

QLab App - Use Manual

Miguel Angel Avila Torres - © 2021¹

¹Boyacá, Colombia

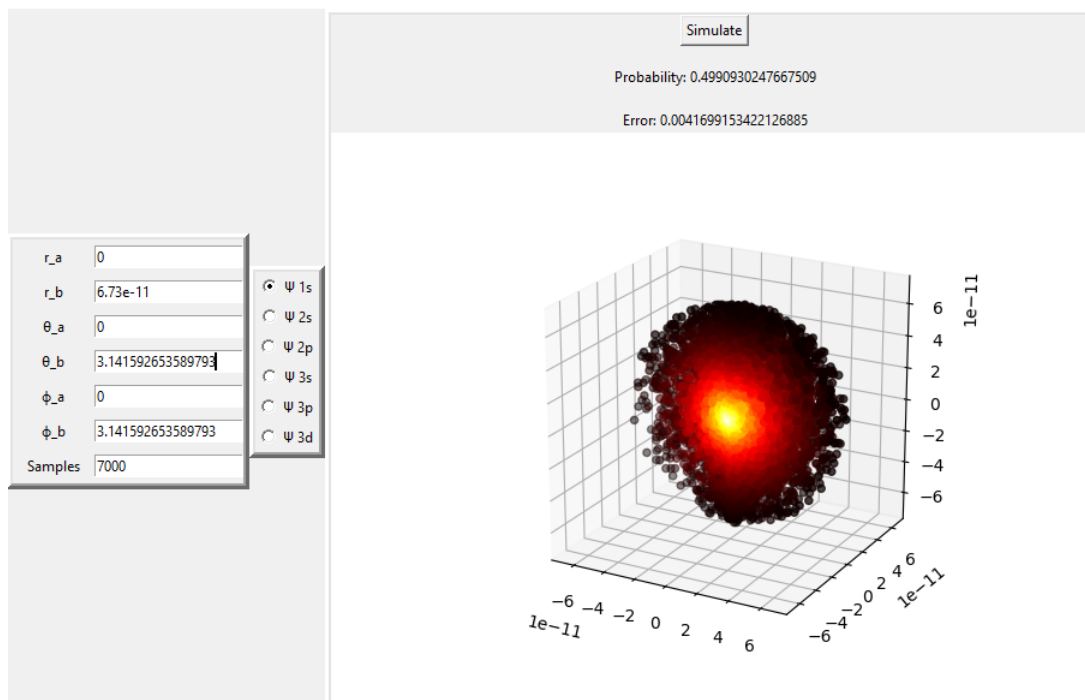
EXECUTING THE APPLICATION

Open the CMD and put the following commands

```
> cd [full path to where you have the QLab app folder]
> python qlab.py
```

That will start the program. Now, for Windows, Linux and Mac users it is the same procedure, go to the folder “QLab app” and put python qlab.py, It will work if you installed all the modules required.

MONTE CARLO INTEGRATION



As is showed in the image, the Monte Carlo integral has the parameters You can fill the parameters taking into consider

Application parameter	Equivalent Variable	Default Value
@r_a	r_a	0,E+0
@r_b	r_b	6,73E-11
@ θ _a	θ_b	0,E+0
@ θ _b	θ_b	2π
@ ϕ _a	ϕ_a	0,E+0
@ ϕ _b	ϕ_b	π
@samples	N	100

Table 1. Values and Parameters - Monte Carlo Integral

the following graph which shows how spherical coordinates works:

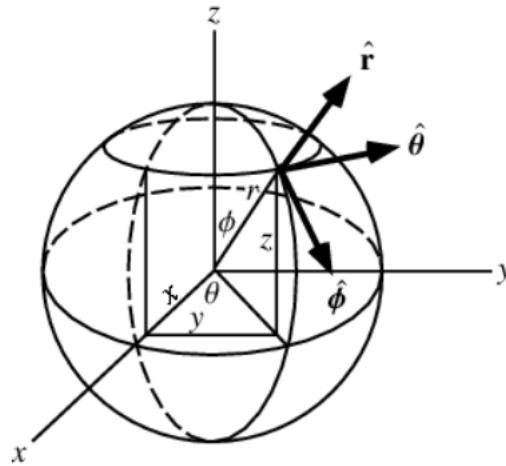


Figure 1. Source: <https://mathworld.wolfram.com/SphericalCoordinates.html>

Now, as to how was done the conversion from spherical coordinates to cartesian coordinates, it was done using the following equalities:

$$x = r \sin \theta \cos \phi \quad (1)$$

$$y = r \sin \theta \sin \phi \quad (2)$$

$$z = r \cos \theta \quad (3)$$

As a warning, try to not exceed the default values for the upper limits for this integral, being those @ θ _a, @ θ _b, @ ϕ _a, @ ϕ _b. That because the application was not programmed to normalize the angles (put them values into its initial value ranges). So, do not exceed for θ the value of 2π and for ϕ the value of π