COMP 5411 Programming Assignment 1 Report

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Abstract

This is the report for the programming assignment 1 of COMP 5411 by Mu Cong DING.

1 Laplacian Smoothing on Bunny

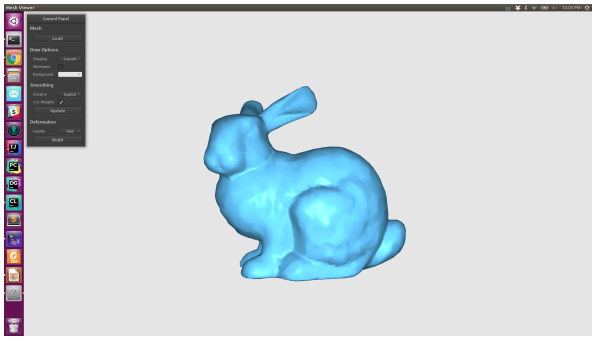

Figure 1: original bunny

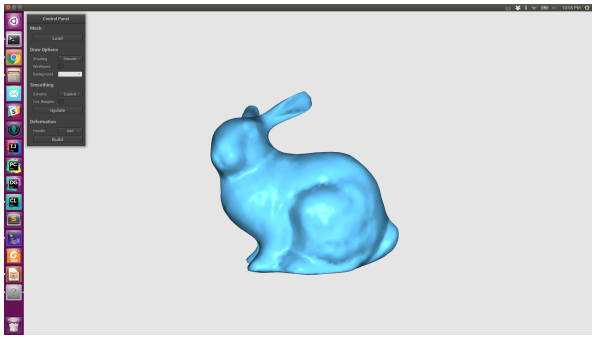

Figure 2: bunny after explicit unweighted laplacian smoothing 15 times with $\lambda = 0.5$.

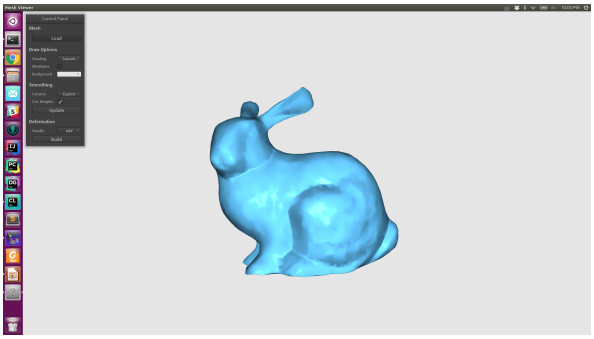

Figure 3: bunny after explicit cotangent weighted laplacian smoothing 15 times with $\lambda = 0.5$.

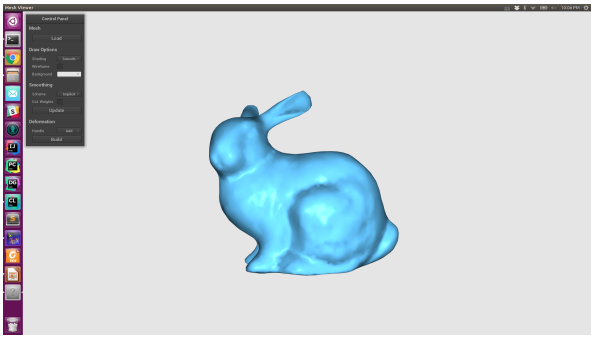

Figure 4: bunny after implicit unweighted laplacian smoothing 15 times with $\lambda = 0.5$.

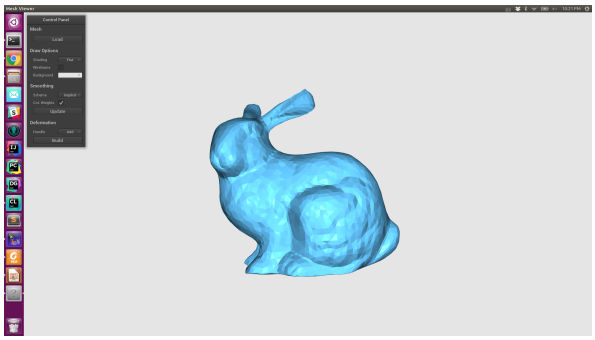

Figure 5: bunny after implicit cotangent weighted laplacian smoothing 15 times with $\lambda = 0.5$.

2 Laplacian Smoothing on Cube Bumpy

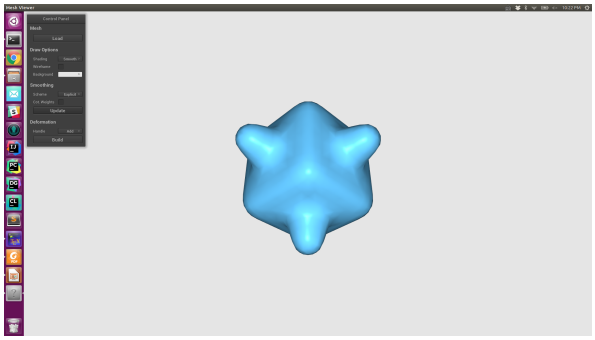

Figure 6: original cube bumpy

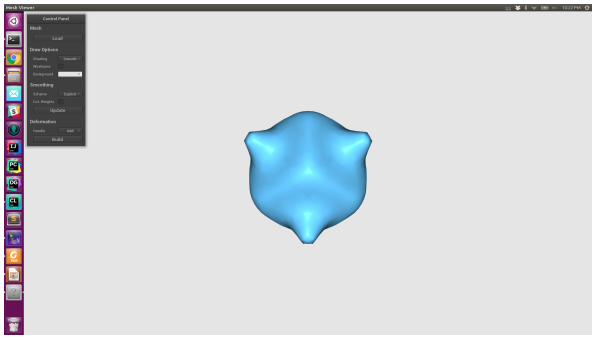

Figure 7: cube bumpy after explicit unweighted laplacian smoothing 15 times with $\lambda = 0.5$.

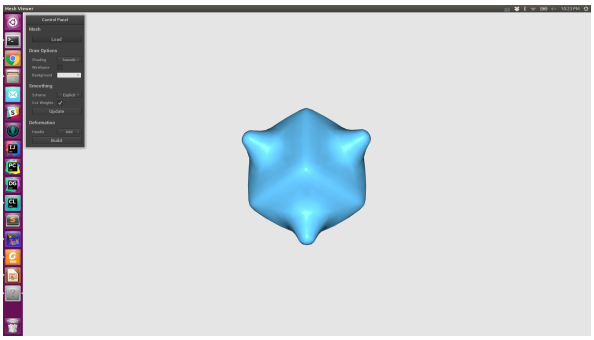

Figure 8: cube bumpy after explicit cotangent weighted laplacian smoothing 15 times with $\lambda = 0.5$.

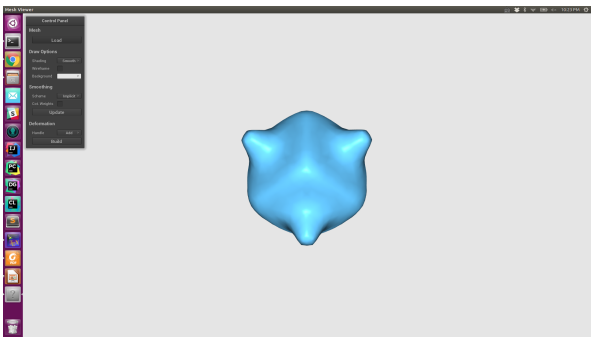

Figure 9: cube bumpy after implicit unweighted laplacian smoothing 15 times with $\lambda = 0.5$.

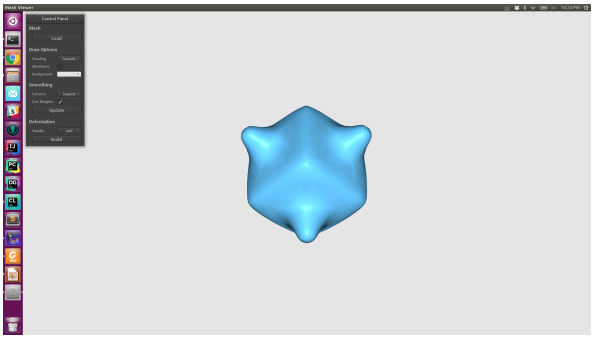

Figure 10: cube bumpy after implicit cotangent weighted laplacian smoothing 15 times with $\lambda = 0.5$.

3 Laplacian Smoothing on Feline

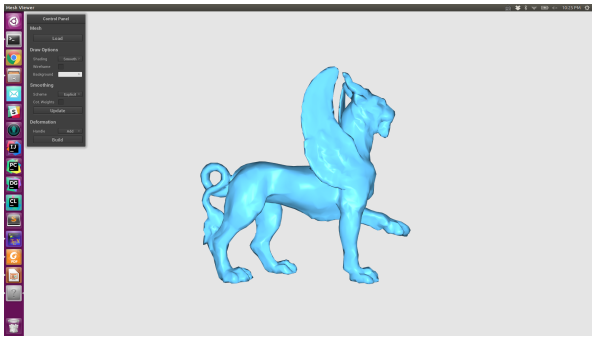

Figure 11: original feline

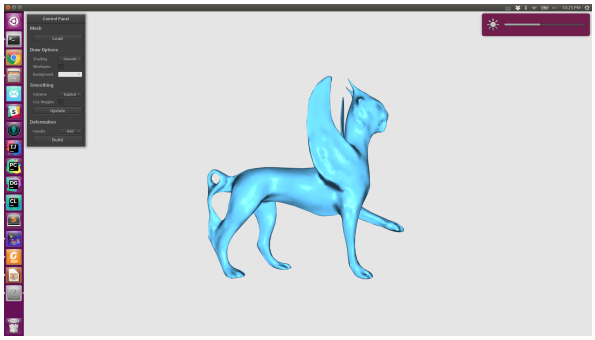

Figure 12: feline after explicit unweighted laplacian smoothing 15 times with $\lambda = 0.5$.

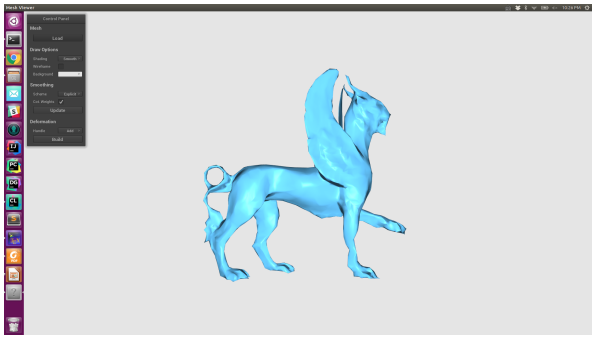

Figure 13: feline after explicit cotangent weighted laplacian smoothing 15 times with $\lambda = 0.5$.

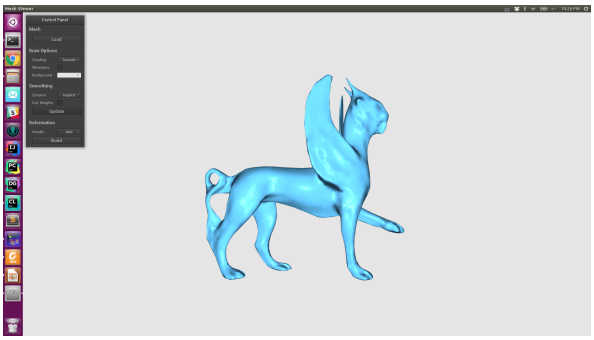

Figure 14: feline after implicit unweighted laplacian smoothing 15 times with $\lambda = 0.5$.

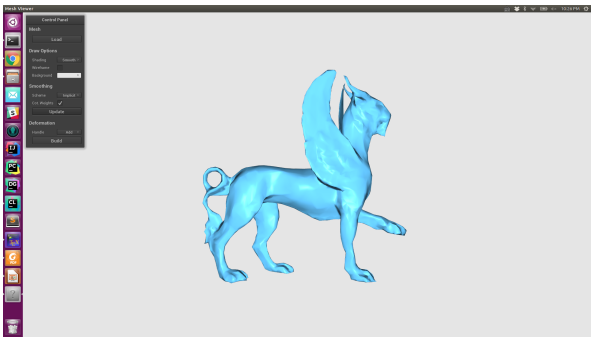

Figure 15: feline after implicit cotangent weighted laplacian smoothing 15 times with $\lambda = 0.5$.

4 Conclusions

Compared to the explicit scheme, the implicit scheme gives slower but gentler smoothing. To get a stable smoothing behavior, a small $\lambda < 0.5$ should be used. And it is clear that the implicit scheme runs much more slower than the explicit scheme. However, since the linear equation in the implicit scheme can be solved to satisfactory precision with in around $5 \sim 20$ iterations, the implicit solver is still affordable fast.