

CHAPTER 5 CONCLUSIONS

5.1 Discussion

This report introduces two new algorithms for evaluating a point on DP triangular surfaces. Our first model is the fastest algorithm compared with other algorithms. It seems to be a perfect model for triangular DP surfaces. However, it was proven later that it does not satisfy the linearly independent property. Consequently, our first model does not lie inside the convex hull of its control net. We needed to abandon this model and tried to adjust it to form exact triangular DP surfaces. The second model requires a bit more computational time than the first model but it possesses all significant geometric properties of surface modeling, for examples, convexity, partition of unity and linear independence. However, the second model does not derive the general forms of basis, degree elevation, and conversion.

For the degree from 1 to 3, the number of computations for both triangular Bézier surface and our new DP triangular patch algorithms are the same as shown in Table 3.2. Thus, there is no differences between them.

5.2 Conclusions of The Research

There are three types of algorithms for constructing DP triangular surfaces. First, there is the algorithm provided by Chen in 2008 [6] which lacks many geometric properties such as convexity and still has cubic computational complexity $O(n^3)$. Furthermore, Chen (2008) does not directly apply the formation's idea of DP curves, which is that the most important points are located near one (or two) middle points.

The first model in this paper corrects all missing properties of triangular DP surface (2008), e.g., convexity and it is also quadratic complexity $O(n^2)$. Unfortunately, the degree elevation and the conversions between DP and Bézier surfaces could not be found because it lacks the linear independence property. This is an important property of convex hull property. In other words, this model does not lie inside the convex hull of its control net. Thus, there was no complete and correct algorithm for evaluating triangular DP surfaces. Hence, we propose a second representation of DP triangular patches that possesses all significant geometric property for surface modeling, that is, convexity, partition of unity and linear independence. Considering the polynomials, it is obvious that this model has the most similar characteristics to the polynomials of the DP curve, which are defined with no coefficient values. In addition, the properties of this model are also presented with the basis's recurrence formulae and a recursive algorithm with quadratic complexity. This

model has been proven to be more correct and efficient than the previous two algorithms for the construction of triangular DP surfaces.

5.3 Future Work and Further Recommendation

This work has been still missing direct formulae for the degree elevation, degree reduction and conversion. They are important properties in the direct geometric modeling. Thus, as future work, one should develop these three properties in this model in order to be an alternative choice of triangular patch modeling methods.