[0004] Imagery (e.g., animation frames, still images, etc.) generated to represent simulated objects, and the simulated objects themselves, can be created in computer-readable form, either procedurally or manually. For example, an image of a sphere might be generated procedurally from a user input of a center location, a radius parameter, and a color. In another example, a more complex object might be generated procedurally from a set of parameters and a set of procedural rules for object creation. Objects might also be created manually, such as by having an artist draw into a computer system the shape of an object. In some cases, an artist might manually adjust a procedurally-generated object. In many instances, it might be preferred to maintain a procedural representation of objects further into an imagery generation process so that editors have more opportunities to make adjustments at a procedural level rather than manual touch-ups.

[0005] A weighted principal component analysis process has been proposed in Koren, et al. (Koren, Y. and Carmel, L., "Visualization of Labeled Data using Linear Transformations", in Proceedings of IEEE Information Visualization, vol. 00:16, 2003) herein "[Koren]").

[0006] Weighted covariance matrices have been proposed in Yu, J., and Turk, G., "Reconstructing Surfaces of Particle-Based Fluids Using Anisotropic Kernels", ACM Transactions on Graphics (TOG), No. 5 (February 2013)(hereinafter "[Yu]").

[0007] It is an object of at least preferred embodiments to address at least some of the aforementioned disadvantages. An additional or alternative object is to at least provide the public with a useful choice.

SUMMARY

[0008] A simulation system as described herein can process a procedural representation of objects simulated by particles to provide representations of object surfaces as described herein.

[0009] One general aspect includes a computer-implemented method for modeling surfaces of simulated objects under the control of one or more computer systems configured with executable instructions. The method includes receiving positions and sizes for each particle of a plurality of particles including a first object; identifying a subset of the plurality of particles whose positions are proximate to a first implied surface of the first object; deforming particles of the subset of the plurality of particles to form a set of deformed particles by generating a covariance matrix for each particle of at least some particles of the plurality of particles, wherein the covariance matrix corresponds to a diagonal stretch matrix operated on by a non-linear function and wherein the