



**VIRUP :
Project
Update**

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OUTLINE

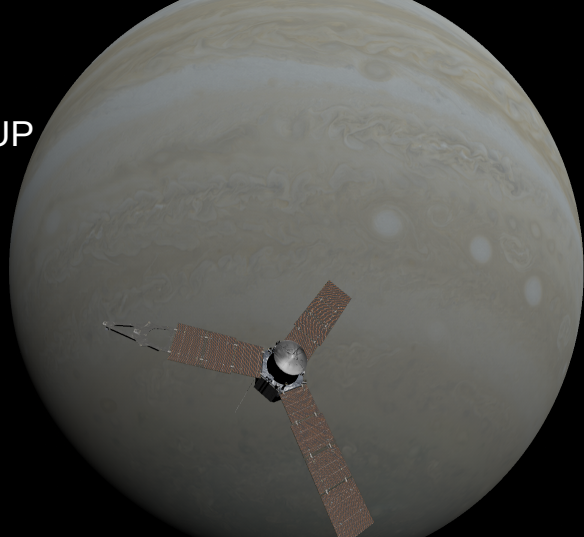
- Reminder about what VIRUP is
- Repositories Work in Progress
- Special Dataset type : Cosmological simulations

REMINDER : GOALS

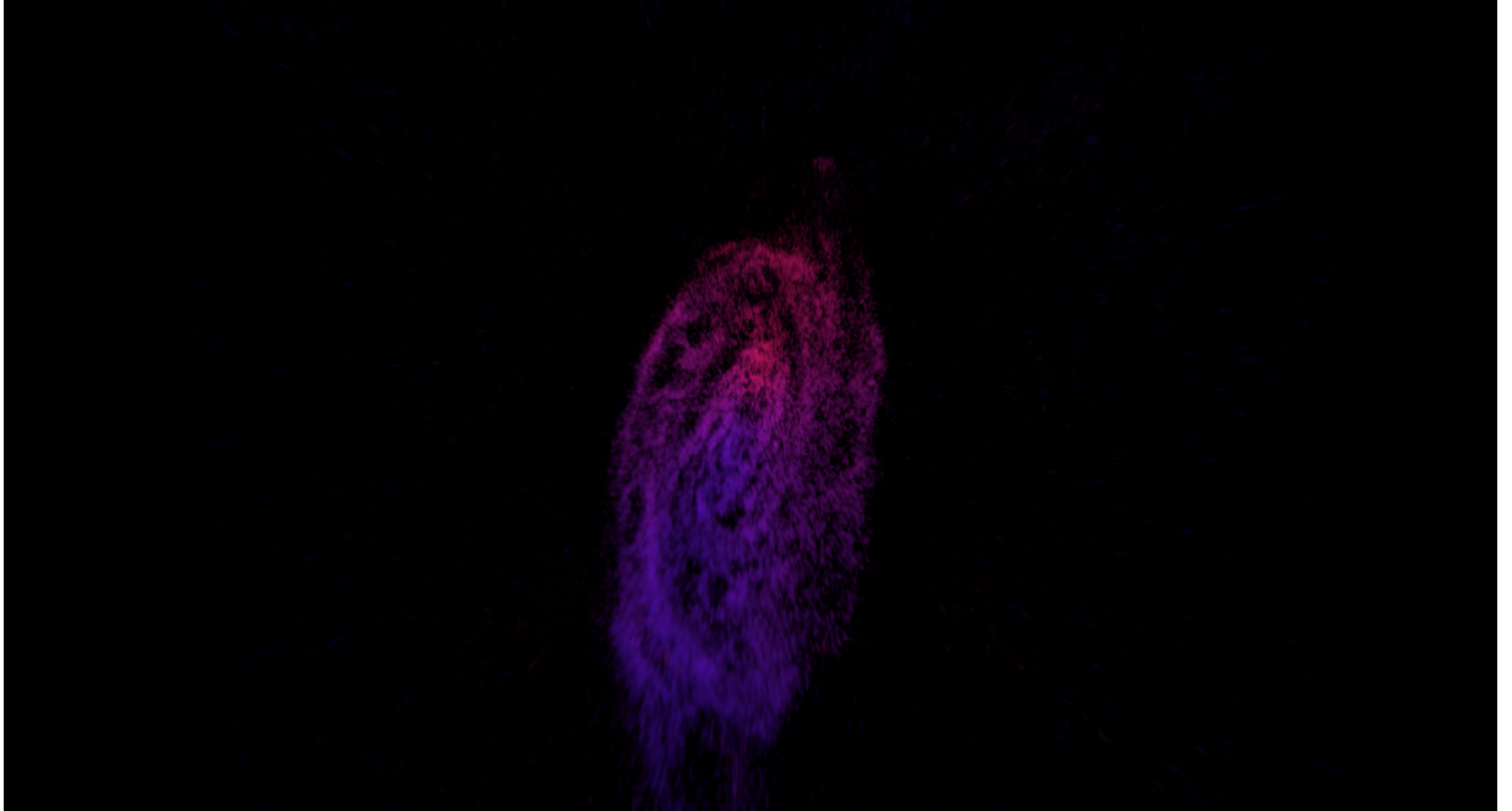
- Originally :
 - Make a VR real-time rendering application
 - Aggregate data from multiple large datasets
 - Help develop an intuition for the sense of scale in the Universe
- Added over the years :
 - Multimodality
 - Pre-rendered movies
 - More complex types of data (volumetric, dynamic, planetary science, etc...)

EPFL

VIRUP



EPFL VOLUMETRIC VISUALIZATION



FUTURE

- **Waiting for feedback on** an SNSF Agora proposal with Tanya Petersen and Yves Revaz
 - Focus on putting VIRUP in the hands of as many people as possible
 - Use social media and public events more
 - **Distribute data in a more accessible way to propose more datasets**
 - **Allow scientists to publish their data themselves or use the tool for their own outreach communication**
 - **Experiment with generative AI and voice recognition for automatic guidance through the data**
 - Support even more hardware
 - Dynamic cosmological simulations

REPOSITORIES : REGISTRY

Cache directory for remote data: ...

Repositories list:

Active	Path Type	Path	Remove
<input checked="" type="checkbox"/>	local	/florian/data/virup_local_repo	<input type="button" value="x"/>

local
http
git

DATASET EXAMPLE : COSMO. SIM.

Name :

Data unit (in kpc):

Reference frame:

Solar System local position: x : y : z :

Custom z-axis: x : y : z :

Brightness multiplier:

Type :

Gas Path: ...

Stars Path: ...

Dark Matter Path: ...

Load Dark Matter:

Temporal Series:

Gas Color:

Stars Color:

Dark Matter Color:

DATASET EXAMPLE : TEXTURED SPHERE

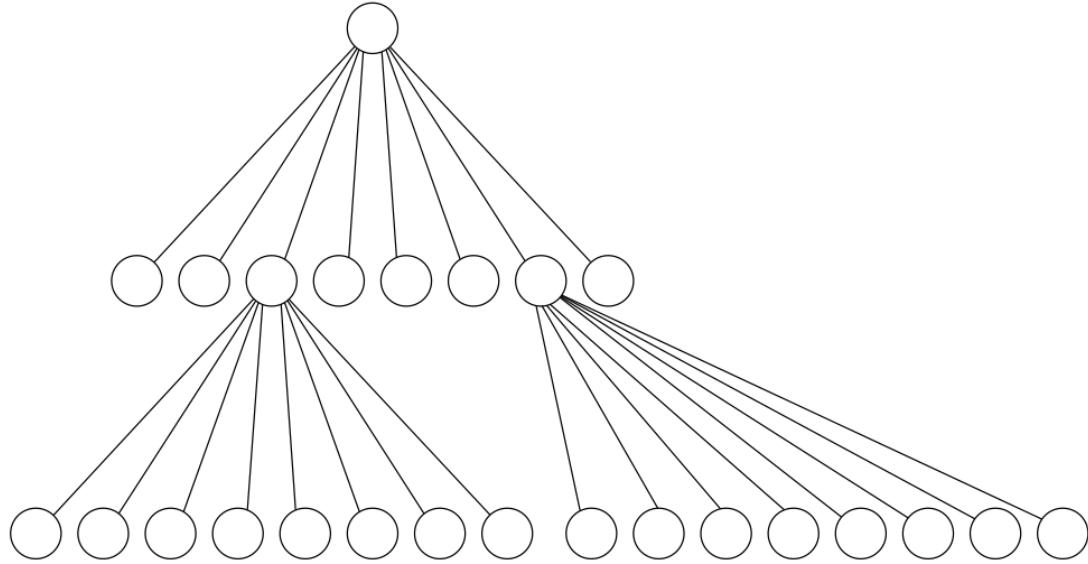
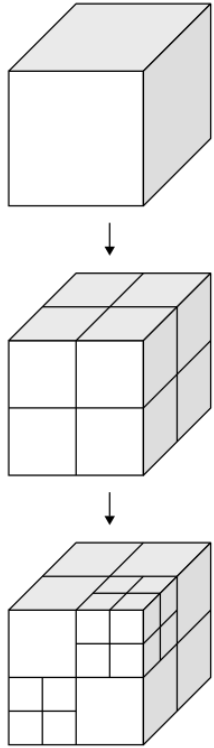
```
1  version = "1.0"  
2  type = "texsphere"  
3  
4  [universelement]  
5  name = "Cosmic Microwave Background"  
6  unit = 1.396488e+07  
7  referenceframe = "galactic"  
8  solarsyslocalpos = [0, 0, 0]  
9  customzaxis = [0, 0, 1]  
10 brightnessmul = 1000  
11  
12 [texsphere]  
13 file = "CMB.jpg"  
14 cullfrontfaces = true  
15
```

COSMOLOGICAL SIMULATIONS

- They are usually very large (tens of gigabytes **at least** just for positional data)
- They require acceleration structures to be rendered in real time to only render what is required for the current frame (requires fast loading independently of the storage technology)

=> We need a preprocessing step

OCTREE ACCELERATION STRUCTURE



OCTREEGEN : GUI

INPUT

Sample rate:

Random Octree HDF5

HDF5 file(s): ...

Specify radius
 Specify luminosity
 Specify RGB luminosity
 Specify density
 Specify temperature

Select particles coordinates:

- Header
- PartType0
 - Coordinates

Dataset path : Dataset selected

Select particles radius:

- PartType0
 - Coordinates
 - Masses
 - ParticleIDs

Dataset path : Dataset selected

OUTPUT

Disable Node Normalization
 Use ZSTD Compression

Max Particles Per Node:

Save as: auto ...

Generate octrees

OCTREEGEN : CLI

```
~> octreegen generate --input-random 1000000 --output random.octree
Generate :
Input options :
    Sample rate :                1

Input Type :                    RANDOM
    Particles number :          1000000
    Add radius :                off
    Add lum :                   off
    Add RGB lum :               off
    Add density :               off
    Add temperature :           off

Output options :
    Node normalization :        on
    zstd compression :          off
    Max particles per node :     16000

Output :                        random.octree

Constructing octree :
[ ] 100%
Writing octree to output file 'random.octree' :
[ ] 100%
Conversion successfull !
~>
```

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**Thank
you !**

go.epfl.ch/VIRUP

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