Package 'music'

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Type Package

Title Learn and Experiment with Music Theory

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Description An aid for learning and using music theory. You can build chords, scales, and chord progressions using 12-note equal temperament tuning (12-ET) or user-defined tuning. Includes functions to visualize notes on a piano using ASCII plots in the console and to plot waveforms using base graphics. It allows simple playback of notes and chords using the 'audio' package.

Imports graphics, utils, audio, crayon

License GPL (>= 3)

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`music-package` **music***: Learn and use music theory*

Description

The music package allows you to build, play, and visualize scales, chords, and chord progression. For playback, **music** builds waveforms as matrices and passes them to the **audio** package which interfaces with the system's audio driver. The default notation and frequencies used throughout the package are based on twelve-tone equal temperament tuning (12ET). Custom tuning can be defined by specifying frequency ratios and a root note. See note2freq. A4 defaults to 440Hz, and can be changed with the 'A4' argument.

`buildChord` *Build Chord*

Description

Build Chord

Usage

```
buildChord(
  root,
  chord = "minor",
  play = FALSE,
  plot = FALSE,
  formatNotation = TRUE,
  ...
)
```

Arguments

`root`	String: Root note
`chord`	String: Chord to build. Default = "minor"
`play`	Logical: If TRUE, play chord using playChord
`plot`	Logical: If TRUE, plot chord notes using cplot.piano
`formatNotation`	Logical: If TRUE, format notes to include both flats and sharps to avoid repeating the same letter. e.g. convert c("Gb4", "G4") to c("F#4", "G4")
`...`	Additional arguments to be passed to playChord if `play = TRUE`

Author(s)

E.D. Gennatas

Examples

```
buildChord("C4", "minor")
buildChord("A4", "sus2", plot = TRUE)
## Not run:
buildChord("B4", "sus2", play = TRUE)

## End(Not run)
```

`buildProgression` *Build Chord Progression*

Description

Build Chord Progression

Usage

```
buildProgression(
  root = "A4",
  scale = "minor",
  play = FALSE,
  plot = FALSE,
  formatNotation = TRUE,
  ...
)
```

Arguments

`root`	String: Root note. Default = "A4"
`scale`	String: "major" or "minor". Default = "minor"
`play`	Logical: If TRUE, play scale using playProgression
`plot`	Logical: If TRUE, plot each chord in the progression using cplot.piano
`formatNotation`	Logical: If TRUE, format notes to include both flats and sharps to avoid repeating the same letter. e.g. convert c("Gb4", "G4") to c("F#4", "G4")
`...`	Additional arguments to be passed to playProgression if `play = TRUE`

Author(s)

E.D. Gennatas

Examples

```
buildProgression("C4", "minor")
buildProgression("Bb4", "major")
## Not run:
buildProgression("Bb4", "major", play = TRUE, plot = TRUE)

## End(Not run)
```

`buildScale` *Build Scale*

Description

Build Scale / Mode

Usage

```
buildScale(
  root,
  scale = "minor",
  descending = FALSE,
  play = FALSE,
  pairs = FALSE,
  plot = FALSE,
  formatNotation = TRUE,
  ...
)
```

Arguments

`root`	String: Root note. e.g. "C4"
`scale`	String: Scale to build. Default = "minor"
`descending`	Logical: If TRUE, return notes in descending order, otherwise in ascending Default = FALSE
`play`	Logical: If TRUE, play scale using playNote
`pairs`	Logical: If TRUE and `play = TRUE`, play the root note along with each other note, in sequence
`plot`	Logical: If TRUE, plot scale notes using cplot.piano
`formatNotation`	Logical: If TRUE, format notes to include both flats and sharps to avoid repeating the same letter. e.g. convert c("Gb4", "G4") to c("F#4", "G4")
`...`	Additional arguments to be passed to playNote if `play = TRUE`

Author(s)

E.D. Gennatas

Examples

```
buildScale("C4", "minor")
buildScale("B4", "minor", descending = TRUE, plot = TRUE)
## Not run:
buildScale("B4", "minor", descending = TRUE, play = TRUE, plot TRUE)

## End(Not run)
```

---

cplot.piano *Console piano plot for notes*

Description

Build an ASCII plot of notes on a piano

Usage

```
cplot.piano(notes = buildScale("C4", "minor"), blackKey.col = "white")
```

Arguments

notes	String, vector: Notes to highlight. Default = buildScale("C4", "minor")
blackKey.col	Color to use for black keys. Default = "white" for use on a dark terminal. Set to "black" for use on a light terminal.

Author(s)

E.D. Gennatas

Examples

```
cplot.piano(buildScale("B4", "minor"))
```

---

formatNotation *Format Notation*

Description

Converts the internal note representation which uses only flats, to the notation commonly used to write scales and chords, where a mix of sharps and flats is used to avoid repeating the same letter note. (e.g. "G#5" "A5", instead of "Ab5" "A5") e.g. convert the C4 Lydian from: "C4" "D4" "E4" "Gb4" "G4" "A4" "B4" "C5" to: "C4" "D4" "E4" "F#4" "G4" "A4" "B4" "C5" or convert the A4 major from: "A4" "B4" "Db5" "D5" "E5" "Gb5" "Ab5" "A5" to: "A4" "B4" "C#5" "D5" "E5" "F#5" "G#5" "A5"

Usage

```
formatNotation(notes)
```

Arguments

notes	String, vector: Notes to format

Author(s)

E.D. Gennatas

Examples

```
formatNotation(c("Db4", "D4", "E4", "Gb4", "G4", "A4", "B4", "C5"))
```

---

formatNote *Format notes*

Description

Format notes for use in other **music** functions

Usage

```
formatNote(notes, default.octave = 4)
```

Arguments

notes	Vector, String: Input notes in the form `c("C4", "D4", "Eb4")`
default.octave	Integer: Octave to use if missing in `notes`. Default = 4; i.e. `"C"` becomes `"C4"`

Details

Converts sharps to flats, adds octave number if missing (Default = 4), and converts (rare) "bb" notes to regular notes

Author(s)

E.D. Gennatas

Examples

```
formatNote(c("D#4", "Ebb"))
```

freq2wave *Frequency to waveform*

Description

Frequency to waveform

Usage

```
freq2wave(
  frequency,
  oscillator = c("sine", "square", "saw", "triangle"),
  duration = 1,
  BPM = 120,
  sample.rate = 44100,
  attack.time = 50,
  inner.release.time = 50,
  plot = FALSE
)
```

Arguments

`frequency`	Float, vector: Frequency/ies to convert to waveform
`oscillator`	String: "sine", "square", "saw". Default = "sine"
`duration`	Float: Note duration in beats. Default = 1
`BPM`	Integer: Beats per minute. Default = 120
`sample.rate`	Integer: Sample rate. Default = 44100
`attack.time`	Integer: Attack time. Default = 50 (Helps prevent popping)
`inner.release.time`	Integer: Release time, that ends on note OFF (instead of beginning at note OFF). Default = 50 (Also helps prevent popping)
`plot`	Logical: If TRUE, plot wave(s) using mplot

Author(s)

E.D. Gennatas

Examples

```
wave <- freq2wave(note2freq(buildChord("A4", "sus2")))
```

mplot *Plot waveform*

Description

Plot waveform

Usage

```
mplot(
  x,
  type = "l",
  main = NULL,
  legend = TRUE,
  lwd = 1,
  pty = "m",
  bg = "black",
  fg = "gray50",
  col = "cyan",
  col.axis = "gray50",
  col.lab = "gray50",
  col.main = "gray80",
  col.legend = "white",
  tcl = 0.3,
  xaxt = "s",
  yaxt = "s",
  new = FALSE,
  mgp = c(2, 0, 0),
  mar = NULL,
  oma = NULL,
  ...
)
```

Arguments

x	Input
type	String: "l" for lines, "p" for points. Default = "l"
main	String: Plot title
legend	Logical: If TRUE, show legends on plot, if x has column names
lwd	Float: Line width. Default = 1
pty	String: "m" to fill available device space, "s" for square plot. Default = "m"
bg	Color: background color
fg	Color: foreground color
col	Color: Point/line color

col.axis	Color: Axes' color
col.lab	Color: Label color
col.main	Color: Title color
col.legend	Color: Legend color
tcl	The 'tcl' param of par
xaxt	The 'xaxt' param of par
yaxt	The 'yaxt' param of par
new	The 'new' param of par
mgp	The 'mgp' param of par
mar	Vector, length 4: Margins for par
oma	Vector, length 4: The 'oma' param of par
...	Additional parameters to pass to plot

Author(s)

E.D. Gennatas

---

note2freq *Convert musical notes to frequencies*

Description

Convert notes to frequencies

Usage

```
note2freq(
  note,
  tuning = c("12ET", "custom"),
 custom.ratios = c(1, 16/15, 9/8, 6/5, 5/4, 4/3, 45/32, 3/2, 8/5, 5/3, 9/5, 15/8, 2),
  A4 = 440,
  custom.root = "C",
  default.octave = 4
)
```

Arguments

note	String: Note(s) to convert to frequencies
tuning	String: "12ET": 12-note equal temperament, "custom": Intonation defined by customRatios
custom.ratios	Numeric, vector, length 13: Custom ratios for a 12-note scale, starting with 1 (root) and ending in 2 (octave) to use when tuning = "custom". The A4 note will be set to A4 Hz and the rest of the frequencies will be built based on these ratios and the customRoot

A4	Float: Frequency for A4 in Hz. Default = 440
custom.root	String: Root note for just intonation (tuning = "custom"). Default = "C"
default.octave	Integer: If note is provided without octave number (e.g. "C"), default to this octave. Default = 4

Author(s)

E.D. Gennatas

Examples

```
note2freq(buildScale("B4", "minor"))
```

---

noteDistance *Note distance in semitones*

Description

Calculates note distance in semitones

Usage

```
noteDistance(notes)
```

Arguments

notes	String, vector: Notes in form c("C4", "Eb4", "Gb4")

Value

Vector of length length(notes) with semitone distances between successive notes

Author(s)

E.D. Gennatas

Examples

```
noteDistance(strings("C4 Eb4 Gb4 Bb4"))
```

playChord *Play Chord*

Description

Play Chord

Usage

```
playChord(
  chord,
  type = c("harmonic", "ascending", "descending"),
  oscillator = "sine",
  duration = 1,
  sample.rate = 44100,
  attack.time = 50,
  inner.release.time = 50,
  A4 = 440,
  plot = FALSE,
  ...
)
```

Arguments

chord	String, vector: Notes making up chord. e.g. c("A4", "C5", "E5"). e.g. output of buildChord
type	String: "harmonic", "ascending", "descending". Default = "harmonic"
oscillator	String: "sine", "square", "saw". Default = "sine"
duration	Float: Note duration in beats. Default = 1
sample.rate	Integer: Sample rate. Default = 44100
attack.time	Integer: Attack time. Default = 50 (Helps prevent popping)
inner.release.time	Integer: Release time, that ends on note OFF (instead of beginning at note OFF). Default = 50 (Also helps prevent popping)
A4	Float: Frequency for A4 in Hz. Default = 440
plot	Logical: If TRUE, plot chord using cplot.piano
...	Additional arguments to pass to note2freq

Value

The constructed waveform (invisibly)

Author(s)

E.D. Gennatas

Examples

```
## Not run:
playChord(buildChord("E4", "minor"))

## End(Not run)
```

`playFreq` *Play frequency*

Description

Play frequency

Usage

```
playFreq(
  frequency,
  oscillator = "sine",
  duration = rep(1, length(frequency)),
  BPM = 120,
  sample.rate = 44100,
  attack.time = 50,
  inner.release.time = 50,
  plot = FALSE
)
```

Arguments

`frequency`	Numeric, Vector: Frequency / frequencies to play
`oscillator`	String: "sine", "square", "saw". Default = "sine"
`duration`	Float: Note duration in beats. Default = 1
`BPM`	Integer: Beats per minute. Default = 120
`sample.rate`	Integer: Sample rate. Default = 44100
`attack.time`	Integer: Attack time. Default = 50 (Helps prevent popping)
`inner.release.time`	Integer: Release time, that ends on note OFF (instead of beginning at note OFF). Default = 50 (Also helps prevent popping)
`plot`	Logical: If TRUE, plot waveform

Author(s)

E.D. Gennatas

Examples

```
## Not run:
playFreq(440)

## End(Not run)
```

`playNote` *Play Note*

Description

Play Note

Usage

```
playNote(
  note,
  oscillator = "sine",
  duration = rep(1, length(note)),
  BPM = 120,
  sample.rate = 44100,
  attack.time = 50,
  inner.release.time = 50,
  A4 = 440,
  plot = FALSE,
  ...
)
```

Arguments

`note`	String, Vector: Note(s) to be played, e.g. c("Ab4", "B4")
`oscillator`	String: "sine", "square", "saw". Default = "sine"
`duration`	Float: Note duration in beats. Default = 1
`BPM`	Integer: Beats per minute. Default = 120
`sample.rate`	Integer: Sample rate. Default = 44100
`attack.time`	Integer: Attack time. Default = 50 (Helps prevent popping)
`inner.release.time`	Integer: Release time, that ends on note OFF (instead of beginning at note OFF). Default = 50 (Also helps prevent popping)
`A4`	Float: Frequency for A4 in Hz. Default = 440
`plot`	Logical: If TRUE, plot notes using cplot.piano. This support only two octaves; do not try plotting if your notes span more than two octaves.
`...`	Additional arguments to pass to note2freq

Author(s)

E.D. Gennatas

Examples

```
## Not run:
playNote("B4")

## End(Not run)
```

`playProgression` *Play Progression*

Description

Play Progression

Usage

```
playProgression(
  progression,
  oscillator = c("sine", "square", "saw", "triangle"),
  duration = 1,
  BPM = 120,
  sample.rate = 44100,
  attack.time = 50,
  inner.release.time = 50,
  A4 = 440,
  plot = FALSE,
  ...
)
```

Arguments

`progression`	List of string vectors: Each element of the list is a chord. e.g. output of buildProgression
`oscillator`	String: "sine", "square", "saw". Default = "sine"
`duration`	Float: Note duration in beats. Default = 1
`BPM`	Integer: Beats per minute. Default = 120
`sample.rate`	Integer: Sample rate. Default = 44100
`attack.time`	Integer: Attack time. Default = 50 (Helps prevent popping)
`inner.release.time`	Integer: Release time, that ends on note OFF (instead of beginning at note OFF). Default = 50 (Also helps prevent popping)
`A4`	Float: Frequency for A4 in Hz. Default = 440
`plot`	Logical. If TRUE, plot each chord in the progression using cplot.piano
`...`	Additional arguments to pass to note2freq

Author(s)

E.D. Gennatas

Examples

```
## Not run:
playProgression(buildProgression("G4", "minor"))

## End(Not run)
```

---

playWave *Minimal "Polyphonic" Wave Player*

Description

Play one or more waveforms at the same time using `audio::play`

Usage

```
playWave(wave, sample.rate = 44100, plot = FALSE)
```

Arguments

`wave`	Matrix or vector of waveforms. If a matrix, each column should be a waveform to be played simultaneously
`sample.rate`	Integer: Sample rate. Default = 44100
`plot`	Logical: If TRUE: plot wave using mplot.

Author(s)

E.D. Gennatas

Examples

```
## Not run:
playWave(freq2wave(440))

## End(Not run)
```

`strings` *Separate notes into vector of strings*

Description

Convenience function to separate notes into vector of strings

Usage

```
strings(x, sep = " ")
```

Arguments

`x`	String: A single character object which consists of multiple notes separated by `sep` e.g. `"C4 Eb4 G4 D5"`
`sep`	String: the character that separates notes in `x`. Default = `" "`

Details

Makes it easy to copy-paste notes into other functions e.g. `playChord(strings("C4 Eb4 G4 D5"))`

Author(s)

E.D. Gennatas

Examples

```
strings("C4 Eb4 Gb4 Bb4")
```

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