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Data storage: HDF5

3 minute read

In this lesson we will learn how to store different kind of data on disk. For this purpose we will use `JLD.jl` (https://github.com/JuliaIO/JLD.jl), a Julia dialect of HDF5, which is a file format designed to store and organise large amounts of data.

Operating on `.jld` files

Installing `JLD.jl`

First of all we need to install `JLD`, to do it type the following code:

```
using Pkg
Pkg.add("JLD")
```

Exporting data

`JLD` can save to disk almost any form of data, including **variables, dictionaries** and even **concrete types**. In order to save some data, we first need to create a dictionary containing a string identifier for each element (the key in the dictionary) and the data. Then we can export that dictionary with the `save` function. For example, we can do it in this way:

```
1  using JLD
2
3  x = collect(-3:0.1:3)
4  y = collect(-3:0.1:3)
5
6  xx = reshape([xi for xi in x for yj in y], length(y), length(x))
7  yy = reshape([yj for xi in x for yj in y], length(y), length(x))
8
9  z = sin.(xx .+ yy.^2)
10
11 data_dict = Dict("x" => x, "y" => y, "z" => z)
12
13 save("data_dict.jld", data_dict)
```

At line 3-4 we define `x` and `y` (remember that `collect` transforms a range into an array), at line 6-7 we create a grid of `x` and `y` to compute all the possible combinations of `x` and `y`. At line 9 we compute z and at line 11 we create a dictionary containing the variables that we want to store: `x`, `y` and `z`. At line 13 we export `data_dict` through the `save` function to a file called `data_dict.jld`.

Reading data

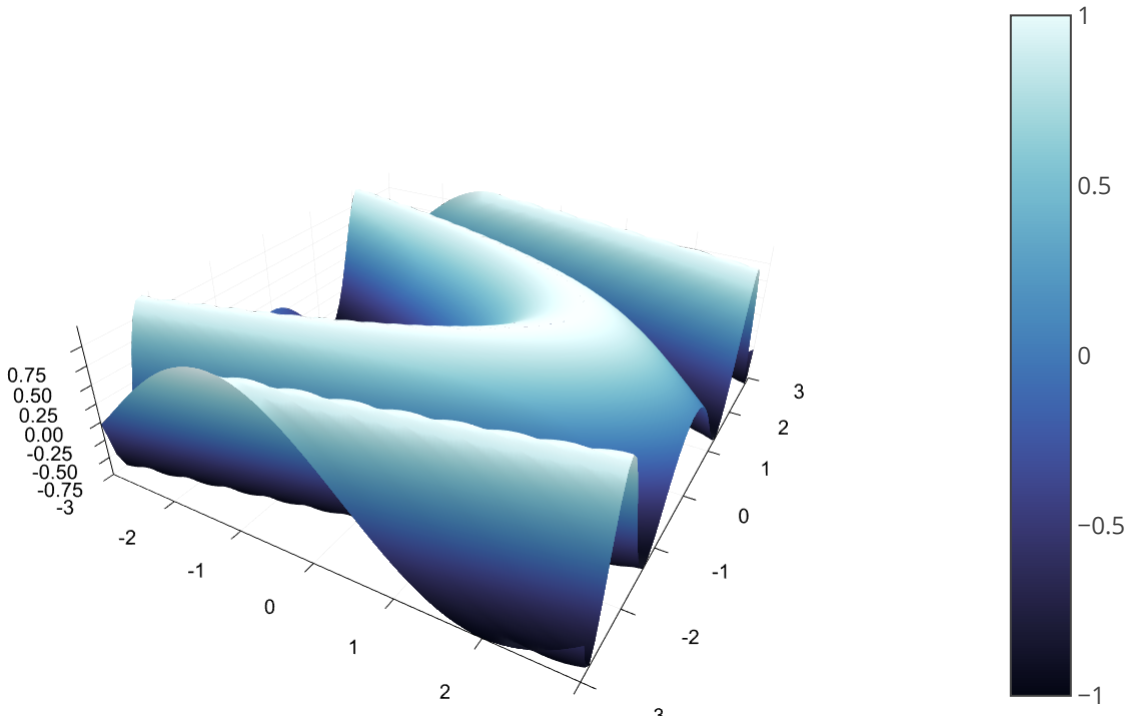
In order to demonstrate that the data is actually read from disk, please **restart the REPL**.

It is possible to read a `.jld` file through the `load` function:

```
1  using JLD
2  data_dict2 = load("data_dict.jld")
```

We can now inspect the content of `data_dict2` and perform some operations with the loaded data, for example we can plot it:

```
1  x2 = data_dict2["x"]
2  y2 = data_dict2["y"]
3  z2 = data_dict2["z"]
4
5  using Plots
6  plotly()
7
8  plot(x2, y2, z2, st = :surface, color = :ice)
```



Structures

It is also possible to **store structures** in `.jld` archives, which is done in the following way:

```
using JLD
struct Person
    height::Float64
    weight::Float64
end

bob = Person(1.84, 74)

dict_new = Dict("bob" => bob)
save("bob.jld", dict_new)
```

The file is loaded in the same way as before with one exception: the `Person` structure should be defined before loading the archive. Before running the following code please restart the REPL.

```
using JLD
struct Person
    height::Float64
    weight::Float64
end
bob2 = load("bob.jld")

>>>bob2["bob"]
Person(1.84, 74.0)
```

If we restart the REPL and we omit redefining `Person`, we get the following output:

```
using JLD

>>>bob3 = load("bob.jld")
Warning: type Person not present in workspace; reconstructing

>>>bob3["bob"]
JLD.var"##Person#402"(1.84, 74.0)

>>>bob3["bob"].height
1.84
```

As you can see at line 4, we were able to import the file but we didn't get a `Person` structure (line 7), as `Person` was not known at the time of the import. Nonetheless we can retrieve the data stored inside `bob`, as shown at line 9.

> At the time of writing, it is not possible to store data with units of measurement inside `.jld` files.

Conclusions

In this lesson we have learned how it is possible to store and retrieve data using `JLD.jl`. Moreover, in the case of structures, we have seen that it is better to define the desired structure before importing the data.

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