21/6/2024

OctoPyUs Simulation Package (status update)

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What's new

- A preliminary version of the OctoPyUs simulation package is ready to be downloaded and tested (Valerio, Lucia, Paolo already contacted)

What is available:
- Components: Mass, Beam, Blades, Spring
- Connections: Series, Parallel, Derivation, Ground
- Dynamical load computation
- Automatic topology solving

- A preliminary documentation has been uploaded on the TDS (VIR-0584A-24)

Next steps
- Controls
- Integrate in official gitlab repository
- Tutorial video

How to test the simulation package

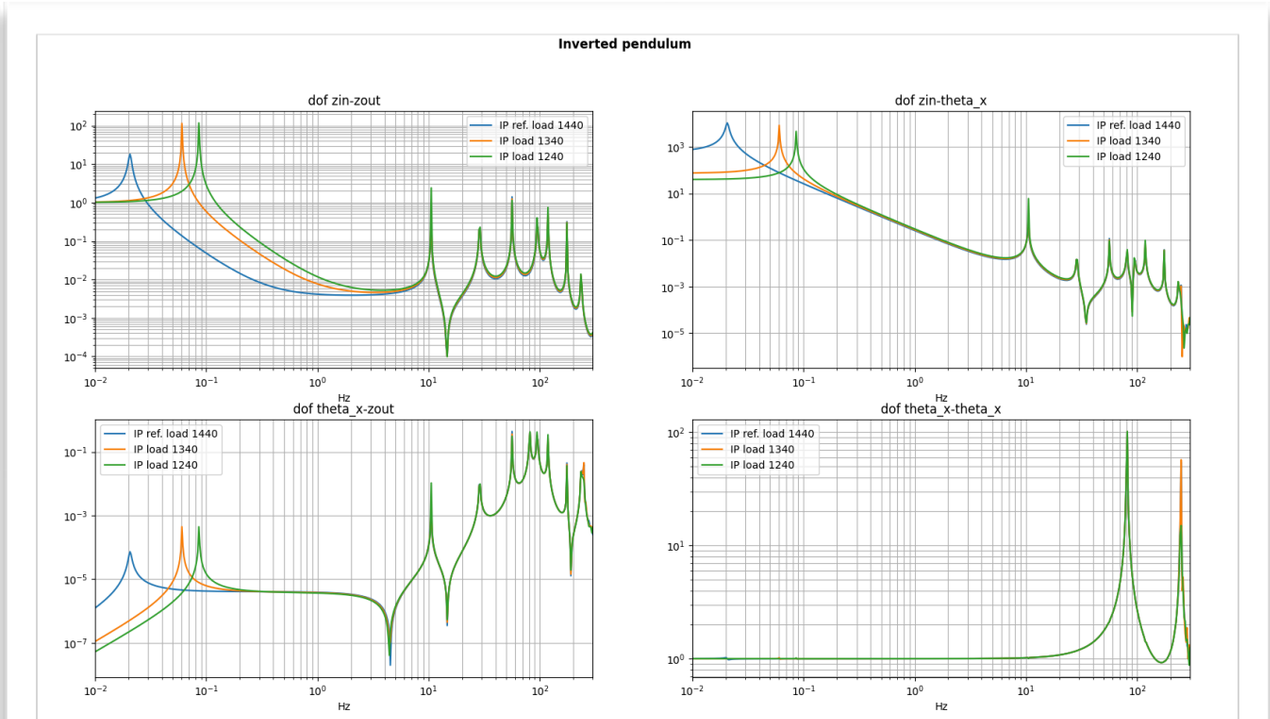
- Download the .zip file **octopyus_pack_v0.0.1.zip** at the following **link**
- Unzip in a dedicated folder (e.g. OCTOPYUS). There are three folders (**/data, /dist, /notebook**)
- From inside OCTOPYUS folder where the .zip file has been unzipped

pip3 install ./dist/octopyus-0.0.1.tar.gz

- To test the software: **cd notebook** (contains example scripts), then

python example.py or **python example2.py**

- The second example will simulate an inverted pendulum with different loads in the z θ degrees of freedoms (see Figure)
- A file **ip.png** should be now present in **data/figure** while in **data/simulation** there should be a file **IP1.pkl** with simulation data
- The folder **data/json** contains the .json files used for the simulation i.e., the description of the simulated elements



example2.py: IP under different loads

example2.py

```
import logging
import octopyus.engine.simulation as SIM
import octopyus.engine.dataview as DW

#set the log level during the simulation process: FATAL,
CRITICAL, ERROR, WARNING, DEBUG
logging.basicConfig(level=logging.WARNING)

#set the path of directories
jsonfilepath = "../data/json/"
simfilepath = "../data/simulation/"

#simulation
sim1 = SIM.simulate(jsonfilepath + "IP.json")

sim2 = SIM.simulate(jsonfilepath + "IP.json",
params=[{"elName": "susp_load", "param_list": {"mass": 1340}}])

sim3 = SIM.simulate(jsonfilepath + "IP.json",
params=[{"elName": "susp_load", "param_list": {"mass": 1240}}])

#save simulation
SIM.savesim(sim1, simfilepath + "IP1")
```

IP.json

- .json file containing names of elements and nodes (and parameters of the system) to be simulated. See documentation

Classes

- SIM, simulation method
- DW, plot results

- Based on nodes names (in - out) in the json file, the right connections are automatically implemented

- Parameters can be modified (e.g. mass) with **params**

- **With one file json different configurations can be simulated**

example2.py

```
#PLOT creation
data = DW.dataview(sim1)
fig, ax = DW.dataview.new_figure(title="Inverted pendulum", subplots=[2, 2], figsize=(10, 5))

label = label1

data.plotTF(ax[0,0], dof_in=2, dof_out=2, label=label, type_of_tf='XoXi', title="dof zin-zout")
data.plotTF(ax[0,1], dof_in=2, dof_out=3, label=label, type_of_tf='XoXi', title="dof zin-theta_x")
data.plotTF(ax[1,0], dof_in=3, dof_out=2, label=label, type_of_tf='XoXi', title="dof theta_x-zout")
data.plotTF(ax[1,1], dof_in=3, dof_out=3, label=label, type_of_tf='XoXi', title="dof theta_x-theta_x")

if "sim2" in locals():
    label = label2
    data2 = DW.dataview(sim2)
    data2.plotTF(ax[0,0], dof_in=2, dof_out=2, label=label, type_of_tf='XoXi', title="dof zin-zout")
    data2.plotTF(ax[0,1], dof_in=2, dof_out=3, label=label, type_of_tf='XoXi', title="dof zin-theta_x")
    data2.plotTF(ax[1,0], dof_in=3, dof_out=2, label=label, type_of_tf='XoXi', title="dof theta_x-zout")
    data2.plotTF(ax[1,1], dof_in=3, dof_out=3, label=label, type_of_tf='XoXi', title="dof theta_x-theta_x")

if "sim3" in locals():
    label = label3
    data3 = DW.dataview(sim3)
    data3.plotTF(ax[0,0], dof_in=2, dof_out=2, label=label, type_of_tf='XoXi', title="dof zin-zout")
    data3.plotTF(ax[0,1], dof_in=2, dof_out=3, label=label, type_of_tf='XoXi', title="dof zin-theta_x")
    data3.plotTF(ax[1,0], dof_in=3, dof_out=2, label=label, type_of_tf='XoXi', title="dof theta_x-zout")
    data3.plotTF(ax[1,1], dof_in=3, dof_out=3, label=label, type_of_tf='XoXi', title="dof theta_x-theta_x")

#save the picture in a png file
DW.dataview.save_figure(fig, "../data/figure/ip.png")

#show the result (this function is blocking)
DW.dataview.show_figure(fig)
```

Dataview

- Script example2.py also generate a plot of the TF
- plotTF: Matplotlib to generate, show and save plots

Preliminary Documentation

PRELIMINARY

OctoPyUs simulation results: Inverted pendulum and standard filter

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