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ShapeWorks Documentation

ShapeWorks : Script Usage

Shireen Elhabian, Praful Agrawal, Riddhish Bhalodia,
Joshua Cates, Manasi Datar, Ross Whitaker

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Abstract

This document describes the usage of the bash scripts for running the ShapeWorks optimization functionality.

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1 Usage

We provide two command line scripts for the two different mode of operations for the *ShapeWorks* particle optimization. These scripts uses the processed (groomed to the signed distance transform) data and generates the directory structure, construct the parameter files and executed the required binaries. Using these scripts for both single scale mode as well as multi-scale hierarchical mode is described as follows.

1.1 Single Scale Operation

ShapeWorks in a single scale model of operation means it takes a fixed number of particles (usually a power of 2 like 256, 512, ...) and performs the operation in following steps.

- It splits the particles with surface based entropy term till the desired number of particles is achieved. These are initialized that they are independently spread out uniformly on each shape.
- Then it performs the full optimization using the surface as well as population based entropy terms of the ShapeWorks optimization and bringing the points on all the shapes into correspondence.

The script which performs this is `SingleScaleShapeWorksRun.sh`, whose usage is given as ./SingleScaleShapeWorksRun.sh –data_dir $1 –out_dir $2 –verbosity $3
–model_suffix $4 –num_particles $5 –start_reg $6 –end_reg $7
–procrustes_interval $8

Parameter Description:

- `data_dir`: Path to the directory containing the processed data in form of signed distance transform.
- `out_dir`: The directory where you need to save the output produced by the ShapeWorks optimization.
- `verbosity`: (Optional) 0 : almost zero verbosity, 1: minimal verbosity, 2: Default verbosity, 3: full verbosity.
- `start_reg`: (Optional) Sets the starting regularization value (refer to the parameter description documentation of *ShapeWorksRun*).
- `end_reg`: (Optional) Sets the ending regularization value (refer to the parameter description documentation of *ShapeWorksRun*).
- `model_suffix`: (Optional) (default : model)
- `num_particles`: Number of particles, a power of 2 like 256, 512...
- `procrustes_interval`: (Optional) (default = 0) Flag for the turning on and off the procrustes correction during optimization.

1.2 Multiple Scale Operation

ShapeWorks in a multi scale operation means we run the entire code for different particle numbers in a hierarchical manner. In more detail, we start the ShapeWorks with a low number of particles, say 64 particles and perform the ShapeWorks single scale using this many particles, then we move to the next power of 2 number of particle which is 128, and using the ShapeWorks output of 64 particles as initialization for the next level. We do this till the desired number of particles is reached. This way of performing ShapeWorks results in more robust shape models as the optimization using the full objective function is happening at each level.
Automated bash script for multi scale operation of ShapeWorks performs all stages of the processing and constructing the relevant parameter files in process. The usage of the script is given as follows:

./RunShapeWorksMultiScale.sh –data_dir $1 –out_dir $2 –verbosity $3 –model_suffix $4 –start_reg $5 –end_reg $6 –procrustes_interval $7 –max_num_particles $8 –min_num_particles $9

The parameters for this are the same as that of the single scale operation, instead of specifying the number of particles there is instead `min_num_particles` and `max_num_particles`, which are argument tags for the starting number of particles (for example 64) and the ending number of particles (for example 2048) respectively.