

**3dard.cnrs.fr :**  
**3D-Acquired Research Dataset**

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# Motivation 1/2

- **3d acquisition is ubiquitous,**  
**BUT**
- **Professional 3d acquisition remains costly**
  - Acquisition hardware: camera, scanners, UAVs
  - Acquisition process: takes time, need physical access, requires stable conditions (weather, lighting, surroundings, ...)
  - Processing: computationally demanding, needs human intervention, requires scalable architectures

# Motivation 1/2

- **3d acquisition is ubiquitous,**  
**BUT**
- **Professional 3d acquisition remains costly**
- **Computer Scientists lack access to such data**
  - Who supports the acquisition cost ?

# Motivation 2/2

- **Available datasets are very specific**

- CAD, robot SLAM

[deep-geometry.github.io/abc-dataset/](https://deep-geometry.github.io/abc-dataset/)



- **Available datasets are “too” simple**

- Small point-clouds/meshes (few millions of points)
- Miss detail about acquisition and processing

[texturedmesh.isti.cnr.it/](https://texturedmesh.isti.cnr.it/)



# Our proposal

- **3d acquisition**

- Made by practitioners
- Using professional means
- Using different modalities

- **Processing**

- Following professional workflow
- Detail each process and inputs/outputs

- **Sharing**

- Deliver metadata and data under CC non-commercial Licence

# Team

- **A multidisciplinary team**
  - Computer Scientists and Engineers
  - 3d acquisition and Cultural Heritage experts



Mellado Nicolas  
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Chargé de Recherche



Marcadet Quentin  
Archeovision  
Intern



Espinasse Loic  
Archeovision  
Chef de projet restitution/valorisation



Mora Pascal  
Archeovision  
Chef de projet numérisation 3D



Bruno Dutailly  
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Ingénieur d'Étude, développeur 3D



Sarah Tournon-Valiente  
Archeovision  
Ingénieure de la donnée



Xavier Granier  
Archeovision  
Directeur Scientifique

# Team

- **Powerful logistics and means**

- 3d acquisition
- Reconstruction/Processing
- Modeling
- Storage
- Dissemination



archeogrid.fr



shs3d.hypotheses.org



huma-num.fr

# Dataset overview and structure

- **Objectives**

- Allow multiple versions of an asset:
  - Acquired point-cloud
  - Photos, masks
  - Photogrammetry reconstruction
  - Cleaned point-clouds
  - Clean mesh
  - Textured low-poly mesh
  - ...
- Allow dataset exploration in python



# Dataset overview and structure

- **Objectives**

- Allow multiple versions of an asset:

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    - ...

- Allow dataset exploration in python



“units”



asset/unit.json

# Dataset overview and structure

- **Assets**

- Description of the physical object/scene

```
asset.json
=====
{
  "name" : "My fancy asset",
  "slug" : "my-fancy-asset",
  "uuid" : "0000",
  "description" : "",
  "owner" : "Le Louvre",
  "url" : "https://optional-link-to-website-describing-the-asset.com"
}
```

*Json file templates are not in final version and might be updated*

# Dataset overview and structure

- **Assets/Units**
  - Description of a process that outputs data
    - Acquisition units: produces raw material
    - Processing units: processes previous units outputs

# Dataset overview and structure

- **Assets/Units**
  - Acquisition

```
unit.json
=====
{
  "name"       : "Scan Left Lady of Elche",
  "slug"       : "scan_left_lady_of_elche",
  "author"     : "MARCADET Quentin <AAAA.BBBB@CCC.DDD>",
  "type"       : "acquired",
  "id"         : "0000",
  "hardware"   : ["FaroArm"],
  "software"   : ["Geomagic Wrap"],
  "description": "3 clouds for Lady of Elche (left view)",
  "details"    : "Acquisition rate: 10kpts/minutes",
  "inputs"     : [""],
  "outputs"    : [
    { "filename": "scan000.pcd" },
    { "filename": "scan001.pcd" },
    { "filename": "scan002.pcd" }
  ]
}
```

# Dataset overview and structure

- **Assets/Units**
  - Processing

```
unit.json
=====
{
  "name"       : "Registered Faro Scans",
  "slug"       : "registered_faro_scans",
  "author"     : "MELLADO Nicolas <nicolas.mellado@irit.fr>",
  "type"       : "processed",
  "id"         : "0005",
  "hardware"   : [""],
  "software"   : ["OpenGR"],
  "description": "Aligned version of the Faro scans",
  "details"    : "Parameter setting for all pairs: o=0.7, d=1.4",
  "inputs"     : ["0000", "0001", "0002", "0003", "0004"],
  "outputs"    : [
    {
      "filename": "aligned.ply",
      "description": "Point-cloud composed by all inputs aligned in the
frame of 0000.",
    },
    {
      "filename": "0001-scan000.mat",
      "description": "Transformation matrix computed for 0001-
scan000.pcd",
    }, ...
  ]
}
```

# Acquired objects

- **Lady of Elche**

[https://en.wikipedia.org/wiki/Lady\\_of\\_Elche](https://en.wikipedia.org/wiki/Lady_of_Elche)

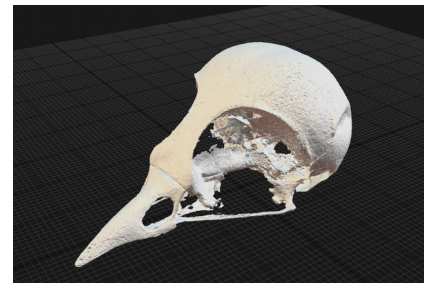
- 2 acquisition modalities
  - Faro ScanArm (anisotropic sampling)
  - Photogrammetry (Nikon D850)
- 12 units
  - Acquired: Faro scans (front, back, left, right, top), photos
  - Processed: Faro meshes (aligned, high, medium), processed photos, point-clouds (2 versions)
  - *Coming: textured + low-poly meshes, another lasers scan*



# Acquired objects

- **Bird skull**

- 3 acquisition modalities
  - ARTEC scanner
  - Photogrammetry (Nikon D850-macro)
  - Micro-tomography
- Photogrammetry challenge
  - thin bones are transparent
  - tomography defines GT



# Acquired objects

- **Engraved bone**
  - 2 acquisition modalities
    - Photogrammetry (Nikon D850-macro)
    - Micro-tomography
  - Reconstruction challenge
    - Thin engraved shapes





# Next steps: units

- **Registration units**

common frame for raw+photogrammetry

- **Cleaning units**

noise and outliers removal by experts

- **Meshing (tri/quads), Uvs, texturings units**

# Next steps: assets

- **Domaine Haut-Carré**
  - UAVs + photogrammetry
  - Mesh modeling and orthophotos
- **Lugasson Stone-pit**
  - Laser scanning + photogrammetry
- **Objects with complex appearance**
  - Musée ethnographique de bordeaux
  - Laser scanning + photogrammetry



# Take-home message

- **A new dataset**
  - combining acquired and processed data
  - generated by experts using state of the art hardware and software
- **Provides**
  - Metadata for scripting
  - GT for several processing steps: photogrammetry, cleaning, meshing
  - Multiple acquisition modalities
- **Shared under Creative Commons**

# 3D-Acquired Research Dataset

- Thanks for your attention



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