rir$_{generator Documentation}$

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CHAPTER

ONE

RIR_GENERATOR MODULE

1.1 Module reference

`rir_generator.generate`(*c*, *fs*, *r*, *s*, *L*, *beta=None*, *reverberation_time=None*, *nsample=None*, *mtype=mtype.omnidirectional*, *order=-1*, *dim=3*, *orientation=None*, *hp_filter=True*)

Generate room impulse response.

Parameters

- **c** (*float*) – Sound velocity in m/s. Usually between 340 and 350.
- **fs** (*float*) – Sampling frequency in Hz.
- **r** (*array_like*) – 1D or 2D array of floats, specifying the `(x, y, z)` coordinates of the receiver(s) in m. Must be of shape `(3,)` or `(x, 3)` where `x` is the number of receivers.
- **s** (*array_like*) – 1D array of floats specifying the `(x, y, z)` coordinates of the source in m.
- **L** (*array_like*) – 1D array of floats specifying the room dimensions `(x, y, z)` in m.
- **beta** (*array_like, optional*) – 1D array of floats specifying the reflection coefficients

  ```
  [beta_x1, beta_x2, beta_y1, beta_y2, beta_z1, beta_z2]
  ```

  or

  ```
  [(beta_x1, beta_x2), (beta_y1, beta_y2), (beta_z1, beta_z2)]
  ```

  Must be of shape `(6,)` or `(3, 2)`.

  You must define **exactly one** of `beta` or `reverberation_time`.
- **reverberation_time** (*float, optional*) – Reverberation time (T_60) in seconds.

  You must define **exactly one** of `beta` or `reverberation_time`.
- **nsample** (*int, optional*) – number of samples to calculate, default is `T_60 * fs`.
- **mtype** (`mtype`, *optional*) – Microphone type, one of *mtype*. Defaults to *mtype.omnidirectional*.
- **order** (*int, optional*) – Reflection order, default is `-1`, i.e. maximum order.
- **dim** (*int, optional*) – Room dimension (`2` or `3`), default is `3`.
- **orientation** (*array_like, optional*) – 1D array direction in which the microphones are pointed, specified using azimuth and elevation angles (in radians), default is `[0, 0]`.

- **hp_filter** (*boolean, optional*) – Enable high-pass filter, the high-pass filter is enabled by default.

Returns
h – The room impulse response, shaped *(nsample, len(r))*

Return type
array_like

Example

```
>>> import rir_generator
>>> h = rir_generator.generate(
...     c=340,
...     fs=16000,
...     r=[
...       [2, 1.5, 2],
...       [2, 1.5, 3]
...     ],
...     s=[2, 3.5, 2],
...     L=[5, 4, 6],
...     reverberation_time=0.4,
...     nsample=4096,
...     mtype=rir_generator.mtype.omnidirectional,
... )
```

class rir_generator.**mtype**(*value*)

Bases: Enum

Microphone type.

b = b'b'

bidirectional = b'b'

c = b'c'

cardioid = b'c'

h = b'h'

hypercardioid = b'h'

o = b'o'

omnidirectional = b'o'

s = b's'

subcardioid = b's'

CHAPTER

TWO

REFERENCES

Python- and C-based room impulse response generator, for use in convolutional reverb.

Official Python port of https://github.com/ehabets/RIR-Generator.

CHAPTER

THREE

EXAMPLE

```python
import numpy as np
import scipy.signal as ss
import soundfile as sf
import rir_generator as rir

signal, fs = sf.read("bark.wav", always_2d=True)

h = rir.generate(
    c=340,                    # Sound velocity (m/s)
    fs=fs,                    # Sample frequency (samples/s)
    r=[                       # Receiver position(s) [x y z] (m)
        [2, 1.5, 1],
        [2, 1.5, 2],
        [2, 1.5, 3]
    ],
    s=[2, 3.5, 2],            # Source position [x y z] (m)
    L=[5, 4, 6],              # Room dimensions [x y z] (m)
    reverberation_time=0.4, # Reverberation time (s)
    nsample=4096,             # Number of output samples
)

print(h.shape)                # (4096, 3)
print(signal.shape)           # (11462, 2)

# Convolve 2-channel signal with 3 impulse responses
signal = ss.convolve(h[:, None, :], signal[:, :, None])

print(signal.shape)           # (15557, 2, 3)
```

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BIBLIOGRAPHY

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[Hab20] Emanuël Habets. Ehabets/rir-generator: rir generator. October 2020. URL: https://github.com/ehabets/RIR-Generator, doi:10.5281/zenodo.4096349.

[Pet86] Patrick M. Peterson. Simulating the response of multiple microphones to a single acoustic source in a reverberant room. *The Journal of the Acoustical Society of America*, 80(5):1527–1529, 1986. doi:10.1121/1.394357.

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