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CROWD DNA

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Acronyms and Abbreviations

CDI	Crowd Dynamics International Limited
INRIA	Institut National De Recherche En Informatique Et Automatique
ONH	Onhys
WP	Work-package
MoCap	Motion Capture
URJC	Universidad Rey Juan Carlos

1. Introduction

This report details the work completed to achieve deliverable D1.3-Numerical Dataset. The data presented consists of two modalities: first, a dataset of interactions between two people that was captured with MoCap suits at the INRIA facilities; and second, a dataset of dense 3D crowd motions that were synthetically simulated using state-of-the-art crowd simulation software and then lifted to 3D by rigging 3D characters following the trajectories obtained by the simulator. Both datasets contain detailed numerical information, including 3D body pose parameters and global position, as well as images and renders that can be leverage to train data-driven crowd simulation and body interaction algorithms.

2. Two-person interaction dataset

2.1. Dataset description.

This dataset consists of 55,800 frames of two-people in interaction. The original data was captured with MoCap suits at the INRIA facilities, which we then converted to 3D skeletons parameterized by joint angles. To increase the variability in poses, we augmented the original data by applying randomized rotation offsets to a selection of degrees of freedom, producing a wide variety of combinations of poses that are in close interaction.

2.2. Tutorial to visualize the data.

To visualize the dataset, follow the steps below:

1. Download the dataset and unzip the file.

   https://urjc-my.sharepoint.com/:u:/g/personal/dan_casas_urjc_es/ETTm2aUvE81Hg5Xr01ntmlUBdmzNPUKIQPCunqnZJFxUMw?e=yO1dVv

2. Review contents of the folder:

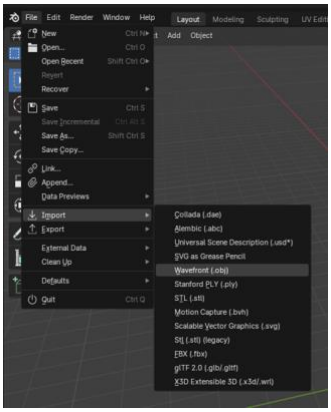
   - The **dataset folder** containing all the avatar poses encoded in **JSON** files.

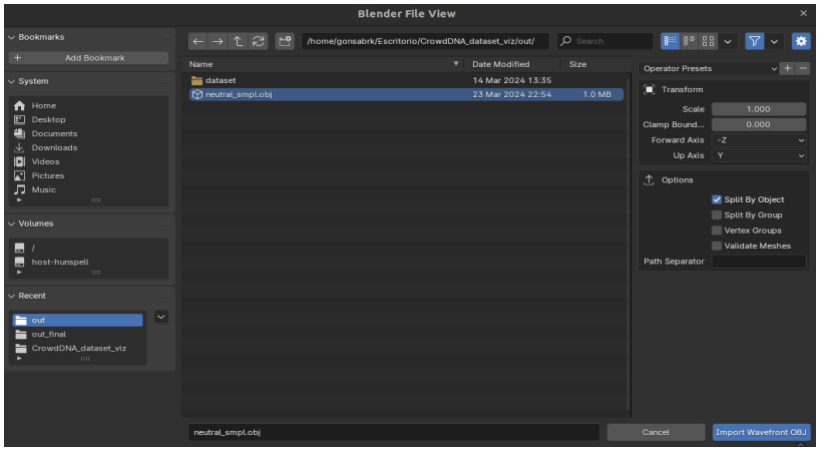
   - 2 **PC2** files for visualizing each subject appearing on each frame of the dataset (*dataset_a.pc2* and *dataset_b.pc2*).

   - An **OBJ** for visualizing the avatars named neutral_*smpl.obj*.

   - A **README** file.

3. Open Blender and import twice the neutral *smpl bodies* using the **OBJ** file.

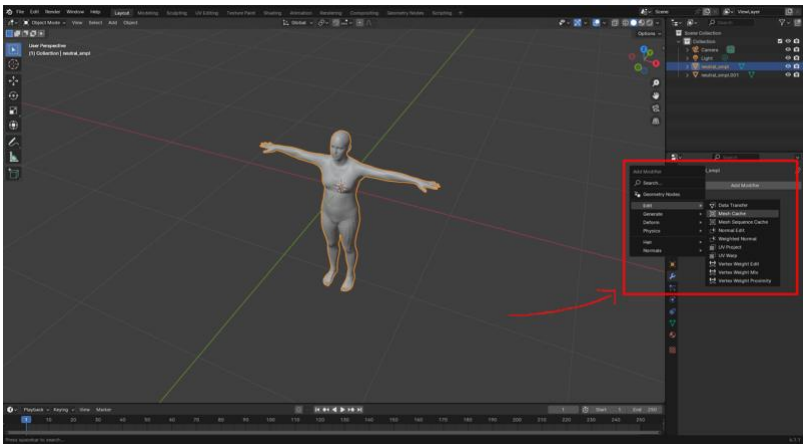




4. Add a **Mesh Cache modifier** for each body selecting each of them first:

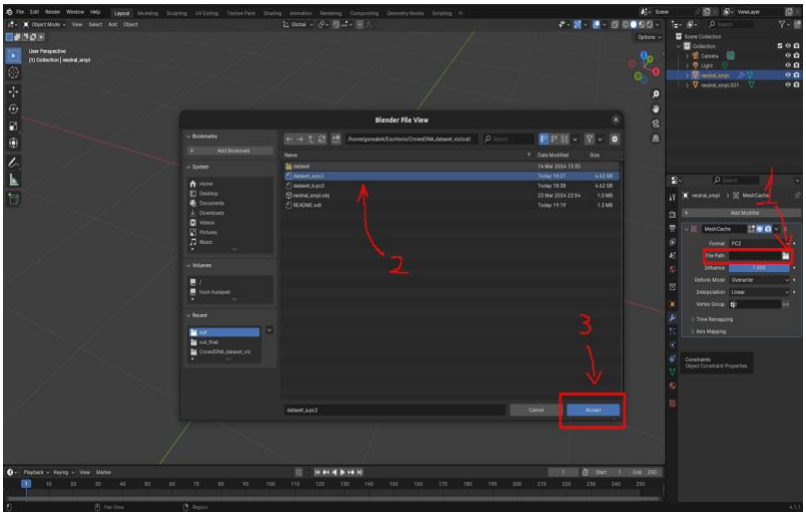
    - Select the first or second body model in the scene.
    - Go to the *modifiers* tab.
    - Click on *Add Modifier* button.

- The modifier is found on **Add Modifier** > **Edit** > **Mesh Cache**.



- Change format from **MDD** to **PC2**.

- Click on the file path folder button to the right of the label to search the directory where the pc2 are located, and select the one that you want to visualize with the first avatar (then do the same for the second avatar but with the other pc2 file left).



- Repeat for the other body left (the one that is still posed in T-pose).

5. Now all the dataset has been loaded as an animation in Blender. To explore, the data we have to go to the animation timeline at the bottom of the Blender GUI. Each frame of the animation corresponds to one interaction between two subjects in contact (correctly solved with our physics simulator). You now can move the blue line to any frame that you want to visualize, or even hit the play button and reproduce an automatic visualization of all the dataset.

6. Finally just make sure that the Starting frame number is **1** and that the Ending frame number is **60000** for being able to explore all the data.

3. Dense 3D crowd dataset

3.1. Dataset description.

This dataset contains sequences of crowded scenarios that were captured and processed in the project. Specifically, the trajectories used in the dataset were captured in Wuppertal, processed by FJZ to extract 2D trajectories of each individual, and converted to 3D articulated crowds by URJC.

The dataset is split into different types of data, which is crucial to train data-driven algorithms. For each sequence, the dataset provide: original images from different viewpoints, 2D trajectories of each individual, 3D meshes for each individual (obtained by articulating the 2D trajectory with a parametric body model), 3D contact maps between individuals at each frame, 3D renders of each viewpoint, 2D optical flow for each viewpoint, and 2D pixel-to-surface correspondences of the individuals that appear on the camera.

The dataset can be downloaded from the following link:

https://urjc-my.sharepoint.com/:u:/g/personal/melania_pmartin_urjc_es/Eb-KAQJD4elNgOF7szHjR-YB-q2cgYZTJQ9TGHe-uvsszQ?e=2OXd1a (20 GB)

Figure 1. Samples of the dataset. Left, real frame with ground truth velocity fields. Right, 3D render obtained from the original 2D trajectories, and the estimated velocity field.

3.1. Dataset summary.

```
root
│
└──test_flow_depth_densepose   # Input EXR images for
|   └ 768 x 768                # File of views with 768x768 resolution
|           └ 000N             # Files for each view (0002, 0004)
|            └ EXR files       # EXR images
|   └ 1024 x 768               # File of view with 1024x768 resolution
|       └ 000N                 # File for view 0000
|            └ EXR files       # EXR images
└──train_flow_depth_densepose  # File containing all training EXR images
|   └ 768 x 768                # File of views with 768x768 resolution
|           └ 000N             # Files for each view (0002, 0004)
|            └ EXR files       # EXR images
|   └ 1024 x 768               # File of view with 1024x768 resolution
|       └ 000N                 # File for view 0000
|            └ EXR files       # EXR images
|
└──validation_heat             # Validation heat maps used to code anomalies
|   └ 768 x 768                # File of views with 768x768 resolution
|           └ 000N             # Files for each view (0002, 0004)
|            └ PNG files       # PNG heatmap images
|   └ 1024 x 768               # File of view with 1024x768 resolution
|       └ 000N                 # File for view 0000
|            └ PNG files       # PNG heatmap images
|
└──validation_flow_depth_densepose          # File contaning all validation EXR
|   └ 768 x 768                # File of views with 768x768 resolution
|           └ 000N             # Files for each view (0001, 0005)
|            └ EXR files       # EXR images
|   └ 1024 x 768               # File of view with 1024x768 resolution
|       └ 000N                 # File for view 0003
|            └ EXR files       # EXR images
|
└──validation_heat             # Validation heat maps used to code anomalies
    └ 768 x 768                # File of views with 768x768 resolution
            └ 000N             # Files for each view (0001, 0005)
             └ PNG files       # PNG heatmap images
    └ 1024 x 768               # File of view with 1024x768 resolution
        └ 000N                 # File for view 0003
             └ PNG files       # PNG heatmap images
```