Advanced Computer Graphics Summative Assignment - LLLL76

QUESTION ONE

An appearance based metric is centred around using the perceivable difference between two corresponding raster images that are produced by the renderer. The difference can be calculated as the average sum of squared differences between all corresponding pixels, using the euclidean distance between two RGB vectors as representation of the distance between two pixel values. There are more complex methods of difference calculation between two vectors but this works well in this domain. If the difference between the vectors is small then the model is a good representation of appearance in this specific view, a total can be given as the integral over a finite set of viewpoints. The benefits of this method is that similarity of appearance is directly measured and occluded details can be removed without introduction of any error. The problems are that sufficient sampling of the possible viewpoints needs to be done so as to avoid removing perceptually important features, which leads to expensive rendering step sometimes being required, only a reduced number of samples can be taken.

A geometric based metric is based around producing a geometrically faithful representation of the data using techniques derived from function approximation. This does not allow for removal of features that are occluded as this is not known, which leads to an increased number of points being fitted to, however many viewpoints are not calculated as all features are represented.

The appearance based metric should be calculated after a model is displayed, this is towards the end of the pipeline. The geometric based metric should be done after the rendering but before the model is displayed.

QUESTION TWO

The Hausdorff distance can be applied where there are a miss matched number of points in each of the meshes as they are not 'paired up' in such a way that this is necessary. A point from M_1 will calculate the distance to the nearest point in the mesh M_2, this is done in such a way that multiple points from M_1 can measure a distance to a single point inM_2. This is only done within a local area and if no point is found the distance is set at a maximum. This is also done backwards; M_2 points are matched to the nearest M_1 points, the two sets of distances are then used to give a metric for comparability, be that mean of all values or sum of all values.

QUESTION THREE

Providing the same functionality as the simplification stream, meaning that at any point we can reconstruct any intermediate model in the simplification process. The benefits of the progressive over the simplification is that the resulting representation can be smaller than the original model and reconstruction time is proportional to the desired approximation size. The progressive mesh exploits the fact that the contraction operation is reversible and is in essence a reversed simplification stream. For each of the contractions in the simplification stream we define a corresponding inverse, called a vertex split. Along with the base mesh or original model we can store each of these vertex splits, each must encode the vertex being split, positions of the two resulting vertices, and which triangles to introduce into the mesh. Not

only being able to encode intermediate steps but also being an efficient compression technique.

Not sure about the rendering efficiency.

Question Four

Question Five

Question Six