CLAIMS

1. An animation system for generating a weighted interpolation between two or more morph target shapes, the animation system comprising:

input means to receive a set of input weightings on morph target shapes for the weighted interpolation to be generated;

a multi-variate continuous interpolation function, wherein given a set of shapes including morph target shapes and constraint shapes representing weighted combinations of morph target shapes, the multi-variate continuous interpolation function is configured to reproduce morph target shapes and constraint shapes when corresponding weights are provided as input weightings on morph target shapes to the multi-variate continuous interpolation function; and

means for generating the weighted interpolation by using the input weightings as arguments to the multi-variate continuous interpolation function.

2. A method for generating a weighted interpolation between two or more morph target shapes relative to a base shape, the morph target shapes each including a plurality of topologically consistent vertex coordinates, including the steps of:

receiving a plurality of input constraint shapes including a plurality of vertex coordinates topologically consistent with those of the morph target shapes, each input constraint shape associated with non-zero weights on one or more of the morph target shapes;

generating additional constraint shapes for a plurality of new weightings on morph target shapes using the input constraint shapes, and associating the additional constraint shapes with their respective new weightings;

receiving interpolation weightings for each of the two or more morph target shapes;

generating an interpolation function for interpolating between the two or more morph target shapes using the base shape, the input constraint shapes and the additional constraint shapes;

using the interpolation weightings as arguments to the interpolation function to generate vertex coordinates corresponding to the weighted interpolation between the two or more morph target shapes.

3. The method of claim 2 wherein at least one input constraint shape is a combination shape corresponding to a combination between the two or more morph target shapes with unitary weights.

4. The method of claim 2 or claim 3 wherein at least one input constraint shape is an incremental shape corresponding to a partial weighting of one or more of the morph target shapes.

5. The method of claim 2 wherein the additional constraint shapes are generated at new weightings such as to complete or augment an n-dimensional cube wherein morph target shapes are dimensions of the n-dimensional cube having the base shape as the origin and edges of the n-dimensional cube as weightings on morph target shapes.

6. The method of claim 5 wherein the additional constraint shapes are generated using a meshless interpolation method.

7. The method of claim 6 wherein the additional constraint shapes are generated using radial basis interpolation.

8. The method of any one of claims 5 to 7 including the step of partitioning the n-dimensional cube into lower dimensional spaces and generating additional constraint shapes for each lower dimensional space.

9. A method for generating a weighted interpolation between a plurality n of morph target shapes $B_1 \ldots B_n$ relative to a base shape B_0 including the steps of:

receiving a set of weights W, including for each morph target shape B_k of the morph target shapes $B_1 \ldots B_n$, a weight w_k to be applied to that morph target shape B_k;

receiving a plurality m of constraint shapes $C_1 \ldots C_m$, each constraint shape associated with non-zero weights (associated weights) on one or more of the morph target shapes $B_1 \ldots B_n$ (associated shapes);

generating a multivariate continuous interpolation function configured to reproduce each morph target shape and each constraint shape when a respective morph target shape or a constraint shape's associated weights on associated shapes are provided as arguments to the multivariate continuous interpolation function; and using the weights W to be applied to morph target shapes as arguments of the multivariate continuous interpolation function to generate the weighted interpolation.

10. The method of claim 9 wherein the multivariate continuous interpolation function represents non-linear relationships between weights W and morph target shapes.

11. The method of claim 10 wherein the multivariate continuous interpolation function is a high dimensional model representation.

12. The method of claim 10 wherein the multivariate continuous interpolation function is linearized as a linear-weighted summation of modifiers applied to morph target shapes and constraint shapes.

13. The method of claim 12 wherein the linear-weighted summation is based on an approximated Taylor series expansion.

14. The method of claim 13 wherein interpolation precision is further improved by interpolating between incremental shapes using a mesh or meshless interpolation system.

15. The method of claim 9 wherein the multivariate continuous interpolation function has the form:

$$f(W) = B_0 + \sum_{k=1}^{n}(w_k \Delta B_k) + \sum_{i=1}^{m}(\beta_i \Delta C_i)$$

wherein ΔB_k represents a modified morph target shape;

ΔC_i represents a modified constraint shape; and

β_i represents a modifier applied to each constraint shape C_i;

wherein the multivariate continuous interpolation function is configured to make the multivariate continuous interpolation function hold for all constraint shapes $C_1 \ldots C_m$.

16. The method of any one of claims 9 to 15 wherein constraint shapes include combination shapes corresponding to a combination between the two or more morph target shapes with unitary weights.

17. The method of claim 16 wherein the modifiers applied to the combination shapes are a function of the associated weights for each combination shape.

18. The method of claim 17 wherein the function of the associated weights is the product of the associated weights.

19. The method of claim 17 wherein the function of the associated weights is the geometric mean or harmonic mean of the associated weights.

20. The method of any one of claims 9 to 19 wherein the constraint shapes include at least one incremental shape corresponding to a partial weighting of one or more of the morph target shapes.