Lenstool parameter file: B-spline

1 Example for the *Lenstool* parameter file

The B-spline surface is implemented as a new potential in the same way than other such as dPIE or NFW ones. The surface is defined in the parameter file by two sections, the `potential` section which refers to the potential used and its associated parameters and the `limit` section which defines the prior for the optimisation. We provide the following example of both sections which is taken from the example supplied with the *Lenstool* source code:

```
potential   perturbative pot
    profil 814
    x_centre 0.1
    y_centre 0.1
    angle_pos 45.0
    degx 5
    degy 5
    n_coeff 5
    file_coeff coeff.txt
    size_patch 10.0
    z_lens 0.3475
    end
limit perturbative pot
    x_centre 1 -10.0 10.0 0.1
    y_centre 1 -10.0 10.0 0.1
    Bs_coeff 3 0.0 5.0 0.1
    size_patch 1 5.0 20.0 0.1
    angle_pos 1 -90. 90.0 0.01
    end
```

In the `potential` section, the `profil` parameter refers to the type of potential. A perturbed potential have the index 814. `x_centre`, `y_centre`, `angle_pos` and `z_lens` are associated with the coordinate of the centre of the B-spline surface, the position angle and the redshift of the lens, respectively. The polynomial degree of the B-spline basis each axis are provided through the parameter `degx` and `degy`. The parameter n is specified with `n_coeff`, the complete mesh is then automatically constructed by the software to match the one specified in Sect. **??**. There is a limit in the current implementation on the possible values of n which is 12. However, it can be extended to any values by changing the following line in `dimension.h`:

```
#define NPAMAX  182
```

Thus, 182 have to be changed to $38 + n^2$ to match the desired n, this increase the memory consumption. It is possible to indicate d_{latt} or $d_{\text{latt}}/(n+1)$ with the keywords `size_patch` or `size_lattice`, respectively; $d_{\text{latt}}/(n+1)$ is the size between two consecutive knots where they are uniformly spaced.

For the B-spline coefficient we use a text file that is specified with the `file_coeff` keyword. Each line in the text file represent the coefficient values associated with a B-spline potential. If you use more than one potential of this kind, you should use unique text file, with each line referring to one potential. The order of the line is the same order of potential appearance in the parameter file, and B-spline potentials should also be put before the other potentials. Figure 1 indicates how this text file is formatted and how this is translatable to models. It also shows the numbering of each basis. This numbering is used in MCMC output in the `bayes.dat` file.

The `limit` section work with the same formatting than other potentials. The first integer refers to the prior kind (1 for uniform and 3 for Gaussian priors). The two following floats are the lower and upper bound or the mean and the standard deviation, respectively. The last float refers to the precision.Each parameter is associated to the same keyword except the B-spline coefficient which all follows the same prior under the keyword `Bs_coeff`.

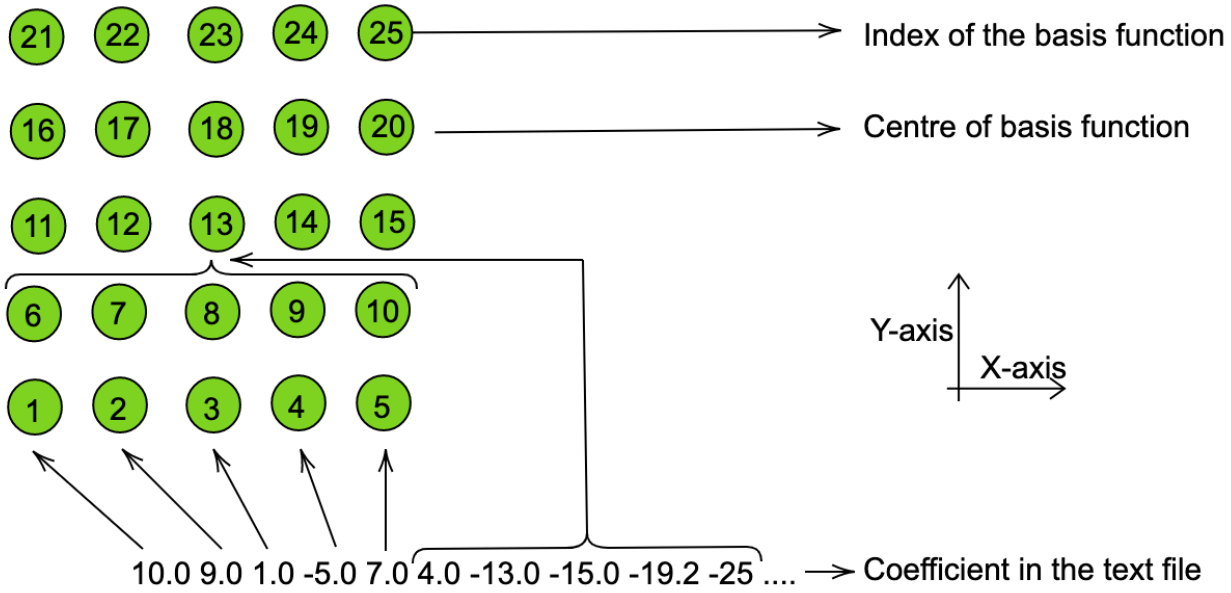

Figure 1: Formatting of the text file containing the values of the B-spline coefficients. Each lines of B-splines functions have their coefficient ordered one after the other inside the text file.