
fsph Documentation

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fsph is a library to compute series of complex spherical harmonics.

Note: The Condon-Shortley phase is not included, although it is often used by many other libraries; to incorporate it, multiply the positive- m spherical harmonics by $(-1)^m$.

CHAPTER 1

Installation

Install from PyPI:

```
pip install --no-build-isolation fsph
```

Or from source:

```
git clone https://github.com/glotzerlab/fsph.git
cd fsph
python setup.py install
```


`fsph.pointwise_sph(phi, theta, lmax, negative_m=True)`

Evaluate a series of spherical harmonics on an array of spherical coordinates.

The array objects `phi` and `theta` should have the same length and can hold single- or double-precision floating point numbers. The resulting array will be of length $(N_coordinates, N_sphs)$ where $N_coordinates$ is the length of the given coordinate arrays.

To map the columns of the result array to particular (l, m) values, see `get_LMs()`.

Parameters

- **phi** – Array-like object of polar angles in $[-\pi, \pi]$
- **theta** – Array-like object of azimuthal angles in $[0, 2\pi]$
- **lmax** – Integer maximum spherical harmonic degree to compute (inclusive)
- **negative_m** – Set to `False` to disable the negative- m spherical harmonics

`fsph.get_LMs(lmax, negative_m=True)`

Returns the (l, m) indices in the order that they are exposed by `fsph`.

Creates a $(N_sphs, 2)$ array where the first column corresponds to the l values and the second column corresponds to the m values for any index in the series.

2.1 Tensorflow Operations

As of version 0.2, `fsph` can also compute spherical harmonic series of points on the CPU and GPU using tensorflow. This module is automatically built when tensorflow is found while installing `fsph`. GPU support is enabled when CUDA (specifically, the `nvcc` binary) is found while installing `fsph`.

`fsph.tf_ops.spherical_harmonic_series(inputs, lmax, negative_m)`

Compute a spherical harmonic series for a set of input points.

Parameters

- **inputs** – ($\dots, 2$) array of (phi, theta) values
- **lmax** – Maximum spherical harmonic l to compute
- **negative_m** – If True, compute for negative as well as positive m values

CHAPTER 3

Indices and tables

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