develop MIR tools with applications on real music. Annotations include all guitar and effect parameters controlled during our dataset recording. EGFxSet contains 8970 unique, annotated guitar tones, and is published with full open-access rights.

1. INTRODUCTION AND RELATED DATASETS

The electric guitar is an influential and ubiquitous instrument, in part because it is possible to change its timbre using effects [1, 2]. Popular effects include distortion, reverb, and chorus, among thousand others [3–6] (from an MIR perspective, these effects are "augmentations" of the clean guitar tones [7]). As a result, the electric guitar can sound different between and within real-world pieces of music, introducing challenges for MIR tasks like robust guitar transcription [8–10] and identification of guitar effects and their parameters [11–15].

In this late-breaking demo, we present EGFxSet (Electric Guitar Effects dataset), featuring recordings of all clean tones in a Stratocaster guitar, recorded with five pickup configurations, and augmented using twelve real guitar effects (**Table 1** shows the effects in EGFxSet and their parameter settings). Similar datasets simulate effects with software [7, 13, 16]. Ours, in contrast, was recorded using real hardware, making it more relevant for MIR tasks on real music. We also include annotations for parameter settings of the effects we used.

It is virtually impossible to curate a dataset representing all possible electric guitar timbres in real music. As a result, existing datasets made compromises to balance musicality, timbre diversity, effect realism, and size. Next, we give a brief overview of four relevant guitar datasets.

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Effect	Setting
blues driver (Boss BD-2)	Level, Tone, Gain
tube screamer (Ibanez TS Mini)	Tone, Overdrive, Level
distortion (Pro Co RAT2)	Distortion, Filter, Volume
chorus (Boss CE-3)	Rate, Depth, Mono, Mode
flanger (Mooer E-Lady)	Color, Type, Normal, Range, 120bpm, Rate
phaser (MXR Phase 45)	120bpm, Speed
tape echo (Line 6 DL4 Delay)	120bpm, Effect Selector, Delay Time, Repeats, Tweak (Bass), Tweez (Treble), Mix
digital delay (Line 6 DL4 Delay)	120bpm, Effect Selector, Delay Time, Repeats, Tweak (Bass), Tweez (Treble), Mix
sweep echo (Line 6 DL4 Delay)	120bpm, 120bpm, Effect Selector, Delay Time, Repeats, Tweak (Sweep Speed), Tweez (Sweep Depth), Mix
plate reverb (Orange CR-60)	Volume, Bass, Treble, Plate, Type, Reverb, Master Volume, Clean, Channel
hall reverb (Orange CR-60)	Volume, Bass, Treble, Hall, Type, Reverb, Master Volume, Clean, Channel
spring reverb (Orange CR-60)	Volume, Bass, Treble, Spring, Type, Reverb, Master Volume, Clean, Channel

Table 1. The guitar effect hardware settings in EGFxSet.

1) GuitarSet is used for guitar transcription as it features fully-annotated acoustic guitar performances [17]. However, it completely lacks effects, which limits its timbre diversity. 2) EGDB also features performances, but played with an electric guitar, and the clean electric guitar recordings were programmatically altered by five simulated guitar amplifier effects [7]. 3) IDMT-SMT-Audio-Effects is considerably larger, featuring clean monophonic and polyphonic guitar sounds [1] captured with different guitar pickup settings, plucking styles and processed by

[1] IDMT-SMT-Audio-Effects also features bass guitar recordings.

	GuitarSet	EGDB	IDMT-SMT-Audio-FX	GUITAR-FX-DIST	EGFxSet
content type	performance	performance	mono- and poly-phonic	mono- and poly-phonic	monophonic
No. guitars	1	1	2	2	1
No. performers	6	1	1	1	1
No. effects	0	5	11	13	12
No. guitar pickup settings	1	1	2	2	**5**
effects with real hardware	-	False	False	False	**TRUE**
annotated effect settings	-	False	True	True	True
duration (clean)	3 h	2 h	35 min	34 min	57 min
duration (effects)	-	10 h	18 h 33 min	111 h 6 min	11 h 30 min
duration (total)	3 h	12 h	19 h 8 min	111 h 40 min	12 h 27 min

Table 2. Overview of existing datasets featuring (electric) guitar recordings and augmentations with audio effects. Each row contrasts their characteristics with EGFxSet. Note that EGFxSet is the only one using real effects hardware.

eleven simulated effects [16]. 4) GUITAR-FX-DIST borrows the clean recordings from IDMT-SMT-Audio-Effects and processes them through thirteen simulated distortion effects [13]. **Table 2** contrasts these datasets.

2. THE EGFXSET DATASET

Existing datasets use software to apply effects on clean guitar recordings, and few include effect parameter annotations. As a result, there is a need for datasets featuring recordings of clean electric guitar tones, augmented using real effects hardware, and including annotations of effect and guitar settings. EGFxSet addresses this need and is freely available on Zenodo [2] [18] under a Creative Commons license. A mirdata [19] loader [3] is also available.

2.1 Recording of clean guitar tones

A professional guitarist played each note (138 total) in a twenty-two-fret Stratocaster (2004 model) with standard tuning. The guitarist wore headphones to listen a 60bpm metronome and time an eight-second interval between notes. This process was repeated for the five possible guitar pickup configurations in the guitar, resulting in a total of $138 \times 5 = 690$ clean notes. The guitar's volume and tone knobs were set to maximum throughout.

The guitar was connected to an input channel of an Audient iD14 audio interface, powered and connected via USB to a 2013 MacBook Pro running Logic Pro X. Using this hardware and software setup, the guitar tones were recorded using a sampling rate of 48kHz and 24 bit-depth.

2.2 Application of audio effects using real hardware

We prepared a Logic Pro X track where all clean tones played one after the other, lasting five seconds each. The computer's audio played through the output channel of the Audient iD14 audio interface. This output was connected to the input channel of each effect, whose output became the input of the Audient iD14 audio interface. This setup allowed us to play the track with all clean guitar tones, and record them after they went through the guitar effects (one at a time). We recorded 12 effects: tube screamer, blues driver, rat distortion, chorus, flanger, phaser, tape echo, digital delay, sweep echo, plate reverb, hall reverb, and spring reverb. EGFxSet has 8970 audio files, 690 per effect (and 690 clean tones). Each file had a linear fade-out of 2000ms and normalized amplitude.

2.3 A functional categorization of effect controls

Semantic grouping of language descriptors has been a useful tool to capture redundancies between them [20]. Language descriptors can explain sound effects [21], potentially yielding a small set of words that describe how any sound effect changes sounds. Here we propose a set of language descriptors that explain how all the effect parameters in our dataset change the guitar's clean sound. **Volume dials**: adjust audio amplitude. **Selector switches**: choose discrete settings in an audio effect (for example, mono vs stereo effects). **Eq dials**: control the spectral equalization. **Effect amount dials**: determine the mix ratio between an effect's output and the original input signal (i.e. dry vs wet balance). **Effect decay dials**: control the amount of time it takes for an effect to fade after its onset. **Rate dials**: determine the interval between effect onsets that repeat periodically (for example, delay).

2.4 Annotations

Our dataset was annotated by a professional guitarist. Each file's annotations are: **String-Fret tuple**: digits indicating the string number (1 through 6) and fret number (0 for open strings, and 1 through 22 for fret position). **Note**: the guitar had standard tuning, so the note played can be inferred with string-fret tuple [22, 23]. **Pickup configuration**: one of the five possible pickup configurations: bridge, bridge-middle, middle, middle-neck, or neck. **Effect**: this is the name of the effect used (i.e. blues driver, or plate reverb). **Model**: the commercial name and version of the effect hardware used. **Effect type**: a categorical name for the effect type, abstracting away the effect's specific name and brand. **Knob names**: each effect we used has controllable parameters with names given by the original manufacturer. **Knob type**: we use language descriptors from our functional categorization of effect controls to categorize each effect's controllable parameters. **Knob setting**: A value (between 0.0 and 1.0, or bpm for rate effects, or name of selected category) indicating the setting captured.

Read more in `https://egfxset.github.io`.

[2] `https://zenodo.org/record/7044411`

[3] `https://mirdata.readthedocs.io/en/stable/source/mirdata.html#module-mirdata.datasets.egfxset`

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