A Skinned Multi-Person Linear Model (SMPL)

Master Seminar

At Friedrich-Alexander-Universität Erlangen-Nürnberg at the Masters in Data Science in the Data Science Department

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SMPL is a realistic 3D model of the human body that is based on skinning and blend shapes and is learned from thousands of 3D body scans.

Originally developed using Python, heavily relies on libraries such as PyTorch , smplx , Homogenus, opencv-python, configargparse , loguru and PyYAML.

To generate a model with the Skinned Multi-Person Linear Model (SMPL), set up your environment by installing the necessary libraries and downloading the SMPL model files.
Load the model, define and convert shape and pose parameters from the dataset into tensors, and generate the body mesh.

Finally, use Open3D to visualize the resulting 3D human body model.

During this procedure, I encountered difficulties, which I addressed by implementing the following changes:

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1. Resolved Name, Runtime, and Indentation Errors.
2. Added comments in the code to clarify each step's purpose and functionality.
3. Replaced specific lines of code with updated methods to improve efficiency.
4. Updated the simulation of model orientation and grouping.
5. Validated and customized the reformatted output.

Original Resource link:

1. https://github.com/nghorbani/human_body_prior#egg=human_body_prior
2. https://smpl-x.is.tue.mpg.de/download.php
3. https://github.com/vchoutas/smplx/tree/main/transfer_model

Updated repository:

Link: https://github.com/firozfau/smpl

Experiments and Extensions:

Conducted tests to evaluate the performance and accuracy of the Skinned Multi-Person Linear Model (SMPL) under various conditions, assessing the impact of different shape and pose parameters on the generated body mesh.

```
(base) frzf7@frzf7 smplx % clear
(base) frzf7@frzf7 smplx %  python codeHub/main.py --model-folder /Users/frzf7/Documents/www/python_server/computer_vision/smplx/smplx/models --plot-joints true --genders
neutral male female
SMPLX(
  Gender: NEUTRAL
  Number of joints: 55
  Betas: 10
  Number of PCA components: 6
  Flat hand mean: False
  Number of Expression Coefficients: 10
  (vertex_joint_selector): VertexJointSelector()
)
SMPLX(
  Gender: MALE
  Number of joints: 55
  Betas: 10
  Number of PCA components: 6
  Flat hand mean: False
  Number of Expression Coefficients: 10
  (vertex_joint_selector): VertexJointSelector()
)
SMPLX(
  Gender: FEMALE
  Number of joints: 55
  Betas: 10
  Number of PCA components: 6
  Flat hand mean: False
  Number of Expression Coefficients: 10
  (vertex_joint_selector): VertexJointSelector()
)
(base) frzf7@frzf7 smplx %
```